Magyarországi földrengések évkönyve
Hungarian Earthquake Bulletin
2004

Tóth L., Mónus P., Zsíros T., Kiszely M., Czifra T.

GeoRisk

Földrengéskutató Intézet ✦ Earthquake Research Institute

Magyar Tudományos Akadémia
Geodéziai és Geofizikai Kutatóintézet
Szeizmológiai Főosztály

MTA GGKI

Hungarian Academy of Sciences
Geodetic and Geophysical Research Institute
Seismological Observatory

Budapest

MAGYARORSZÁGI FÖLDRENGÉSEK ÉVKÖNYVE

HUNGARIAN EARTHQUAKE BULLETIN

2004

TÓTH LÁSZLÓ, MÓNUS PÉTER, ZSÍROS TIBOR,
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Hátsó borító: Az 1995-2004 között észlelt (piros körök) és a 456-1994 időszakból ismert historikus (szürke körök) földrengések epicentrumainak eloszlása; *lent:* földrengések gyakorisága Magyarországon

Back cover page: Distribution of recent 1995-2004 earthquakes (red dots) and historical 456-1994 earthquakes (grey circles); *lower part:* earthquake recurrence in Hungary

TARTALOMJEGYZÉK

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Előszó

Jelen kiadvány a magyarországi földrengések tizedik évkönyve. Az előző évkönyvekhez hasonlóan tartalmaz minden fontos adatot a 45.5-49.0 északi szélesség és a 16.0-23.0 keleti hosszúság közötti területen 2004 folyamán kipattant földrengésekről.

Jelenleg 16 szeizmográf állomás működik Magyarországon. Az MTA GGKI négy digitális szélessávú szeizmológiai állomást működtet: Budapesten, Mórágyon, Piszkéstetőn és Sopronban három komponens digitális regisztrálása folyik, az STS-2 széles sávú szeizmométer jeleit 80 Hz mintavételi frekvenciájú, nagyfelbontású adatgyűjtővel regisztrálják, az adatok on-line módon is hozzáférhetők. A Paksi Atomerőmű Rt. 1995-ben létesített mikroszeizmikus megfigyelő hálózata, a Bátaapáti – Üveghuta térségében tervezett kis és közepes radioaktivitású hulladéktároló szeizmikus monitorozására 1999-ben létrehozott, és a Püspökszilágyi Radioaktív Hulladéktároló és Feldolgozó monitorozására felállított állomások adják a hálózat további állomásait, melyek a talajmozgás három rövidperiódusú komponensét regisztrálják szintén digitálisan. Ez utóbbi állomásokat a GeoRisk Földrengéskutató Intézet Kft. üzemelteti.

A hálózat földrengésmérő állomásainak száma és minősége is 1995-ben érte el azt a szintet, hogy a lakosság által érzett földrengéseket az ország szinte teljes területén – az északkeleti rész kivételével – nagy valószínűséggel detektálja. Működtetésétől emiatt joggal várjuk, hogy a hazai földrengés tevékenységről néhány évtized után minden eddiginél pontosabb képet fogunk kapni.

A földrengések valószínűségi jellemzése tudományosan megalapozott, jól kidolgozott szakterület. A magyar szeizmológusok elkészítették hazánk földrengés katalógusát és a nemzetközileg elfogadott metodika használatával megbízható módon felmérték Magyarország földrengés veszélyeztetettségét. Különböző térképek készültek, az egyik csúcsgyorsulásra vonatkozó térkép a 2000. évi évkönyv hátsó borítóján is látható. A Pannon-medence szeizmikus aktivitása viszonylag kicsiny, bár a medence külső részein (DK-i Alpok és a Dinári-hegyég, Bécsi-medence és a Ny-i Kárpátok, Kárpátalja) markáns földrengés tevékenység tapasztalható. A DK-i Kárpátok lábánál, a Vrancea – Háromszéki-havasok környékén pedig nagyméretű (M>7) földrengések is előfordulnak.

A XIX. század közepétől napjainkig terjedő időszak rengéseinek gyakorisága alapján, az ország területén évente négy-öt 2.5-3.0 magnitúdójú, az epicentrum környékén már jól érezhető, de károkat még nem okozó földrengésre kell számítani. Jelentősebb károkat okozó rengésre 15-20 évenként, míg erős, 5.5-6.0 magnitúdójú földrengésre 40-50 évente kerül sor. Az utóbbi tíz évben mintegy 600 földrengést regisztráltak. Ezeknek mintegy tizede volt érezhető és szerencsére egyikük sem okozott említésre méltó károkat. Az a tény azonban, hogy az utóbbi évtizedben Magyarországon nem volt nagyobb földrengés nem jelenti azt, hogy nem is lesz. A kis rengések mutatják, hogy a tektonikai folyamatok nem álltak le. A geodéziai módszerekkel jól nyomon követhető szintváltozások jelzik egyes területek emelkedését, mások süllyedését. A feszültségmérésekből világosan kitűnik, hogy Magyarország nem feszültségmentes terület. A nagyobb mélységek viszonyait felderítő szeizmikus mérések sok törésvonalat - tört, zúzott övet - tártak fel, melyek egy része ma is aktív lehet, vagy tektonikai aktivitása felújulhat.

Amikor megemlékezünk a tizedik évfordulóról arra is emlékeztetnünk kell, hogy – többek között – az évkönyvben szereplő adatokra támaszkodva több OTKA kutatás folyt, PhD dolgozatok születtek és tudományos dolgozatok készültek. A sikeres, magas színvonalú kiadvány készítőinek további eredményes munkát kívánok a következő évekre, évtizedekre is!

Budapest, 2005. február

Meskó Attila

Preface

The present publication is the tenth volume of the Hungarian Earthquake Bulletin. It contains all earthquake-related information available from the year of 2004. The geographic region covered is bounded by latitudes 45.5-49.0N and longitudes 16.0-23.0E.

At present 16 seismograph stations are running in Hungary. The Geodetic and Geophysical Research Institute of the Hungarian Academy of Sciences operates four stations. These stations (Budapest, Mórágy, Piszkéstető and Sopron), equipped with STS-2 broadband seismometers and high resolution data acquisition systems, provide three component 80 Hz continuous data online. The other thirteen stations, operated by GeoRisk Earthquake Research Institute Ltd., record three component, short period event data. Each station belongs either to the microseismic monitoring network of the Paks Nuclear Power Plant Ltd. installed in 1995, the seismic monitoring stations of the planned low and medium activity nuclear waste disposal site at Bátaapáti – Üveghuta installed in 1999, or the seismic monitoring stations of the Radioactive Waste Management and Disposal Facility at Püspökszilágy.

The seismograph network, developed by 1995 has the ability to detect earthquakes in almost the full territory of the country with high probability excluding the northeast region. Therefore it is reasonable to expect its operation to present the most detailed picture of the Hungarian earthquake activity within a few decades.

The probabilistic seismic hazard assessment is a scientifically sound and well-established field. As a result of several years' coordinated effort, a comprehensive earthquake catalogue for the whole Pannonian Basin has been published, as well as standard methodology-based, reliable and realistic seismic hazard estimations have been carried out for Hungary. Seismic hazard maps at different probability levels have been calculated of which one is presented on the back cover of the Bulletin of the year 2000. Although the overall seismicity in the Pannonian Basin is moderate, significant earthquake activity is observed at the periphery, SE Alps and Dinarides, W Carpathians and Vienna Basin, E Carpathians. Rather intense seismicity is concentrated in the Vrancea region at the SE Carpathians with strong earthquakes of M>7.

Based on the statistics of historical records and recent observations, four to five earthquakes are expected annually with magnitude 2.5-3.0. Although the population near the epicenter area usually does feel these events, no significant damage is expected. The return period of larger earthquakes with considerable damage is about 15-20 years. Strong 5.5-6.0 magnitude earthquakes are statistically anticipated in every 40-50 years. In the last ten years, about ten percent of the some 600 small detected and located events were felt but no significant damage was reported. However, the lack of larger earthquakes in the last decade does not mean that the probability to have one has decreased. On the contrary, the number of small events provides direct evidence for ongoing tectonics, and the present day movements monitored by space geodesy show both vertical and horizontal continuing deformation. In situ stress measurements also express obvious signs of an existing strain field in the Pannonian Basin. Deep seismic profiles indicate a number of faults and discontinuities in the geological strata, which might be either active or reactivated in the future.

Based on the data published in the Bulletin, a significant amount of research was carried out, and numerous PhD thesis and scientific papers were written. On behalf of the scientific community, I wish for the authors of this high quality and useful publication success for the forthcoming years.

February 2005, Budapest

Attila Meskó

BEVEZETÉS

A Pannon-medencében a földrengés aktivitás a lemezperemi területekhez képest mérsékelt, a rengések epicentrumainak eloszlása pedig első pillantásra rendszertelennek látszik. Nehéz eldönteni, hogy a földrengések izolált területeken, vagy szeizmikusan aktív vonalak mentén keletkeznek. Mindenesetre felismerhető néhány terület, ahol viszonylag gyakran fordult elő a múltban földrengés. Ilyenek pl. Eger és környéke, ahol 70 év alatt legalább 16 földrengés és több mint 50 nagyobb utórengés történt. Komárom és Mór környékén, Jászberény, Kecskemét és Dunaharaszti közelében szintén jelentős volt az aktivitás egy-egy bizonyos időszakban. Az alacsony szeizmicitás nem feltétlenül jelenti a földrengések méretének csekélységét: komoly épületkárokat okozó földrengésekről van szó, néhány esetben talajfolyósodást is okozó gyorsulásokkal (pl. 1763 Komárom, M 6.2; 1911 Kecskemét, M 5.6), esetleg a felszínen is megjelenő töréssel (pl. 1834 Érmellék, M 6.2). Ezek a példák azt mutatják, hogy 6.0-6.5 magnitúdójú rengések lehetségesek, de nem gyakoriak a Pannon-medencében (Tóth et al., 2002a).

A földtudományi kutatás fontos eleme a szeizmicitás vizsgálata, annak megismerése, hogy milyen gyakorisággal, hol és mekkora földrengések keletkeznek, továbbá melyek azok a szeizmotektonikai folyamatok, melyek a földrengéseket létrehozzák.

Az általános ismeretszerzésen túlmenően a földrengés elleni védekezéshez is fontos segítséget nyújt a szeizmicitás pontos ismerete. Egy terület földrengés kockázatát csak komplex szeizmológiai, geofizikai, geológiai ismeretek alapján lehet meghatározni. A legfontosabb információ, mely mennyiségileg meghatározza a földrengéskockázatot, a terület földrengés története, illetve a jelenkori rengések ismerete. Ehhez nyújt kardinális fontosságú segítséget a földrengés monitorozás, a földrengések megfigyelése, mérése és paramétereinek meghatározása.

Magyarországon a földrengésmérő állomások száma és minősége 1995-ben érte el azt a szintet, hogy – az ÉK-i területet kivéve – lakosság által érzékelt valamennyi rengést a hálózat nagy valószínűséggel detektálja. Ez nagyrészt annak a szeizmikus megfigyelő hálózatnak köszönhető, melyet a Nemzetközi Atomenergia Ügynökség javaslatára a Paksi Atomerőmű Rt. létesített az atomerőmű telephely tágabb környezetében.

Jelen kiadványunk célja és tartalma pontosan az, amit a címe is jelez: évkönyv, melyben megtalálható minden olyan adat és ismeret, melyet az év során a magyarországi földrengésekkel kapcsolatban összegyűjtöttünk. A kiválasztott célterület a 45.5-49.0N szélesség és 16.0-23.0E hosszúság által határolt földrajzi tartomány. A teljesség kedvéért azonban a világ jelentős földrengéseinek listája is megtalálható a mellékletben. Reméljük, hogy hasznát látják munkánknak mindazok, akik földtudományi kutatásaikban felhasználói a szeizmicitás adatoknak, de azok is, akik csupán egy-egy földrengéssel kapcsolatos kérdésükre keresnek választ kiadványunkban.

INTRODUCTION

Seismicity in the Pannonian basin is relatively low comparing to the peripherals and the distribution of earthquake epicenters shows a rather scattered pattern at the first glance. It is particularly difficult to decide whether the epicenters occur at isolated places or along elongated zones however, at several single places earthquakes occur repeatedly. For example, near to Eger (47.9N; 20.4E) at least sixteen earthquakes with more than fifty greater aftershocks occurred over a time interval of some 70 years. Komárom and Mór area (47.4-47.8N; 18.2E), Jászberény (47.5N; 20.0E), Kecskemét (46.9N; 19.7E) and Dunaharaszti (47.4; 19.0E) also produced significant activity over a certain but limited period of time. Moderate seismicity does not necessarily mean moderate size of earthquakes: reports of major earthquakes often refer to heavy building damage, liquefaction (e.g. 1763 Komárom earthquake, M 6.2; 1911 Kecskemét earthquake, M 5.6) and sometimes the possibility of surface fault rupture (e.g. 1834 Érmellék earthquake, M 6.2). These observations indicate that magnitude 6.0-6.5 earthquakes are possible but not frequent in the Pannonian basin (Tóth et al., 2002b).

The study of the recent seismicity is an important element of seismotectonic research. Earthquakes represent the sudden release of slowly accumulated strain energy and hence provide direct evidence of active tectonic processes. However, low and moderate seismicity at intraplate areas generally precludes reliable statistical correlation between epicenters and geological features.

Moreover, as one of the chief contributor to seismic hazard at a given area, detailed knowledge of seismicity also plays an important role in earthquake risk reduction. To be useful, accurately located earthquakes are required. While good information about larger historical earthquakes exists for about the past few hundred years, these are not well enough located. Only modern seismic monitoring networks, capable of locating small magnitude local earthquakes provide the necessary information to close this knowledge gap. The developing database of well-located earthquakes can be used, in one hand, to resolve the tectonic framework and required on the other hand to refine our understanding of the level of seismic risk.

1995 was a milestone in the history of Hungarian seismological observations. The Paks Nuclear Power Plant Ltd. installed a network of high quality digital seismographs, following the recommendations by the International Atomic Energy Agency (IAEA). For the first time, this network made it possible to detect and locate such small magnitude local seismic events that it is very unlikely so as to felt events go undetected in most parts of the country not including the NE territory.

The present Earthquake Bulletin is a united annual summary report of all Hungarian earthquake monitoring projects. The information in the Bulletin is based on all available earthquake related data provided by different organizations. The geographic region covered is bounded by latitudes 45.5-49.0N and longitudes 16.0-23.0E.

1.

ÖSSZEFOGLALÁS

A 2004. év szeizmikus szempontból átlagosan aktív időszaknak tekinthető. Az év folyamán 116 szeizmikus eseményről szereztünk tudomást a 45.5-49.0N szélességi és 16.0-23.0E hosszúsági koordináták által határolt területen, amelyek közül 73 volt természetes eredetű földrengés, a többi robbantás. Az események mérete a $0.0 \leq ML \leq 3.8$ lokális magnitúdó tartományba esett.

Az év folyamán 5 olyan földrengés volt, melyet a lakosság is érzett. Ezek közül egy a Rába medencében, egy Berhida környékén, három pedig a Győr-Komárom forrászónában keletkezett.

A legnagyobb földrengés intenzitás, melyet az év folyamán Magyarország területéről jelentettek 5 EMS fokozat volt. Ez kisebb kémény károkat és vakolatrepedéseket jelentett néhány hagyományos épületben, jelentős épületkár azonban ebben az évben nem keletkezett.

Időrendben az első érezhető szeizmikus esemény, mely egyben az év legerősebb magyarországi rengése is volt, május 25-én reggel pattant ki a Rába folyó völgyében. A 3.8 M_L magnitúdójú rengés érezhető volt mintegy 3000 km^2 területen. A legnagyobb megrázottságot (5-6 EMS) Beled, Dénesfa, Edve, Páli, Vág településekről jelentették. A rengés az epicentrum környékén kisebb épület károkat (kémény ledőlt, kisebb repedések a falakban) is okozott. A rengést több kisebb utórengés követte.

Július 20-án éjszaka 2.5 M_L magnitúdójú földrengés keltett riadalmat Berhida környékén. A rengés intenzitása 4-5 EMS fokra becsülhető (Berhida, Litér, Pétfürdő). A rengés csak viszonylag kis területen (100-150 km^2) volt érezhető.

Győr - Komárom térségében ebben az évben is több földrengés volt. 3.4 M_L magnitúdójú rengés pattant ki augusztus 17-én, mely mintegy 400 km^2 területen volt érezhető Győrtől DK-i irányban. A legnagyobb intenzitást (4-5 EMS) Kisbér, Bársonyos, Kerékteleki, Tárkány településekről jelentették.

Kevesebb, mint egy nappal az előző rengés után, ugyanazon forrászónában, viszonylag kis területen (100-150 km^2) volt érezhető augusztus 18-án Kerékteleki, Nyúl, Mezőörs, Táp környékén egy 3.2 M_L magnitúdójú földrengés, melynek legnagyobb becsült intenzitása 5 EMS volt.

Ezt követően, október 14-én reggel újabb kisebb (2.8 M_L) földrengést éreztek és jelentettek Mezőörs, Ács, Nyúl, Kerékteleki környékéről. Az esemény nagyon kis területen volt érezhető, a legnagyobb intenzitás 4-5 EMS volt.

1.

SUMMARY

2004 was an average year for Hungarian seismicity. Out of the 116 seismic events ($0.0 \leq M_L \leq 3.8$) located within the area bounded by latitudes 45.5-49.0N and longitudes 16.0-23.0E 73 were identified as natural earthquakes, the rest were mostly quarry blasts.

Five earthquakes were reported as felt. One of those burst in the Rába valley, one in Berhida region and three in Győr – Komárom region.

The highest magnitude assigned to a shock was 3.8 M_L while the highest intensity reported during the year was 5 EMS causing fine cracks in the plaster at a few ordinary buildings. No significant earthquake damage was reported.

Reviewing the more notable events of the year in chronological order, the first and the highest magnitude (3.8 M_L) earthquake of the year was the Beled event in the Rába valley on May 25th. The earthquake was felt in an area of about 3000 km^2 in NW Hungary. The highest intensity values (5-6 EMS) were reported from Beled, Dénesfa, Edve, Páli, Vág. Minor damage (chimney went down, cracks in walls) was reported from the epicenter area. The main shock was followed by several smaller aftershocks.

On July 20th night, a 2.5 M_L magnitude earthquake alarmed people in the N of Balaton region. The shock was felt in a relatively small area of 100-150 km^2 and produced reports of 4-5 EMS from Berhida, Litér, Pétfürdő.

There were a number of earthquakes in the Győr - Komárom region in this year. 3.4 M_L magnitude event was felt in an area of 400 km^2 SE of Győr and produced reports of 4-5 EMS from Kisbér, Bársonyos, Kerékteleki, Tárkány.

Less than one day after the Kisbér earthquake, a slightly smaller magnitude event (3.2 M_L) was felt and reported from Kerékteleki, Nyúl, Mezőörs, Táp, from a relatively small area of 100-150 km^2. The highest intensity was estimated 5 EMS in Kerékteleki.

Following the August 17th and 18th earthquakes, in the morning October 14th, an other small magnitude (2.8 M_L) event was felt and produced reports of intensity 4-5 EMS from a very small area at Mezőörs, Ács, Nyúl, Kerékteleki.

2.

A MAGYARORSZÁGI FÖLDRENGÉS-MEGFIGYELŐ HÁLÓZAT

2004-ben 16 szeizmográf állomás működött Magyarországon. A megfigyelő hálózat az előző évhez képest nem változott.

A *Paksi Atomerőmű Rt.* által 1995-ben létesített mikroszeizmikus megfigyelő hálózat az egész év folyamán működött. A Bátaapáti - Üveghuta térségében tervezett kis és közepes aktivitású radioaktív hulladéktároló környezetének monitorozására 1999-ben létrehozott *„üveghutai hálózat”* mérőállomásai közül az RHK1 (Bakonya) és az RHK3 (Tenkes) szintén üzemelt. A *Püspökszilágyi Radioaktív Hulladéktároló és Feldolgozó* monitorozására létesített RHK5 (Szentendre) és RHK6 (Őrbottyán) állomások is működtek.

Az egész hálózat gerincét továbbra is a paksi mikroszeizmikus megfigyelő hálózat egységes adatbázissal működő mérőállomásai jelentették, melyek az események felismerését lehetővé tették. A helymeghatározás során számottevő szerepe volt az *MTA GGKI Szeizmológiai Obszervatóriuma* által működtetett öt állomásnak is. Különösen jelentős a német GEOFON hálózattal együttműködve üzemeltetett piszkéstetői szélessávú mérőállomás, mely a folyamatos regisztrálás miatt referencia szerepet töltött be.

A feldolgozás és kiértékelés során fontos szerepet játszott a szomszédos országok állomásaival, illetve nemzetközi adatközpontokkal történt adatcsere is.

Átlagos zaj- (talajnyugtalanság) viszonyokat feltételezve a hálózat észlelési küszöbe ML=1.5-2.0 magnitúdó körül van (2.3. ábra). Ennek számítása azon feltételezésen alapul, hogy az eseményt legalább négy mérőállomás érzékeli, mely a helymeghatározáshoz szükséges minimális állomásszám. Az ország középső részén kissé alacsonyabb, a határok környékén kissé magasabb ez az érték. Ez azt jelenti, hogy az ÉK-i területeket kivéve, a lakosság által érzékelt valamennyi rengést a hálózat nagy valószínűséggel detektálja.

Öt gyorsulásmérő állomás működött Magyarországon az év folyamán, melyek adatai szintén rendelkezésre álltak. Ezen állomások tulajdonosai, illetve üzembentartói: a *Paksi Atomerőmű Rt.,* a *GeoRisk Földrengéskutató Intézet,* az *MTA GGKI,* a *Környezetvédelmi Minisztérium* és a *MOL Rt*.

2.

SEISMOGRAPH STATIONS IN HUNGARY

In 2004, there were 16 seismograph stations running in Hungary. No modification has been done with the monitoring network compared to the previous year.

The microseismic monitoring network established by the *Paks Nuclear Power Plant Ltd.* in 1995, has been operational throughout the year. Two stations (RHK1-Bakonya and RHK3-Tenkes) of the "*Üveghuta Network"* set up in 1999 to monitor microseismic activity at potential low and medium activity nuclear waste disposal site vicinity were running throughout the year. Two additional stations (RHK5-Szentendre and RHK6-Őrbottyán) were also running to monitor the Püspökszilágyi Nuclear Waste Disposal.

The core of the whole network was formed by the Paks microseismic monitoring stations. This network had been operated and data collected in a uniform database what made possible to detect and identify the local seismic events. In addition, data was contributed by five stations operated by the *Seismological Observatory, GGKI*. Of those, especially important was the broadband station PSZ operated in cooperation with the German GEOFON network.

Data exchange with stations from the adjoining countries and international data centers was also utmost important.

The estimated detection capabilities of the present network with average noise conditions, supposing that at least four stations is needed for origin determination, is typically around 1.5-2.0 M_L, somewhat lower in the middle of the country and a little higher towards the border regions. (See Fig. 2.3) This means that in most parts of the country, not including the NE territory, it is very unlikely that felt events go undetected.

During the reporting period, we also had access to five strong motion accelerograph stations belonging to and operated by different organizations such as *Paks Nuclear Power Plant, GeoRisk, GGKI, Ministry of Environment* and *MOL RT.*

2.1. Táblázat Szeizmológiai állomások, műszerek és alapkőzet
Table 2.1. Seismic stations, instrumentation and lithology

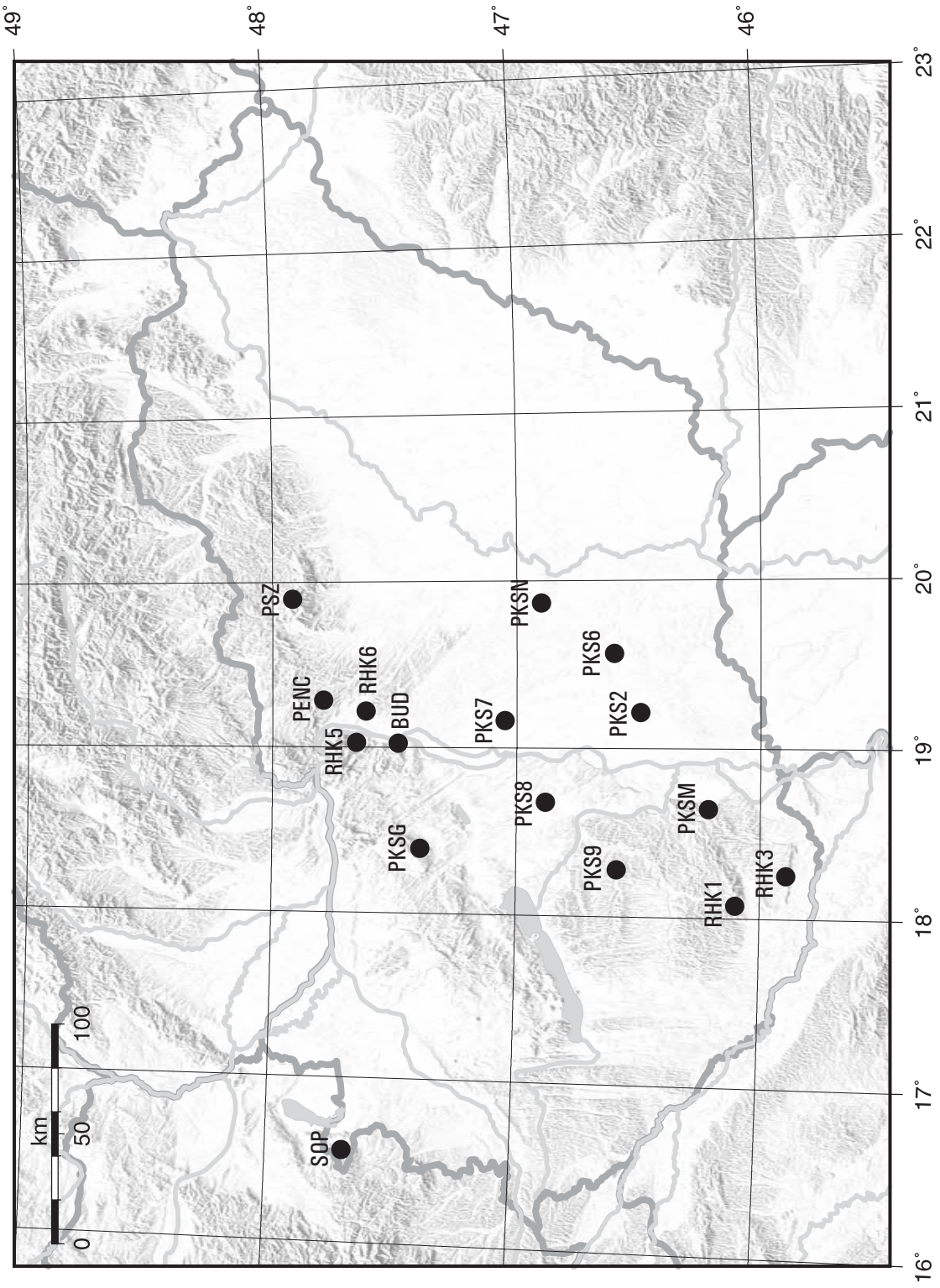
Jel Code	Szélesség Latitude (N)	Hosszúság Longitude (E)	Magasság Elevation (m)	Alapkőzet Foundation	Állomás típusa Station type (1)	Érzékelő típusa Sensor type (2)	Regisztrálás Recording (3)	Szervezet Org. (4)
BUD	47,4836	19,0239	196	dolomit dolomite	3C BB 3C SP	STS-2 LE-3D	D - C D - E	GGKI GR
PENC (RHK4)	47,7905	19,2817	250	üledék alluvium	3C SP	LE-3D	D - E	GGKI-GR
PKS2	46,4920	19,2131	106	homok sand	3C SP	LE-3D	D - E	GR
PKS6	46,5998	19,5645	120	homok sand	3C SP	LE-3D	D - E	GR
PKS7	47,0473	19,1609	95	agyag mud	3C SP	LE-3D	D - E	GR
PKS8	46,8787	18,6765	135	riolit tufa rhyolite tuff	3C SP	LE-3D	D - E	GR
PKS9	46,5870	18,2789	240	lösz loess	3C SP	LE-3D	D - E	GR
PKSG	47,3918	18,3907	200	dolomit dolomite	3C SP	LE-3D	D - E	GR
PKSM	46,2119	18,6413	170	gránit granite	3C BB	STS-2	D - C	GGKI
PKSN	46,8972	19,8673	110	homok sand	3C SP	LE-3D	D - E	GR
PSZ	47,9184	19,8944	940	andezit andesite	3C BB	STS-2	D - C	GGKI
RHK1	46,0948	18,0720	297	mészkő limestone	3C SP	SS-1	D - E	GGKI
RHK3	45,8885	18,2521	420	mészkő limestone	3C SP	LE-3D	D - E	GR
RHK5	47,6983	19,0822	213	mészkő limestone	3C SP	LE-3D	D - E	GR
RHK6	47,6741	19,2488	157	homok sand	3C SP	LE-3D	D - E	GR
SOP	47,6833	16,5583	260	gneisz gneiss	3C BB	STS-2	D - C	GGKI

(1) 3C – 3 komponenses szeizmométer / three component seismometer
SP – rövid periódusú szeizmométer / short period seismometer; BB – széles sávú szeizmométer / broad band seismometer
LP – hosszú periódusú szeizmométer / long period seismometer

(2) STS-2 – Streckeisen széles sávú szeizmométer / Streckeisen broad band seismometer
LE-3D – Lennartz 3 komponenses 1Hz-es geofon / Lennartz three directional 1Hz geophone
SS-1 – Kinemetrics 1Hz-es szeizmométer / Kinemetrics 1Hz seismometer
Kirnos – 12 s-os hosszú periódusú szeizmométer / 12 s long period seismometer

(3) A – analóg / analogue; D – digitális / digital; C – folyamatos felvétel / continuous recording; E – esemény felvétel / event recording

(4) GGKI – MTA Geodéziai és Geofizikai Kutatóintézet / Geodetic and Geophysical Research Institute, HAS
GR – GeoRisk Földrengéskutató Intézet Kft. / GeoRisk Earthquake Research Institute Ltd.



2.1. ábra A magyarországi szeizmológiai állomáshálózat 2004-ben (részletek: 2.1. Táblázat)

Figure 2.1. Seismograph station network in Hungary in 2004 (See Table 2.1. for details)

2.2. Táblázat Gyorsulásmérő állomások, műszerek és alapkőzet
Table 2.2. Strong motion accelerograph stations

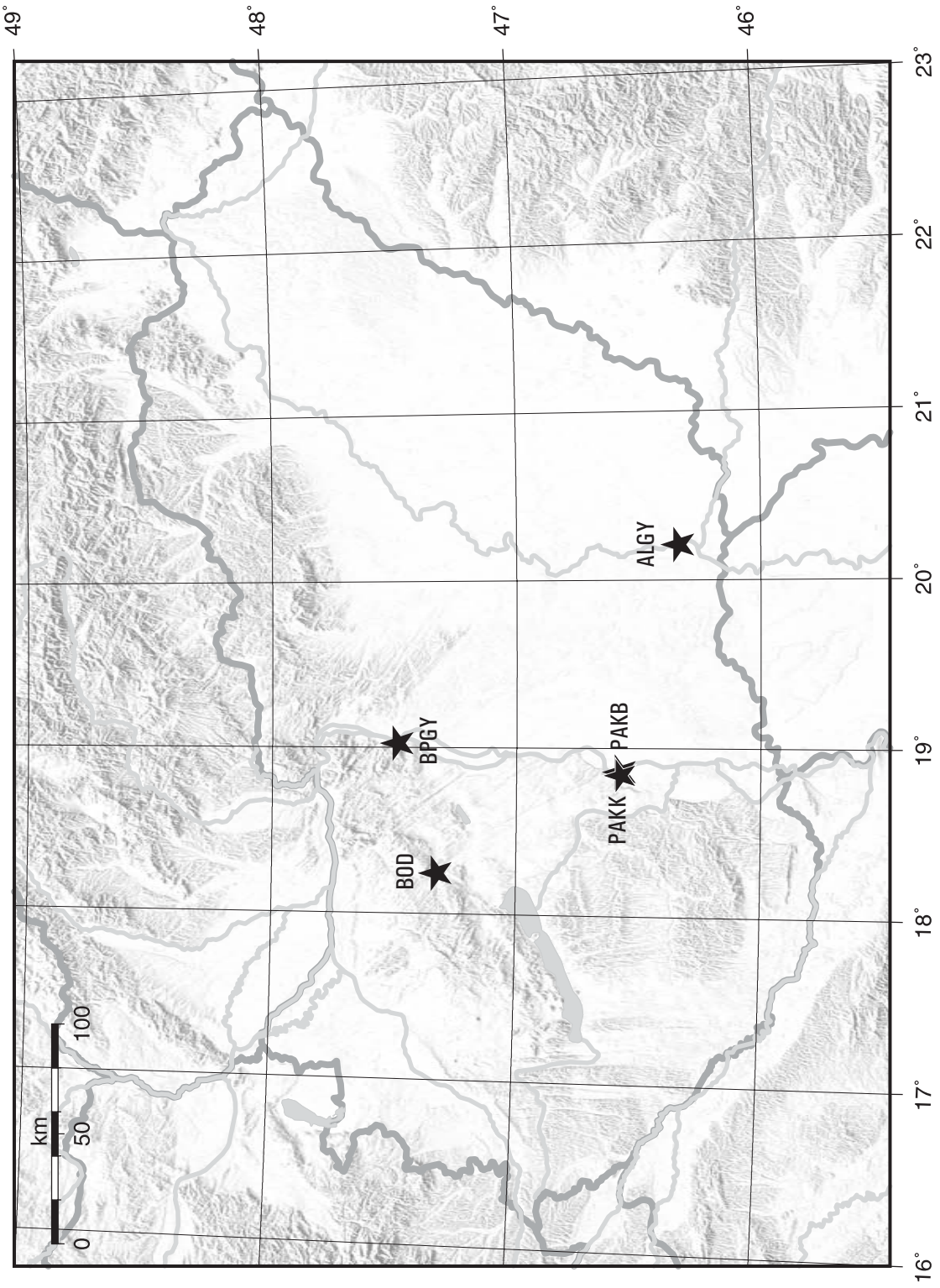
Jel Code	Szélesség Latitude (N)	Hosszúság Longitude (E)	Magasság Elevation (m)	Alapkőzet Foundation	Állomás típusa Station type (1)	Érzékelő típusa Sensor type (2)	Regisztrálás Recording (3)	Szervezet Org. (4)
ALGY	46.3332	20.2092	90	laza homok loose sand	3C SM	AC-23	D – E	MO-GR
BOD	47.322	18.241	250	mészkő limestone	3C SM	AC-23	D – E	GR
BPGY	47.4836	19.0239	196	dolomit dolomite	3C SM	AC-23	D – E	GGKI
PAKB	46.5743	18.8587	100	homok sand	3C SM	AC-23	D – E	PART
PAKK	46.5743	18.8449	100	laza homok loose sand	3C SM	AC-23	D – E	GGKI

(1) 3C – 3 komponenses szeizmométer / three component seismometer
SM – gyorsulásmérő / strong motion accelerograph

(2) AC-23 – triaxiális gyorsulásmérő egység / triaxial accelerometer package (full scale 0.5g)

(3) D – digitális / digital
E – eseményfelvétel / event recording

(4) GGKI – MTA Geodéziai és Geofizikai Kutatóintézet / Geodetic and Geophysical Research Institute, HAS
GR – GeoRisk Földrengéskutató Intézet Kft. / GeoRisk Earthquake Research Institute Ltd.
MO – MOL Rt.
PART – Paksi Atomerőmű Rt. / Paks Nuclear Power Plant Ltd.



2.2. ábra A magyarországi gyorsulásmérő állomások 2004-ben (részletek: 2.2. táblázat)

Figure 2.2. Strong motion accelerograph stations in Hungary in 2004 (See Table 2.2. for details)

A PAKSI MIKROSZEIZMIKUS MEGFIGYELŐ HÁLÓZAT

A hálózat keretében - beleértve a radioaktív hulladéktárolók megfigyelésére létesített állomásokat is - 2004-ben 13 mérőállomás működött. Az adatok összegyűjtése és feldolgozása a budapesti adatközpontban történik (Tóth és Mónus, 1997). A terepi állomások műszerezettsége egyforma: érzékelő, digitális adatrögzítő és időjel-vevő. Az érzékelő Lennartz gyártmányú, LE-3D típusú 3 komponenses rövid periódusú szeizmométer. Az adatrögzítő egység szintén Lennartz gyártmányú MARS-88 digitális regisztráló, 20 bites A/D konverzióval, 62,5 Hz-es mintavételi frekvenciával. Az adatrögzítő eseményregisztrálást végez, s emellett egy ritkábban mintavételezett folyamatos adatsort, az ún. „monitor csatornát" is rögzíti. 8 állomás helyszínen regisztrál, az adatok 5¼"-es újraírható magneto-optikai lemezre kerülnek, amelyeket kéthetente cserélünk és juttatunk az adatközpontba. További 5 állomás modemes telefon kapcsolattal érhető el, ezekről az adatgyűjtés naponta történik. Az állomások többségén a tápfeszültséget napelemek biztosítják, a pontos időt pedig mindenütt DCF-77 vevő szolgáltatja.

Az adatközpontban az adatok gyűjtése, rendezése, nyilvántartása Lennartz adatbázis szoftverrel, míg a szeizmológiai igényű feldolgozás a PITSA nevű program felhasználásával történik. A teljes adatmennyiséget archiváljuk.

A paksi mikroszeizmikus megfigyelő hálózat, az üveghutai megfigyelő hálózat és a püspökszilágyi mikroszeizmikus hálózat üzemeltetését és az adatok feldolgozását a GeoRisk Földrengéskutató Intézet végzi.

AZ MTA GGKI ÁLLOMÁSAI

Az év folyamán az MTA GGKI öt digitális szeizmológiai állomást üzemeltetett. Piszkéstető állomás (PSZ) mint „nyílt állomás" (open station) létesült, melynek fő célja az atomcsend egyezmény ellenőrzésében való részvétel volt (Tóth, 1992). Az állomáson a három komponenses STS-2 széles sávú szeizmométer jelét 24 bites A/D konverterrel ellátott 80 Hz-es mintavételezésű, nagyfelbontású adatgyűjtő regisztrálja. Folyamatos adatgyűjtés történik mágneslemezen, az adatok azonnali (on-line) hozzáférhetősége több mint 1 hónap. Az állomás jelenleg a német GEOFON hálózat társult állomásaként üzemel. A másik három állomás, Mórágy (PKSM), Budapest (BUD) és Sopron (SOP) hasonlóan működik.

A Bakonya (RHK1) állomáson 3 komponenses rövid periódusú adatok gyűjtése folyik KINEMETRICS gyártmányú K2 és SSR-1 típusú digitális eseményregisztrálókon. A mintavételi frekvencia 20 Hz, az A/D konverter felbontása 16 bit. Az érzékelők szintén KINEMETRICS gyártmányú SS-1 rövidperiódusú szeizmométerek.

GYORSULÁSMÉRŐ ÁLLOMÁSOK

Az öt gyorsulásmérő állomás műszerezettsége azonos, annak ellenére, hogy ezen állomások három különböző intézményhez tartoznak. Érzékelő: AC-23 három tengelyű gyorsulásmérő egység (0,5 g legnagyobb gyorsulás); adatgyűjtő: SM-2 digitális eseményregisztráló (a svájci SIG^{SA} termékei).

2004. folyamán mindegyik állomás mérési adata rendelkezésünkre állt.

PAKS MICROSEISMIC MONITORING NETWORK

The system (including the *Paks Microseismic Monitoring Network*, the *Üveghuta Network* and the *Püspökszilágyi Monitoring Network*) comprises of a network of 13 seismometer stations and a data centre in Budapest where the data is collected and analyzed (Tóth and Mónus, 1997). The field stations each consist of a three component short period seismometer, a digital recorder and time signal receiver. The seismometers used are the LE-3D three directional compact size high sensitivity 1 Hz geophones. The digital acquisition system is the MARS-88 recorder that uses 20 bit AD converters sampling the data 62.5 times per second. The recorder also performs signal detection by its internal STA/LTA algorithm. Eight of the stations store event and continuous monitor channel data on rewritable magneto-optical disks, which are collected and transferred to the data center on two-week basis. Five additional stations are accessible via telephone modems. Most of the stations are powered by solar panels, and absolute time is provided by DCF-77 time code receivers.

At the data center Lennartz M88 database software is used for the data management and PITSA for advanced seismogram analysis. All recorded data are archived.

The *Paks Microseismic Monitoring Network*, the *Üveghuta Network* and the *Püspökszilágyi Monitoring Network* are currently operated and their data processed and analyzed by *GeoRisk Earthquake Research Institute Ltd.*

STATIONS OPERATED BY GGKI

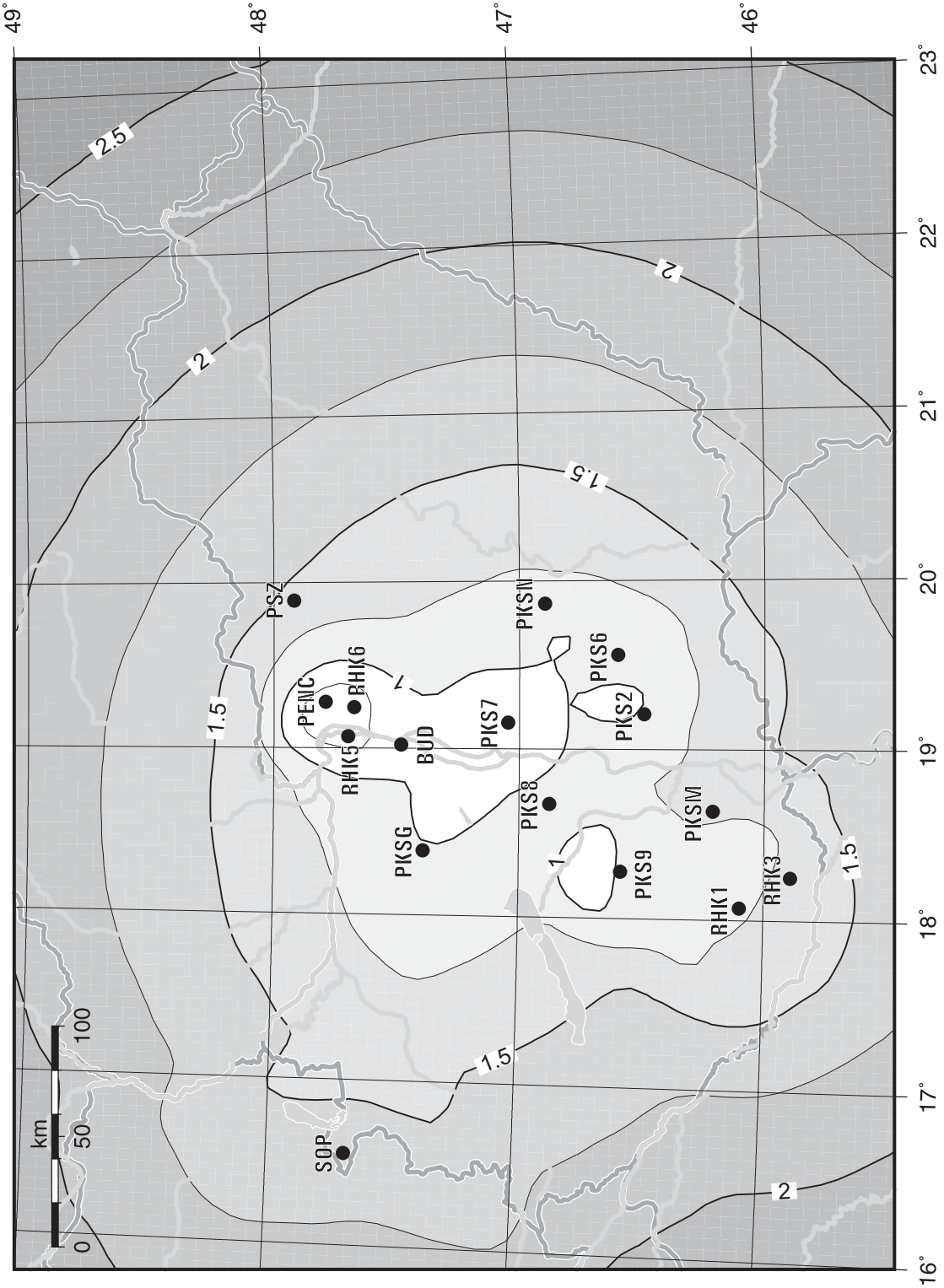
During 2004 GGKI operated four digital seismic stations. Piszkés *(PSZ)* has been installed as an ‘Open Station’ with the primary goal of nuclear test ban monitoring (Tóth, 1992). The station is equipped with a triaxial STS-2 broad-band seismometer and data acquisition system with a 24 bit high resolution digitizer. Three component continuous data streams are transmitted near real time to the Data Centre via internet and recorded in circular buffers on magnetic disks and archived on CDs. The station serves as an associated station to the German GEOFON Network. The configuration of the other three stations, Mórágy (PKSM), Budapest (BUD) and Sopron (SOP) is similar.

RHK1 (Bakonya) is a three component short period station where Kinemetrics K2 and SSR-1 16bit digitizer and event recorder samples and records the output of three component SS-1 Ranger seismometers.

STRONG MOTION STATIONS

Although the five strong motion accelerograph stations belong to three different organizations, they are all equipped with the same instrumentation: AC-23 triaxial accelerometer package (full scale 0.5g) and an SM-2 digital event recorder (manufactured by SIG^{SA}, Switzerland).

During 2004, we had access to all of these stations.



2.3. ábra Érzékenységi küszöb átlagos zajviszonyokat feltételezve. Az izovonalak Richter-féle lokális magnitúdót (ML) mutatnak.

Figure 2.3. Detection capability at average noise conditions. Contour values are local Richter magnitudes (ML)

3.

ESEMÉNYLISTA
ÉS
FÖLDRENGÉS FÉSZEKPARAMÉTEREK

A FÖLDRENGÉS FÉSZEKPARAMÉTEREK MEGHATÁROZÁSA

A fészekparaméterek rutinszerű kiszámításához a HYPO71PC programot használtuk (Lee and Lahr, 1975). Az eredeti kódot kissé módosítottuk a könnyebb kezelhetőség érdekében, és kiegészítettük egy rutinnal, amely a Richter-féle lokális magnitúdót (M_L) számolja Bakun és Joyner (1984) módszerével.

A fészekparaméterek meghatározásánál mind a magyarországi, mind a szomszédos országok állomásainak adatait felhasználtuk. A számításnál az egyes állomások kimérési adatait az epicentrumtól való távolsággal fordított arányban súlyoztuk. Néhány esetben, amikor elegendő P fázis adat állt rendelkezésre, az S fázis adatokat nem használtuk fel.

Az amerikai NEIC (National Earthquake Information Center) 2003-ra vonatkozóan közölt 11 olyan kisebb magnitúdójú eseményt, melynek a megadott epicentruma a vizsgált tartományba esett, de hálózatunk eseményként nem azonosított. A teljesség kedvéért az események listáján „*Reported by NEIC*” megjelöléssel ezeket is szerepeltetjük.

SEBESSÉGMODELL

A számításnál felhasznált 3 rétegű sebességmodell több száz helyi és közeli földrengés kéregfázis adatain alapul (Mónus, 1995).

Sebesség (v_P) [km/s]	*Mélység [km]*	*Vastagság [km]*	v_P/v_S
5,60	0,0	20,0	1,78
6,57	20,0	11,0	
8,02	31,0	∞	

3.

LIST OF ORIGINS AND HYPOCENTER PARAMETERS

METHOD FOR HYPOCENTER PARAMETER DETERMINATION

HYPO71PC (Lee and Lahr, 1975) was used for the routine calculation of hypocenter parameters. The original program has been modified and a routine for Richter local magnitude calculation implemented. For the magnitude calculations, the method published by Bakun and Joyner (1984) has been used.

The hypocenter parameters have been calculated using phase readings of seismological stations from Hungary and from the adjoining countries. However, a distance weighting has been applied, phase data from stations with epicenter distance greater than 450 km have been weighted out. In some cases, when sufficient number of P readings were available, S phase readings were not used in the calculations.

During 2003, *USGS National Earthquake Information Center* reported 11 low magnitude events on the monitored area what were not identified by our network. For the sake of completeness, these events are also listed with an indication of *"Reported by NEIC"*.

CRUSTAL VELOCITY MODEL

The three-layer crustal velocity model used in the hypocenter calculations has been derived from crustal phase travel times of several hundreds of local earthquakes (Mónus, 1995).

Velocity (v_P) [km/s]	*Depth [km]*	*Thickness [km]*	v_P/v_S
5.60	0.0	20.0	1.78
6.57	20.0	11.0	
8.02	31.0	∞	

ESEMÉNYLISTA / LIST OF EVENTS

Nap	Kipattanási idő (UTC) óó pp mp	Földrajzi koordináták Lat	Long	Mélység (km)	ML	I_{MAX} (EMS)	Helyszín
Day	Origin time UTC hr mn sec	Geographic coordinates Lat	Long	Depth (km)	ML	I_{MAX} (EMS)	Locality/Region
JANUÁR / JANUARY, 2004							
07	10:34:57.6	47.377N	18.336E	0	0.9	-	Csákberény (expl.)
07	10:35:23.9	47.500N	18.321E	0	1.0	-	Kecskéd (expl.)
08	23:39:37.2	46.417N	16.967E	10	1.9	-	Kiskanizsa
09	13:38:53.6	45.615N	17.485E	14	1.4	-	Croatia
10	7:43:18.3	48.691N	19.282E	7	2.2	-	Slovak Republic
11	22:34:48.8	47.335N	19.426E	10	1.0	-	Vasad
25	21:42:16.9	47.858N	20.780E	10	1.9	-	Gelej
31	12:24:13.6	46.632N	18.989E	0	0.7	-	Dunapataj (expl.)
31	12:36:28.2	46.566N	18.987E	0	0.7	-	Kalocsa (expl.)
31	14:56:14.1	46.668N	19.016E	0	0.7	-	Dunapataj (expl.)
FEBRUÁR / FEBRUARY, 2004							
02	5:53:10.4	47.433N	18.321E	12	1.5	-	Oroszlány
02	9:58:49.0	47.459N	18.408E	0	1.5	-	Várgesztes (expl.)
04	19:40:46.9	47.444N	18.331E	13	0.6	-	Oroszlány
05	15:52:40.9	47.800N	19.411E	7	1.5	-	Acsa
05	16:32:27.7	47.783N	19.424E	10	1.5	-	Acsa
25	11:59:17.9	46.408N	18.821E	0		-	Bogyiszló (expl.)
25	12:07:06.4	46.357N	19.199E	0	1.6	-	Kéleshalom (expl.)
25	12:18:41.0	46.373N	19.135E	0	0.6	-	Hajós (expl.)
25	13:26:59.8	46.485N	19.020E	0	1.2	-	Drágszél (expl.)
25	16:08:53.0	46.551N	18.984E	0	1.0	-	Kalocsa (expl.)
25	16:18:13.2	46.526N	19.000E	0	0.5	-	Negyvenszállás (exp.)
25	16:53:31.6	46.526N	19.035E	0	1.3	-	Negyvenszállás (exp.)
26	14:40:16.6	46.567N	19.003E	0	1.1	-	Szakmár (expl.)
27	9:44:36.5	46.487N	18.961E	0		-	Bátya (expl.)
27	11:10:50.8	46.473N	19.031E	0	1.1	-	Drágszél (expl.)
MÁRCIUS / MARCH, 2004							
01	12:40:59.9	46.462N	18.960E	0	0.1	-	Bátya (expl.)
03	9:51:59.2	46.547N	18.876E	0	0.9	-	Uszód (expl.)
09	15:30:43.1	45.725N	18.894E	10	1.4	-	Croatia
17	8:31:21.0	47.472N	18.478E	0	1.8	-	Bodmér (expl.)

22	9:28:23.7	47.452N	18.451E	0	1.2	-	Bodmér (expl.)
22	9:29:14.1	47.460N	18.407E	0	1.3	-	Várgesztes (expl.)
ÁPRILIS / APRIL, 2004							
01	11:12:45.8	47.440N	18.157E	10	2.3	-	Felsődobos
10	9:52:04.8	46.025N	16.649E	10	1.5	-	Croatia
14	9:08:48.5	47.425N	18.358E	0	1.2	-	Gánt (expl.)
15	8:22:53.7	47.440N	18.313E	0	0.9	-	Oroszlány (expl.)
15	8:23:40.1	47.503N	18.258E	0	1.4	-	Dad (expl.)
26	20:58:17.8	48.028N	16.630E	10	2.6	4.0	Austria
27	7:57:35.1	45.531N	18.152E	10	1.3	-	Croatia
30	10:43:21.2	45.553N	17.711E	16	1.4	-	Croatia
MÁJUS / MAY, 2004							
11	1:33:09.1	45.713N	18.067E	14	2.4	-	Croatia
11	2:18:56.2	45.704N	18.179E	10	1.5	-	Croatia
11	13:39:53.4	47.153N	19.150E	0	1.1	-	Apaj
15	10:48:20.2	45.874N	17.194E	10	2.2	-	Croatia
18	21:33:22.0	45.693N	18.177E	13	3.2	-	Croatia
18	23:00:54.6	45.669N	18.125E	1	1.1	-	Croatia
21	1:02:10.7	45.932N	18.330E	10	0.5	-	Kisherend
25	7:30:14.9	47.479N	17.141E	8	3.8	5.5	Beled
JÚNIUS / JUNE, 2004							
02	7:45:07.7	47.435N	18.419E	0	1.6	-	Várgesztes (expl.)
02	7:46:21.0	47.431N	18.399E	0	1.8	-	Gánt (expl.)
04	12:26:03.5	45.909N	18.695E	0	1.9	-	Udvar
05	2:15:23.6	45.648N	18.132E	8	2.0	-	Croatia
07	2:08:00.3	45.638N	18.077E	7	1.2	-	Croatia
08	19:16:46.4	45.797N	18.771E	17	1.7	-	Croatia
12	9:59:21.7	48.657N	19.119E	17	2.2	-	Slovak Republic
14	10:07:01.3	47.408N	18.416E	0	0.7	-	Gánt (expl.)
14	10:07:50.3	47.352N	18.395E	0	1.0	-	Gánt (expl.)
14	23:26:44.8	46.251N	19.633E	6	1.5	-	Öttömös
15	9:56:22.6	45.549N	17.860E	5	1.2	-	Croatia
19	10:48:06.4	47.391N	19.956E	10	2.5	-	Portelek
21	21:42:28.0	47.323N	17.379E	13	1.8	-	Mezőlak
22	0:34:28.6	47.314N	17.330E	10	1.9	-	Mihályháza
25	2:34:04.5	47.439N	16.930E	12	2.1	-	Csér
25	18:12:45.1	47.439N	16.959E	10	2.6	-	Répceszemere
28	9:39:09.7	47.615N	16.437E	4	2.7	4.0	Austria
28	11:50:23.1	47.62 N	16.37 E	5	2.2	-	Austria
29	0:35:47.8	47.915N	19.453E	8	1.3	-	Szanda

JÚLIUS / JULY, 2004

02	9:57:01.7	45.849N	18.422E	1	0.7	-	Nagyharsány
07	8:33:02.5	47.398N	18.422E	0	1.3	-	Gánt (expl.)
09	8:33:12.7	46.237N	16.544E	21	1.8	-	Croatia
15	3:16:23.1	45.720N	18.154E	1	1.0	-	Croatia
20	22:13:25.9	47.091N	18.115E	10	2.5	4.5	Berhida
24	4:30:42.3	46.288N	16.567E	10	1.6	-	Croatia
25	8:11:12.9	46.282N	16.482E	7	1.9	-	Croatia
26	7:41:59.0	47.471N	18.451E	0	1.3	-	Várgesztes (expl.)
28	10:49:18.7	47.511N	16.400E	2		-	Austria

AUGUSZTUS / AUGUST, 2004

03	12:06:36.6	48.418N	19.088E	10		-	Slovak Republic
07	18:37:22.8	47.602N	18.400E	0	1.3	-	Vértessző́lős
10	8:44:57.8	45.779N	18.037E	10	1.3	-	Cún
10	12:15:00.0	45.965N	18.236E	7	0.8	-	Szalánta
10	13:15:00.0	45.895N	18.096E	2	0.5	-	Hegyszentmárton
10	15:15:00.1	45.928N	18.066E	0	0.4	-	Tengeri
10	15:59:59.5	45.912N	18.086E	10	0.0	-	Tengeri
13	18:24:13.7	47.207N	18.215E	10	1.0	-	Csór
17	18:00:34.9	47.578N	17.942E	6	3.4	4.5	Kisbér
17	22:51:48.2	47.633N	18.100E	3	1.0	-	Nagyigmánd
18	9:01:23.2	47.596N	17.974E	10	3.2	5.0	Kerékteleki

SZEPTEMBER / SEPTEMBER, 2004

02	16:40:32.4	45.600N	20.209E	10	2.4	-	Serbia
02	18:51:47.4	45.795N	20.436E	10	1.6	-	Serbia
03	8:45:24.9	47.456N	18.370E	0	1.2	-	Oroszlány (expl.)
03	8:46:14.1	47.475N	18.249E	0	1.4	-	Bokod (expl.)
07	9:17:39.3	47.441N	18.358E	0	1.3	-	Oroszlány (expl.)
07	16:06:39.5	48.158N	19.333E	10	1.6	-	Slovak Republic
10	9:51:07.6	48.246N	18.858E	0		-	Slovak Rep. (expl?)
11	18:28:07.3	47.909N	16.424E	7	2.8	3.0	Austria
16	8:57:57.6	47.406N	18.397E	0	1.0	-	Gánt (expl.)
16	8:58:37.6	47.429N	18.464E	0	1.2	-	Csákvár (expl.)
16	12:30:30.4	45.701N	17.919E	18	1.0	-	Croatia
16	12:48:41.0	48.223N	19.078E	0		-	Slovak Rep. (expl?)
17	10:17:26.1	45.736N	18.247E	0	0.4	-	Croatia (expl.)
17	17:11:03.3	45.666N	18.291E	10	1.1	-	Croatia
23	5:32:12.8	48.261N	18.845E	10	3.5	-	Slovak Republic
24	9:21:13.5	45.783N	18.260E	7	0.5	-	Matty
24	11:29:27.7	48.350N	18.296E	0		-	Slovak Rep. (expl?)
28	8:05:02.5	47.551N	16.322E	1	2.8	-	Austria
29	0:46:27.3	47.907N	19.511E	1	2.0	-	Buják

OKTÓBER / OCTOBER, 2004

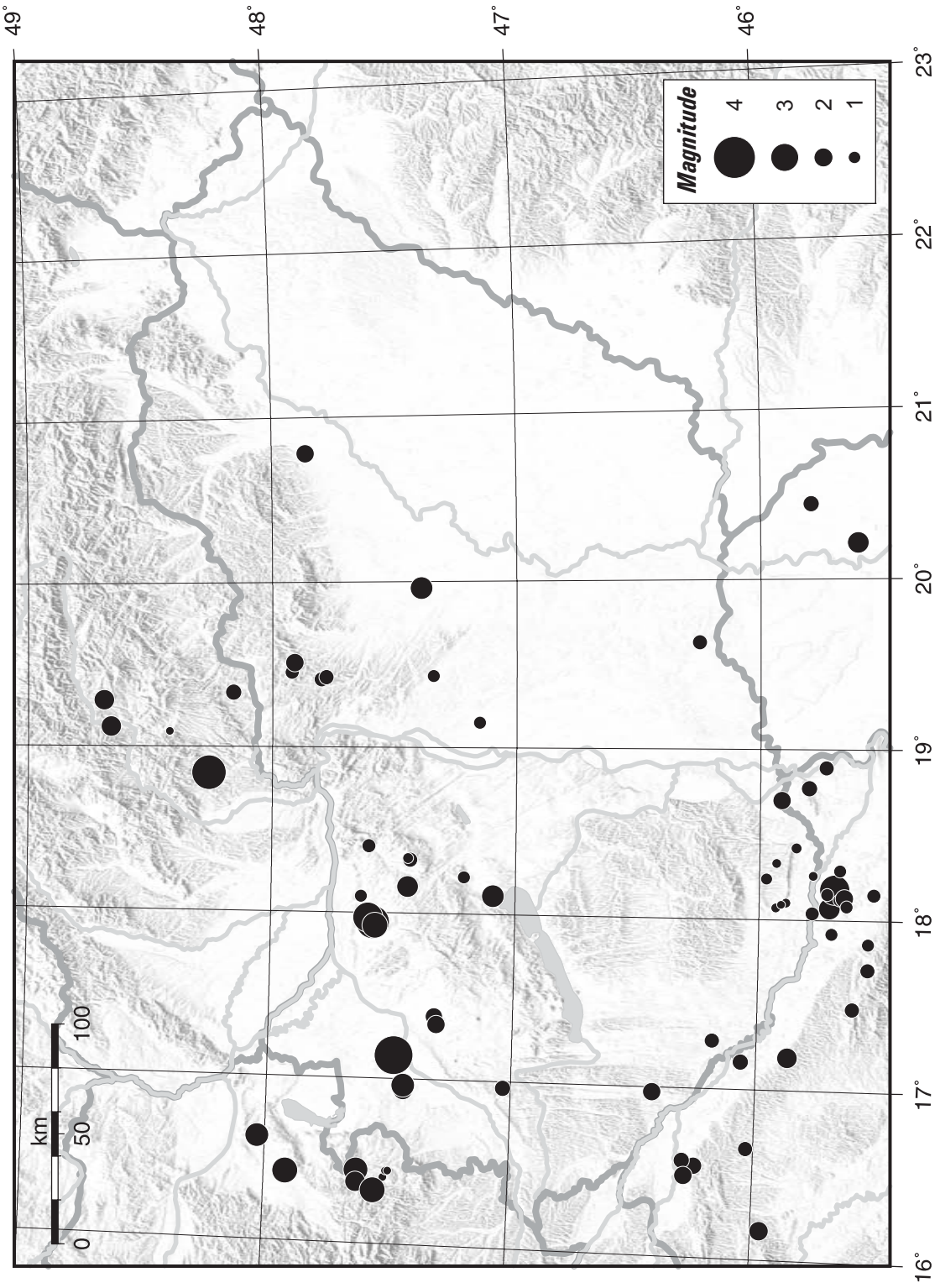
09	18:14:39.1	47.030N	16.961E	10	1.6	-	Mikosszéplak
12	11:43:37.5	47.495N	16.436E	6		-	Austria
14	9:44:51.7	47.572N	17.922E	10	2.8	4.5	Mezőörs
16	12:48:53.0	46.183N	17.277E	10	1.4	-	Somogyudvarhely
21	12:05:26.0	47.487N	16.437E	5		-	Austria
22	11:32:41.2	48.538N	20.780E	0		-	Bódvalenke (expl?)
25	11:09:04.0	48.555N	20.832E	0		-	Hidvégardó (expl?)
28	10:14:14.1	48.344N	19.809E	0		-	Slovak Rep. (expl?)

NOVEMBER / NOVEMBER, 2004

10	11:08:40.5	47.460N	18.399E	0	1.8	-	Várgesztes (expl.)

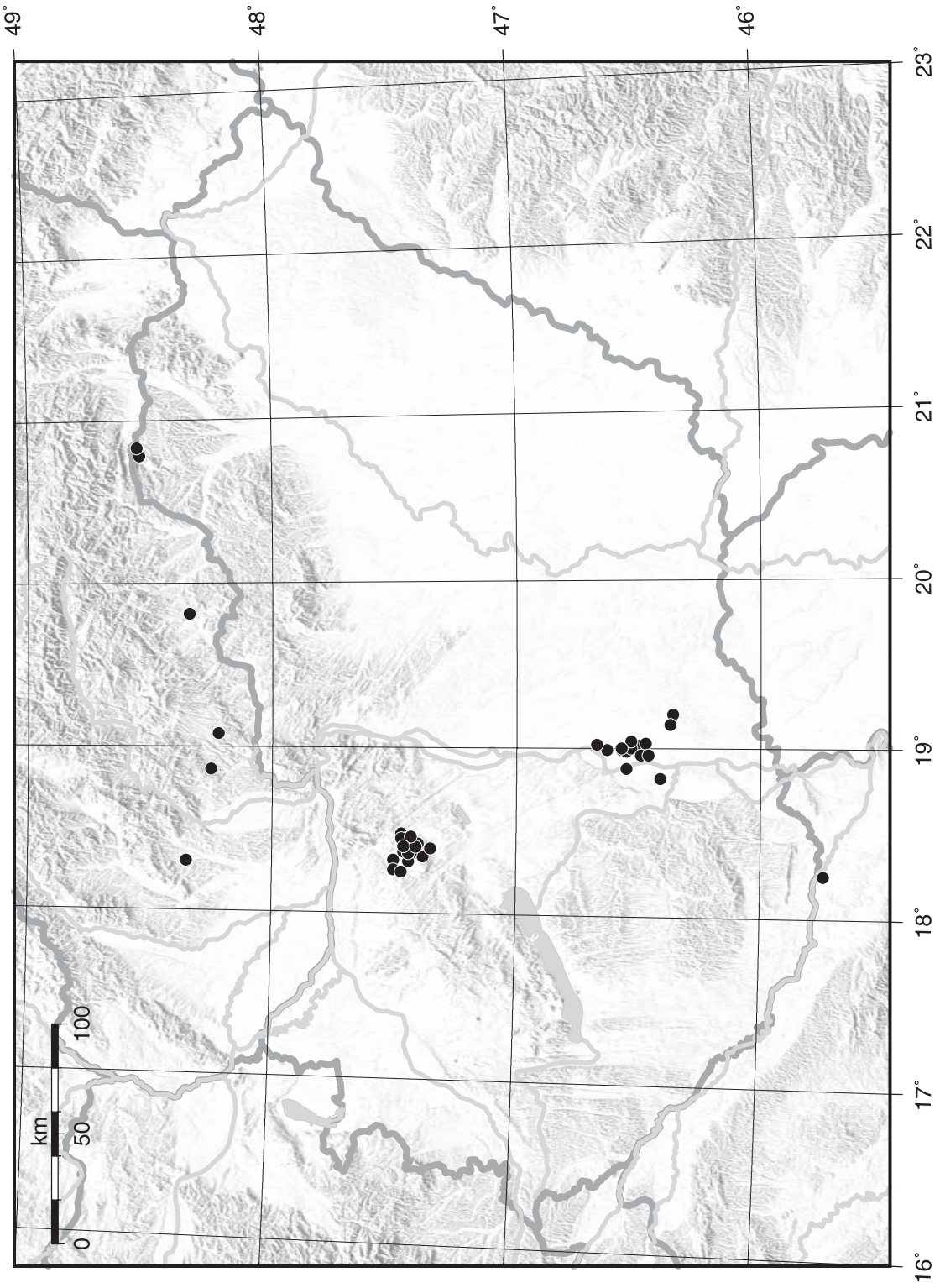
DECEMBER / DECEMBER, 2004

30	7:32:49.6	45.960N	16.165E	10	2.1	-	Croatia
31	4:23:23.1	46.058N	17.156E	10	1.7	-	Croatia



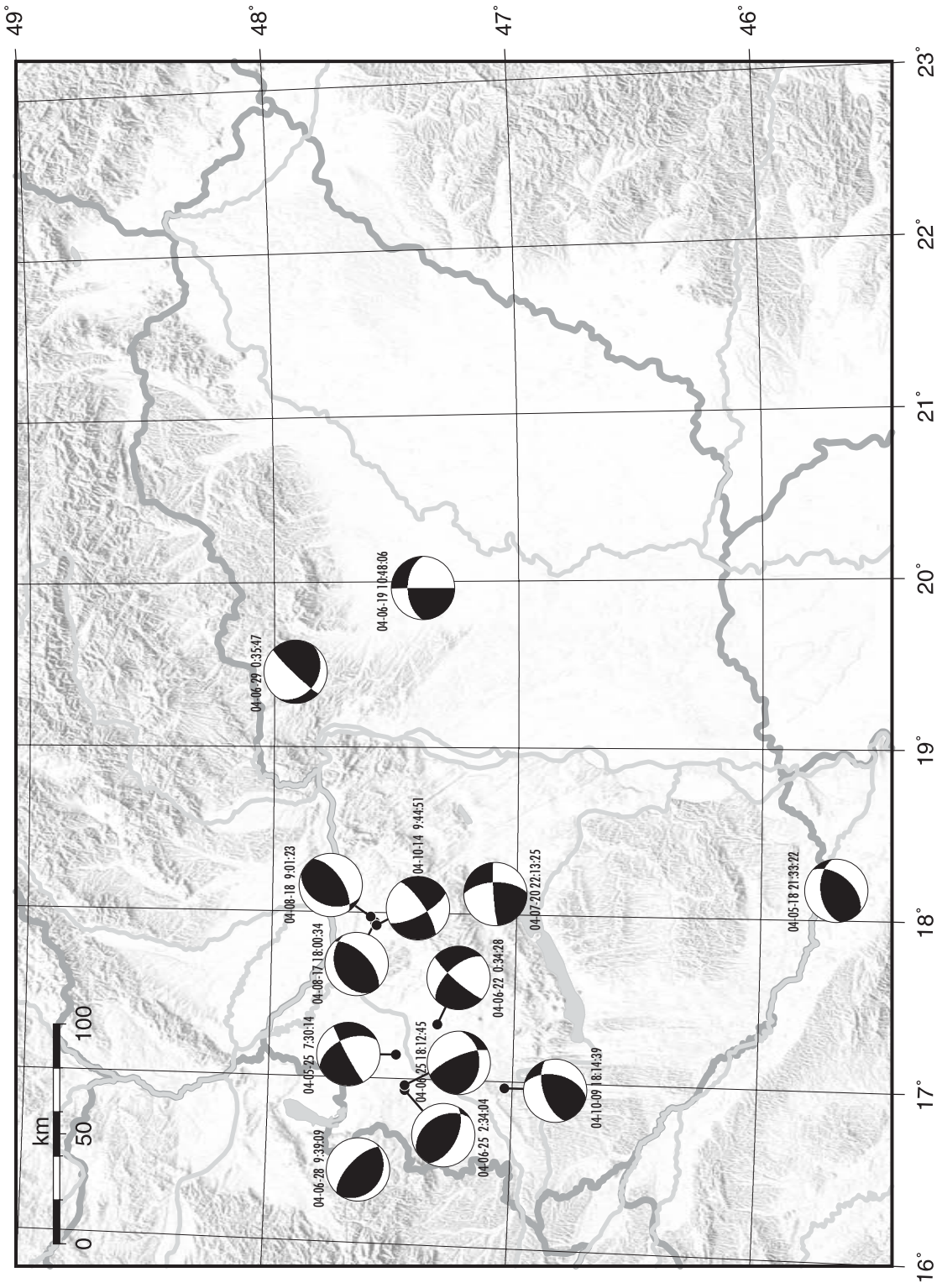
3.1. ábra A 2004-ben regisztrált földrengések epicentrumai

Figure 3.1. Epicenters of 2004 earthquakes



3.2. ábra A 2004-ben regisztrált robbantások epicentrumai

Figure 3.2. Epicenters of 2004 explosions



3.3. ábra A 2004-ben regisztrált földrengések fészekmechanizmusai

Figure 3.3. Fault plane solutions of 2004 earthquakes

FÉSZEKPARAMÉTEREK ÉS FÁZISADATOK

A listában alkalmazott jelek és rövidítések magyarázata:

time: Az esemény kipattanásának ideje (óra:perc:másodperc; UTC).
ML: A rengés Richter-féle lokális magnitúdója.
lat: Az esemény földrajzi szélessége (fok).
lon: Az esemény földrajzi hosszúsága (fok).
h: A fészek mélysége (km).
erh: Horizontális hiba km-ben. ($erh = \sqrt{SDX^2 + SDY^2}$, ahol *SDX* és *SDY* az epicentrum földrajzi szélességének és hosszúságának meghatározási hibái.) Ha *erh* = ---, a kevés rendelkezésre álló adat miatt *erh* nem volt meghatározható.
erz: A fészekmélység meghatározásának hibája (km). *erz* = --- azt jelzi, hogy *erz* nem volt meghatározható a kevés rendelkezésre álló adat miatt.
nr: A számításnál felhasznált fázisadatok száma. Azonos állomásról származó P és S beérkezések 2 adatnak számítanak.
gap: Az állomások közötti legnagyobb irányeltérés (fok).
rms: A számított beérkezési idők átlagnégyzetes hibája (mp). ($rms = \sqrt{\sum R_i^2 / nr}$, ahol R_i az *i* –edik állomás időhibája (reziduál).)
Locality: A rengés földrajzi helyének megnevezése, általában a legközelebbi település neve.
Comments: Az eseménnyel kapcsolatos egyéb közlemény (pl. epicentrális intenzitás).
sta: Az állomás neve. (L. 2. fejezet.)
dist: Az állomás távolsága az epicentrumtól (km).
azm: Az állomás irányszöge az epicentrumból az északi iránytól számítva (fok).
phase: Fázis azonosító; az első betű a kezdetet jellemzi: *e* = lassan emelkedő *i* = hirtelen kitérő; a második és harmadik betű a fázis megnevezése pl. Pn, Pg, Sn, Sg; a negyedik a kitérési irányt jelzi: C=kompresszió/fel, D=dilatáció/le.
hr mn sec: A fázis beérkezési ideje (óra, perc, másodperc).
res: Reziduál (másodperc). ($res = T_{obs} - T_{cal}$, ahol T_{obs} a mért, és T_{cal} a számított menetidő.)

Minden rengésnél, ahol elegendő számú első kitérési adat állt rendelkezésre, megkíséreltük a fészekmechanizmus meghatározását. Az ábrákon az alsó félteke sztereografikus képe látható, **P** a maximális, **T** a minimális feszültségtengely iránya. A fészekmechanizmusokat a 3.3. ábra foglalja össze.

PHASE DATA

Key to phase data encoding

time:	Time of occurrence of event in hours, mins and secs (UTC).
ML:	Richter local magnitude of the earthquake.
lat:	Latitude of the event in degrees.
lon:	Longitude of the event in degrees.
h:	Depth of the hypocenter in km.
erh:	Standard error of the epicenter in km. ($erh = \sqrt{SDX^2 + SDY^2}$, where *SDX* and *SDY* are the standard errors in latitude and longitude respectively, of the epicenter.) If *erh* = ---, this means that *erh* could not be computed because of insufficient data.
erz:	Standard error of the focal depth in km. If *erz* = ---, this means that *erz* could not be computed either because focal depth is fixed in the solution or because of insufficient data.
nr:	Number of station readings used in locating the earthquake. P and S arrivals for the same stations are regarded as 2 readings.
gap:	Largest azimuthal separation in degrees between stations.
rms:	Root mean square error of time residuals in seconds. ($rms = \sqrt{\sum R_i^2 / nr}$, where R_i is the time residual of the i^{th} station.
Locality:	A geographical indication of the epicenter area, usually the nearest settlement.
Comments:	Additional comments about the event, eg. maximum EMS intensity
sta:	Station name. (For details see Chapter 2.)
dist:	Distance from earthquake epicenter to station in km.
azm:	Azimuthal angle between epicenter to station measured from North in degrees.
phase:	Phase identifier; the first letter characterizes onset *e* = emergent *i* = impulsive, the second and third indicate the phase eg. Pn, Pg, Sn and Sg, the forth indicates the polarity C=compression/up D=dilatation/down.
hr mn sec:	Arrival time of the phase from input data.
res:	Residual of the phase in secs. ($res = T_{obs} - T_{cal}$, where T_{obs} is the observed and T_{cal} is the calculated travel time respectively.

Fault plane solutions were attempted for each event where any information for the stress field could be drawn. Stereographic projections of the lower focal hemisphere are shown, **P** and **T** are the main compression and tension axes respectively. Strike, dip and slip values of the nodal planes are also indicated. Calculations were carried out by computer program FPFIT (Reasenberg and Oppenheimer, 1985). The results are summarized in Fig. 3.3.

1.

2004-01-07 time: 10:34:57.57 UTC ML= 0.9
lat: 47.377N lon: 18.336E h= 0.0 km
erh=28.5km erz= 7.8km
nr= 5 gap=259 rms=1.05
Locality: Csákberény
Comments: explosion

sta	dist	azm	phase	hr mn	sec	res
PKSG	4.5	69	ePgC	10:34:58.80		-0.73
			eSg		34:59.50	-1.55
PKS8	61.2	155	ePgC	10:35:10.10		1.46
			eSg		35:17.90	0.62
PKSM	131.7	170	eSn	10:35:36.50		-0.54

2.

2004-01-07 time: 10:35:23.89 UTC ML= 1.0
lat: 47.500N lon: 18.321E h= 0.0 km
erh=54.2km erz= 7.8km
nr= 5 gap=346 rms=1.02
Locality: Kecskéd
Comments: explosion

sta	dist	azm	phase	hr mn	sec	res
PKSG	13.1	156	ePgC	10:35:26.80		-0.04
			eSg		35:27.70	-1.44
PKS8	74.1	159	ePg	10:35:38.90		1.65
			eSg		35:47.80	0.13
PKSM	145.3	170	eSn	10:36:05.30		-1.08

3.

2004-01-08 time: 23:39:37.23 UTC ML= 1.9
lat: 46.417N lon: 16.967E h= 10.0 km
erh= 8.8km erz= 9.9km
nr= 9 gap=200 rms=0.49
Locality: Kiskanizsa
Comments:

sta	dist	azm	phase	hr mn	sec	res
RHK1	92.4	113	ePgC	23:39:53.50		-0.33
			eSg		40:03.50	-3.28
GROS	112.7	272	iPn	23:39:57.60		0.56
			iSn		40:11.80	-0.69
GOLS	113.1	246	iPn	23:39:57.20		0.12
			eSn		40:12.60	0.04
DOBS	119.2	256	iPn	23:39:58.00		0.15
CRES	134.0	241	iPn	23:39:59.20		-0.48
LEGS	137.6	248	iPn	23:40:00.90		0.76

4.

2004-01-09 time: 13:38:53.57 UTC ML= 1.4
lat: 45.615N lon: 17.485E h= 14.5 km
erh= 9.6km erz= 3.2km
nr= 6 gap=338 rms=0.40
Locality: Croatia
Comments:

sta	dist	azm	phase	hr mn	sec	res
RHK3	67.0	63	ePgC	13:39:06.10		0.28
			eSg		39:14.90	-0.47
RHK1	70.2	41	ePgD	13:39:06.00		-0.37
			eSg		39:17.10	0.74
PKSM	111.6	54	ePnC	13:39:12.90		0.23
			eSn		39:26.90	-0.67

5.

2004-01-10 time: 7:43:18.25 UTC ML= 2.2
lat: 48.691N lon: 19.282E h= 7.1 km
erh= 2.9km erz= 3.2km
nr= 19 gap=100 rms=0.76
Locality: Slovak Republic
Comments:

sta	dist	azm	phase	hr mn	sec	res
PSZ	97.2	152	iPgC	7:43:35.90		0.25
			iSg		43:48.30	-0.92
PENC	100.1	180	ePgD	7:43:36.30		0.13
			eSg		43:49.50	-0.65
SRO	121.2	216	ePn	7:43:40.50		1.00
			eSn		43:55.40	-0.67
OKC	151.9	327	ePn	7:43:43.20		-0.13
			eSn		44:01.00	-1.89
MODS	152.2	257	iPn	7:43:43.50		0.14
			eSn		44:02.00	-0.94
PKSG	159.0	205	ePnD	7:43:46.20		1.99
			eSn		44:05.00	0.55
CRVS	161.8	82	ePn	7:43:44.80		0.24
			eSn		44:04.80	-0.29
ZST	170.4	251	ePn	7:43:46.00		0.37
			eSn		44:05.90	-1.08
MORC	175.0	314	ePn	7:43:45.70		-0.51
			eSn		44:07.40	-0.61
KWP	270.9	67	Pn	7:43:59.73		1.57
DPC	282.8	311	ePn	7:44:04.10		4.45
			eSn		44:36.10	4.16
MOX	594.6	291	ePn	7:44:36.00		-2.52
SUW	651.4	25	Pn	7:44:39.54		-6.07
RGN	771.4	328	ePn	7:44:59.46		-1.11

6.

2004-01-11 time: 22:34:48.81 UTC ML= 1.0
lat: 47.335N lon: 19.426E h= 10.0 km
erh= 5.8km erz= 6.4km
nr= 10 gap=225 rms=0.72
Locality: Vasad
Comments:

sta	dist	azm	phase	hr mn	sec	res
BUD	34.5	299	iPgD	22:34:55.00		-0.22
			eSg		34:59.50	-0.73
RHK6	39.9	341	iPgD	22:34:56.40		0.24
			eSg		35:01.10	-0.80
PKS8	76.2	228	ePg	22:35:02.70		0.16
			eSg		35:13.60	0.35
PKSG	78.4	275	ePgC	22:35:04.20		1.27
			eSg		35:12.00	-1.94
PKSM	138.5	206	iPnD	22:35:11.60		-0.24
			eSn		35:27.30	-2.50

7.

2004-01-25 time: 21:42:16.91 UTC ML= 1.9
lat: 47.858N lon: 20.780E h= 10.0 km
erh=64.0km erz=38.3km
nr= 8 gap=306 rms=0.94
Locality: Gelej
Comments:

sta	dist	azm	phase	hr mn	sec	res
PSZ	66.6	276	ePgD	21:42:29.20		0.27
			eSg		42:38.00	-0.30
PKS7	151.8	234	ePnC	21:42:43.30		1.71
			eSn		43:02.40	1.56
PKS8	192.6	236	ePnC	21:42:46.30		-0.38
			eSn		43:07.50	-2.41
PKS9	236.4	233	eSn	21:43:26.30		6.69
PKSM	244.8	222	iPnC	21:42:52.40		-0.79

```
                eSn      43:18.40   -3.08
8.
```

```
 2004-01-31  time: 12:24:13.60 UTC  ML= 0.7
   lat: 46.632N  lon: 18.989E  h=  0.0 km
                 erh= ---km    erz= ---km
   nr=  4        gap=227       rms=0.07
   Locality: Dunapataj
   Comments: explosion

sta   dist azm  phase  hr mn  sec     res
PKS2  23.2 132   iPgC  12:24:19.10   -0.06
                 eSg      24:23.80    0.29
PKSM  53.8 210   iPgD  12:24:23.70    0.04
PKS9  54.6 265   ePg   12:24:23.80    0.01
```

```
9.
```

```
 2004-01-31  time: 12:36:28.23 UTC  ML= 0.7
   lat: 46.566N  lon: 18.987E  h=  0.0 km
                 erh= ---km    erz= ---km
   nr=  3        gap=203       rms=0.00
   Locality: Kalocsa
   Comments: explosion

sta   dist azm  phase  hr mn  sec     res
PKS2  19.2 115   ePgC  12:36:32.10    0.00
                 eSg      36:39.30    4.18
PKSM  47.5 214   iPgD  12:36:36.90    0.00
                 eSg      36:38.80   -4.86
PKS9  54.3 272   ePg   12:36:38.10    0.00
                 eSg      36:39.40   -6.39
```

```
10.
```

```
 2004-01-31  time: 14:56:14.13 UTC  ML= 0.7
   lat: 46.668N  lon: 19.016E  h=  0.0 km
                 erh= ---km    erz= ---km
   nr=  3        gap=242       rms=0.00
   Locality: Dunapataj
   Comments: explosion

sta   dist azm  phase  hr mn  sec     res
PKS2  24.7 142   ePgD  14:56:18.90    0.01
                 eSg      56:25.50    2.89
PKS9  57.2 261   ePgC  14:56:24.50    0.00
                 eSg      56:27.10   -5.49
PKSM  58.4 210   ePgC  14:56:24.70    0.00
                 eSg      56:26.80   -6.15
```

```
11.
```

```
 2004-02-02  time:  5:53:10.39 UTC  ML= 1.5
   lat: 47.433N  lon: 18.321E  h= 11.7 km
                 erh= 3.5km    erz= 1.7km
   nr= 15        gap=136       rms=0.76
   Locality: Oroszlány
   Comments:

sta   dist azm  phase  hr mn  sec     res
PKSG   7.0 131   iPgC   5:53:12.70   -0.13
                 iSg      53:14.40   -0.33
SRO   42.3 359   ePg    5:53:18.80    0.56
                 eSg      53:24.00   -0.36
BUD   53.3  84   ePgC   5:53:20.50    0.36
                 eSg      53:27.20   -0.55
PKS9  94.1 182   ePgC   5:53:27.50    0.18
                 eSg      53:40.70    0.17
VYHS 124.1  18   iPn    5:53:31.80    0.40
                 eSn      53:46.20   -1.59
MODS 130.5 323   ePn    5:53:33.60    1.40
                 eSn      53:46.80   -2.41
PKSM 137.9 170   iPnD   5:53:33.20    0.08
                 eSn      53:49.10   -1.75
RHK1 149.9 187   ePn    5:53:51.40   16.78
                 eSn      53:54.60    1.08
```

```
12.
```

```
 2004-02-02  time:  9:58:48.97 UTC  ML= 1.5
   lat: 47.459N  lon: 18.408E  h=  0.0 km
                 erh=20.5km    erz= 2.8km
   nr=  6        gap=343       rms=0.67
   Locality: Várgesztes
   Comments: explosion

sta   dist azm  phase  hr mn  sec     res
PKSG   7.6 190   ePgC   9:58:50.90   -0.32
                 eSg      58:51.80   -1.16
PKS9  97.4 186   ePgC   9:59:07.50    1.03
                 eSg      59:20.40    0.29
PKSM 139.8 173   ePn    9:59:12.10   -0.06
                 eSn      59:29.70   -0.55
```

```
13.
```

```
 2004-02-04  time: 19:40:46.90 UTC  ML= 0.6
   lat: 47.444N  lon: 18.331E  h= 12.8 km
                 erh=17.4km    erz= 4.6km
   nr=  7        gap=320       rms=0.70
   Locality: Oroszlány
   Comments:

sta   dist azm  phase  hr mn  sec     res
PKSG   7.4 142   ePgC  19:40:49.10   -0.44
                 eSg      40:50.80   -0.79
PKS8  68.1 157   ePgD  19:41:00.70    1.42
                 eSg      41:08.00   -0.93
PKS9  95.4 182   eS*   19:41:17.70    0.43
PKSM 139.0 170   iPnC  19:41:09.50   -0.14
                 eSn      41:27.10   -0.27
```

```
14.
```

```
 2004-02-05  time: 15:52:40.87 UTC  ML= 1.5
   lat: 47.800N  lon: 19.411E  h=  6.5 km
                 erh= 6.0km    erz= 3.6km
   nr=  9        gap=166       rms=0.59
   Locality: Acsa
   Comments:

sta   dist azm  phase  hr mn  sec     res
PENC   9.7 264   iPgC  15:52:42.60   -0.36
                 eSg      52:45.20    0.61
RHK6  18.5 221   ePg   15:52:45.30    0.93
                 eSg      52:49.20    2.10
PSZ   38.5  70   iPgC  15:52:47.70   -0.15
                 eSg      52:53.70    0.41
PKSG  89.1 239   eSg   15:53:08.30   -0.97
PKS8 116.5 208   ePn   15:53:01.70    0.10
                 eSn      53:18.00    0.24
```

```
15.
```

```
 2004-02-05  time: 16:32:27.69 UTC  ML= 1.5
   lat: 47.783N  lon: 19.424E  h= 10.0 km
                 erh= 8.3km    erz= 4.4km
   nr= 12        gap=153       rms=1.57
   Locality: Acsa
   Comments:

sta   dist azm  phase  hr mn  sec     res
PENC  10.7 274   ePgD  16:32:29.70   -0.61
                 eSg      32:32.30   -0.05
RHK6  17.9 227   ePgC  16:32:32.00    0.64
                 eSg      32:36.50    2.29
PSZ   38.3  67   iPgD  16:32:34.80    0.04
                 eSg      32:40.90    0.63
BUD   44.9 222   eSg   16:32:45.20    2.89
PKSG  89.1 241   ePg   16:32:42.40   -1.31
                 eSg      32:52.10   -4.09
PKS8 115.4 209   ePn   16:32:48.30    0.46
```

```
                eSn      33:03.60    0.05
PKS9 158.8 213  eSn    16:33:09.20   -3.99
```

16.

```
 2004-02-25  time: 11:59:17.94 UTC  ML=
   lat: 46.408N  lon: 18.821E  h=  0.0 km
                 erh= ***km    erz= ***km
   nr=  5        gap=140       rms=2.63
   Locality: Bogyiszló
   Comments: explosion

sta   dist azm  phase  hr mn  sec     res
PKSM  25.8 212   iPgC  11:59:22.70    0.15
PKS2  31.6  73   ePg   11:59:18.70   -4.88
PKS9  46.1 296   ePg   11:59:26.80    0.62
PKS8  53.5 348   ePg   11:59:26.70   -0.80
PKS6  60.9  70   ePg   11:59:33.40    4.57
```

17.

```
 2004-02-25  time: 12:07:06.38 UTC  ML= 1.6
   lat: 46.357N  lon: 19.199E  h=  0.0 km
                 erh= ***km    erz= ***km
   nr=  6        gap=203       rms=0.66
   Locality: Kéleshalom
   Comments: explosion

sta   dist azm  phase  hr mn  sec     res
PKS2  15.0   4   iPgC  12:07:09.20    0.14
                 eSg      07:10.70   -0.45
PKS6  38.9  46   ePg   12:07:25.60   12.27
PKSM  45.9 249   ePgC  12:07:14.20   -0.38
PKS8  70.5 325   ePgC  12:07:18.70   -0.26
PKS9  75.2 290   iPgC  12:07:20.00    0.20
```

18.

```
 2004-02-25  time: 12:18:41.05 UTC  ML= 0.6
   lat: 46.373N  lon: 19.135E  h=  0.0 km
                 erh= 0.6km    erz=83.5km
   nr=  7        gap=192       rms=0.05
   Locality: Hajós
   Comments: explosion

sta   dist azm  phase  hr mn  sec     res
PKS2  14.5  24   iPgC  12:18:43.70    0.05
                 eSg      18:45.60   -0.07
PKS6  41.5  53   ePg   12:18:48.40   -0.07
PKSM  42.0 245   iPgC  12:18:48.60    0.04
                 eSg      18:54.30   -0.11
PKS8  66.3 328   ePgC  12:18:52.90    0.01
PKS9  69.9 290   ePg   12:18:53.50   -0.04
```

19.

```
 2004-02-25  time: 13:26:59.77 UTC  ML= 1.2
   lat: 46.485N  lon: 19.020E  h=  0.0 km
                 erh= ***km    erz= ***km
   nr=  5        gap=152       rms=1.22
   Locality: Drágszél
   Comments: explosion

sta   dist azm  phase  hr mn  sec     res
PKS2  14.9  87   ePgC  13:27:02.00   -0.43
                 eSg      27:04.50    0.00
PKSM  42.1 224   ePgC  13:27:07.00   -0.28
PKS6  43.7  73   ePg   13:27:18.60   11.03
PKS9  57.9 281   ePgC  13:27:10.40    0.28
```

20.

```
 2004-02-25  time: 16:08:53.05 UTC  ML= 1.0
   lat: 46.551N  lon: 18.984E  h=  0.0 km
                 erh= ***km    erz= ***km
   nr=  5        gap=143       rms=0.71
   Locality: Kalocsa
   Comments: explosion

sta   dist azm  phase  hr mn  sec     res
PKS2  18.8 111   ePgC  16:08:55.80   -0.61
                 eSg      09:00.10    1.07
PKS8  43.3 327   iPgC  16:09:00.50   -0.28
PKSM  46.0 215   ePgC  16:09:00.80   -0.47
PKS9  54.2 274   ePgC  16:09:04.00    1.28
```

21.

```
 2004-02-25  time: 16:18:13.16 UTC  ML= 0.5
   lat: 46.526N  lon: 19.000E  h=  0.0 km
                 erh= 2.1km    erz= 313km
   nr=  5        gap=186       rms=0.15
   Locality: Negyvenszállás
   Comments: explosion

sta   dist azm  phase  hr mn  sec     res
PKS2  16.7 103   iPgC  16:18:16.10   -0.05
                 eSg      18:18.80    0.32
PKSM  44.5 218   ePgC  16:18:21.20    0.10
                 eSg      18:26.90   -0.40
PKS9  55.8 277   ePgC  16:18:23.10   -0.01
```

22.

```
 2004-02-25  time: 16:53:31.59 UTC  ML= 1.3
   lat: 46.526N  lon: 19.035E  h=  0.0 km
                 erh= ---km    erz= ---km
   nr=  4        gap=140       rms=0.29
   Locality: Negyvenszállás
   Comments: explosion

sta   dist azm  phase  hr mn  sec     res
PKS2  14.2 105   ePg   16:53:33.70   -0.41
                 eSg      53:37.70    1.62
PKSM  46.2 221   iPgC  16:53:39.90    0.06
PKS8  47.9 325   iPgC  16:53:40.20    0.07
```

23.

```
 2004-02-26  time: 14:40:16.62 UTC  ML= 1.1
   lat: 46.567N  lon: 19.003E  h=  0.0 km
                 erh= 5.1km    erz= 901km
   nr=  5        gap=153       rms=0.41
   Locality: Szakmár
   Comments: explosion

sta   dist azm  phase  hr mn  sec     res
PKS2  18.1 117   iPgC  14:40:19.80   -0.06
                 eSg      40:23.10    0.72
PKS8  42.7 324   ePgC  14:40:24.00   -0.25
PKSM  48.3 215   iPgC  14:40:24.80   -0.45
PKS9  55.6 272   iPgC  14:40:27.10    0.55
```

24.

```
 2004-02-27  time:  9:44:36.51 UTC  ML=
   lat: 46.487N  lon: 18.961E  h=  0.0 km
                 erh= ---km    erz= ---km
   nr=  4        gap=131       rms=0.56
   Locality: Bátya
   Comments: explosion

sta   dist azm  phase  hr mn  sec     res
PKS2  19.4  88   iPgC   9:44:40.20    0.23
PKSM  39.3 219   iPgC   9:44:43.10   -0.42
```

```
PKS8   48.7 333   iPgC    9:44:44.60   -0.61
PKS9   53.5 282   iPgC    9:44:46.90    0.83
```

25.

```
 2004-02-27  time: 11:10:50.75 UTC  ML= 1.1
   lat: 46.473N  lon: 19.031E  h=  0.0 km
                 erh= 2.1km    erz= 382km
   nr=  5        gap=145       rms=0.17
   Locality: Drágszél
   Comments: explosion

sta   dist azm  phase  hr mn  sec     res
PKS2  14.1  81   ePgC  11:10:53.10   -0.18
                 eSg      10:55.60    0.36
PKSM  41.7 226   ePg   11:10:58.10   -0.11
PKS8  52.7 329   ePg   11:11:00.10   -0.05
PKS9  59.1 282   ePgC  11:11:01.50    0.19
```

26.

```
 2004-03-01  time: 12:40:59.91 UTC  ML= 0.1
   lat: 46.462N  lon: 18.960E  h=  0.0 km
                 erh= ***km    erz= ***km
   nr=  6        gap=141       rms=0.96
   Locality: Bátya
   Comments: explosion

sta   dist azm  phase  hr mn  sec     res
PKS2  19.7  80   iPgC  12:41:02.90   -0.54
                 eSg      41:07.60    1.41
PKSM  37.0 221   iPgD  12:41:07.10    0.57
                 eSg      41:09.40   -2.29
PKS8  51.2 335   ePgC  12:41:04.40   -4.65
PKS9  54.1 285   iPgD  12:41:09.90    0.33
```

27.

```
 2004-03-03  time:  9:51:59.24 UTC  ML= 0.9
   lat: 46.547N  lon: 18.876E  h=  0.0 km
                 erh= ***km    erz= ***km
   nr=  7        gap=126       rms=1.01
   Locality: Uszód
   Comments: explosion

sta   dist azm  phase  hr mn  sec     res
PKS2  26.6 103   ePgC   9:52:04.40    0.42
                 eSg      52:06.40   -1.28
PKS8  40.0 338   ePg    9:52:05.40   -0.97
PKSM  41.4 206   iPgC   9:52:06.70    0.08
                 eSg      52:11.20   -1.18
PKS9  46.0 276   iPgC   9:52:08.60    1.14
                 eSg      52:10.40   -3.47
```

28.

```
 2004-03-09  time: 15:30:43.11 UTC  ML= 1.4
   lat: 45.725N  lon: 18.894E  h= 10.0 km
                 erh= ---km    erz= ---km
   nr=  4        gap=323       rms=0.85
   Locality: Croatia
   Comments:

sta   dist azm  phase  hr mn  sec     res
PKSM  57.5 340   iPgC  15:30:54.30    0.76
                 eSg      31:03.00    1.33
RHK1  75.9 303   iPgC  15:30:56.30   -0.48
PKS9 106.9 334   eP*C  15:31:00.90   -1.29
```

29.

```
 2004-03-17  time:  8:31:21.05 UTC  ML= 1.8
   lat: 47.472N  lon: 18.478E  h=  0.0 km
                 erh=13.0km    erz= 5.0km
   nr=  6        gap=318       rms=0.87
   Locality: Bodmér
   Comments: explosion

sta   dist azm  phase  hr mn  sec     res
PKSG  11.0 217   ePgC   8:31:23.20   -0.51
                 eSg      31:24.30   -1.48
PKS9  99.5 189   iPgC   8:31:39.70    0.80
                 eSg      31:52.80   -0.03
PKSM 140.6 175   ePn    8:31:44.60    0.27
                 eSn      32:00.40   -2.10
```

30.

```
 2004-03-22  time:  9:28:23.74 UTC  ML= 1.2
   lat: 47.452N  lon: 18.451E  h=  0.0 km
                 erh=16.1km    erz= 4.5km
   nr=  7        gap=311       rms=0.73
   Locality: Bodmér
   Comments: explosion

sta   dist azm  phase  hr mn  sec     res
PKSG   8.1 214   ePgC   9:28:25.30   -0.74
                 eSg      28:26.30   -1.53
PKS8  66.0 165   ePg    9:28:36.30    0.63
                 eSg      28:44.70   -0.27
PKS9  97.1 188   iPgC   9:28:41.90    0.73
PKSM 138.7 174   iPnC   9:28:46.70   -0.08
                 eSn      29:03.40   -1.36
```

31.

```
 2004-03-22  time:  9:29:14.14 UTC  ML= 1.3
   lat: 47.460N  lon: 18.407E  h=  0.0 km
                 erh=85.3km    erz=11.1km
   nr=  5        gap=343       rms=0.94
   Locality: Várgesztes
   Comments: explosion

sta   dist azm  phase  hr mn  sec     res
PKSG   7.7 189   iPgC   9:29:15.90   -0.49
                 eSg      29:16.80   -1.34
PKS9  97.5 186   ePgC   9:29:32.70    1.05
PKSM 139.9 173   iPnC   9:29:38.10    0.76
                 eSn      29:53.30   -2.13
```

32.

```
 2004-04-01  time: 11:12:45.78 UTC  ML= 2.3
   lat: 47.440N  lon: 18.157E  h= 10.0 km
                 erh= 3.1km    erz= 2.2km
   nr= 17        gap=134       rms=0.76
   Locality: Felsődobos
   Comments:

sta   dist azm  phase  hr mn  sec     res
PKSG  18.5 107   iPgC  11:12:49.40   -0.13
                 iSg      12:52.00   -0.45
SRO   43.2  16   ePg   11:12:54.50    0.81
                 eSg      13:00.10    0.24
BUD   65.6  86   ePgD  11:12:58.20    0.58
                 eSg      13:05.50   -1.36
ZST  115.3 317   ePn   11:13:05.50   -0.42
                 eSn      13:20.00   -1.62
VYHS 127.7  23   ePn   11:13:08.00    0.54
                 eSn      13:22.60   -1.77
PKS2 132.6 143   ePn   11:13:09.30    1.24
                 eSn      13:25.70    0.26
PSZ  140.9  68   ePnC  11:13:09.20    0.09
                 eSn      13:27.50    0.20
PKSM 141.4 165   ePnD  11:13:08.30   -0.87
```

```
RHK1 149.7 182   ePnC  11:13:11.30    1.10
                 eSn      13:28.70   -0.54
KWP  415.1  54   ePn   11:13:41.55   -1.75
```

33.

```
 2004-04-10  time:  9:52:04.77 UTC  ML= 1.5
   lat: 46.025N  lon: 16.649E  h= 10.0 km
                 erh= 5.7km    erz= 4.9km
   nr=  9        gap=171       rms=0.58
   Locality: Croatia
   Comments:

sta   dist azm  phase  hr mn  sec     res
GOLS  79.4 269   iPg    9:52:19.30    0.23
                 iSg      52:30.00   -0.22
CRES  95.1 257   ePg    9:52:21.50   -0.35
LEGS 103.5 265   iP*    9:52:22.90   -0.43
RHK1 110.3  86   ePn    9:52:24.90    0.62
                 eSn      52:38.70   -0.80
PDKS 128.0 273   iPn    9:52:26.60    0.12
ARSA 161.2 328   iPnC   9:52:31.70    1.08
                 iSn      52:49.90   -0.89
```

34.

```
 2004-04-14  time:  9:08:48.51 UTC  ML= 1.2
   lat: 47.425N  lon: 18.358E  h=  0.0 km
                 erh= 7.6km    erz= 3.5km
   nr= 10        gap=193       rms=0.68
   Locality: Gánt
   Comments: explosion

sta   dist azm  phase  hr mn  sec     res
PKSG   4.4 147   ePgC   9:08:48.90   -0.75
                 eSg      08:50.40   -0.14
PKS8  65.4 158   ePgC   9:08:59.90   -0.31
                 eSg      09:10.60    1.26
PKS9  93.4 184   iPgC   9:09:05.50    0.29
                 eSg      09:19.20    0.97
VYHS 124.1  17   ePn    9:09:10.90    0.47
                 eSn      09:27.60    0.08
PKSM 136.6 171   ePnC   9:09:10.90   -1.09
                 eSn      09:26.60   -3.70
```

35.

```
 2004-04-15  time:  8:22:53.73 UTC  ML= 0.9
   lat: 47.440N  lon: 18.313E  h=  0.0 km
                 erh=73.0km    erz=19.9km
   nr=  6        gap=323       rms=1.31
   Locality: Oroszlány
   Comments: explosion

sta   dist azm  phase  hr mn  sec     res
PKSG   8.0 133   ePgC   8:22:55.60   -0.42
                 eSg      22:56.60   -1.19
PKS8  68.2 156   ePgC   8:23:08.30    2.25
                 eSg      23:14.80   -0.86
PKSM 138.8 170   ePnC   8:23:16.90    0.10
                 eSn      23:33.00   -1.79
```

36.

```
 2004-04-15  time:  8:23:40.11 UTC  ML= 1.4
   lat: 47.503N  lon: 18.258E  h=  0.0 km
                 erh=29.6km    erz= 8.8km
   nr=  6        gap=333       rms=0.80
   Locality: Dad
   Comments: explosion

sta   dist azm  phase  hr mn  sec     res
PKSG  15.9 141   ePgC   8:23:43.50    0.05
                 eSg      23:44.30   -1.76
PKS8  76.3 155   ePgC   8:23:54.20    0.36
                 eSg      24:05.40    0.84
PKSM 146.4 168   ePnC   8:24:04.60    0.48
                 eSn      24:21.40   -1.45
```

37.

```
 2004-04-26  time: 20:58:17.79 UTC  ML= 4.0
   lat: 48.028N  lon: 16.630E  h= 10.0 km
                 erh= 2.2km    erz= 2.2km
   nr= 20        gap=116       rms=0.78
   Locality: Austria
   Comments: felt 4 EMS

sta   dist azm  phase  hr mn  sec     res
VKA   35.1 319   iPgC  20:58:24.50    0.19
                 iSg      58:29.20   -0.20
SOP   38.6 188   ePgC  20:58:25.10    0.18
                 eSg      58:30.20   -0.28
ZST   39.9  62   ePg   20:58:25.10   -0.03
                 iSg      58:30.30   -0.56
ARSA 119.9 224   iPnC  20:58:37.90   -0.60
                 iSn      58:53.00   -1.65
VYHS 171.8  72   ePn   20:58:45.30    0.33
PERS 192.4 216   iPn   20:58:48.90    1.36
GROS 194.0 206   iPn   20:58:48.60    0.86
GEC2 235.0 293   ePn   20:58:53.20    0.35
                 eSn      59:21.00    0.81
LEGS 251.7 203   iPn   20:58:56.30    1.37
KHC  256.4 299   ePn   20:58:55.70    0.18
                 eSn      59:25.60    0.65
DPC  259.3 355   ePn   20:58:58.40    2.52
                 eSn      59:30.10    4.52
CRES 260.5 200   iPn   20:58:57.10    1.07
PRU  266.3 325    Pn   20:58:57.00    0.26
                  Sn      59:25.20   -1.93
WET  303.4 294   ePn   20:59:03.10    1.73
                 eSn      59:38.90    3.53
CLL  449.1 324   ePn   20:59:21.00    1.46
                 eSn   21:00:06.00   -1.70
```

38.

```
 2004-04-27  time:  7:57:35.12 UTC  ML= 1.3
   lat: 45.531N  lon: 18.152E  h= 10.0 km
                 erh=13.5km    erz=40.3km
   nr=  6        gap=328       rms=0.90
   Locality: Croatia
   Comments:

sta   dist azm  phase  hr mn  sec     res
RHK3  40.5  11   ePgC   7:57:44.20    1.63
                 eSg      57:48.60    0.21
RHK1  63.0 354   iPgC   7:57:45.70   -0.81
                 eSg      57:54.90   -0.50
PKSM  84.7  27   ePgC   7:57:50.00   -0.35
                 eSg      58:02.50    0.26
```

39.

```
 2004-04-30  time: 10:43:21.24 UTC  ML= 1.4
   lat: 45.553N  lon: 17.711E  h= 16.0 km
                 erh= 1.8km    erz= 0.6km
   nr=  6        gap=337       rms=0.08
   Locality: Croatia
   Comments:

sta   dist azm  phase  hr mn  sec     res
RHK3  56.3  48   ePgD  10:43:31.60   -0.09
                 eSg      43:40.00    0.15
RHK1  66.5  25   ePgD  10:43:33.50    0.05
                 eSg      43:42.90   -0.08
PKSM 102.9  45   ePnD  10:43:39.10    0.04
                 eSn      43:52.90   -0.06
```

40.

2004-05-11 time: 1:33:09.06 UTC ML= 2.4
lat: 45.713N lon: 18.067E h= 13.8 km
erh= 4.8km erz= 2.2km
nr= 15 gap=241 rms=0.63
Locality: Croatia
Comments:

sta	dist	azm	phase	hr mn	sec	res
RHK3	24.2	36	ePgC	1:33:13.30		-0.73
			eSg	33:17.10		-0.82
RHK1	42.4	1	iPgD	1:33:17.20		0.18
			eSg	33:23.60		0.36
PKS9	98.5	10	iP*D	1:33:26.80		0.30
			eS*	33:41.20		1.10
PKSG	188.3	8	iPnD	1:33:38.20		0.40
			eSn	33:58.30		-1.92
GOLS	192.6	280	ePn	1:33:38.60		0.26
GROS	215.1	293	iPn	1:33:41.30		0.15
			iSn	34:05.10		-1.09
LEGS	215.2	277	iPn	1:33:41.00		-0.17
			eSn	34:12.30		6.09
ARSA	259.5	311	iPnC	1:33:47.40		0.71
			iSn	34:12.30		-3.75
PSZ	282.0	30	ePn	1:33:48.18		-1.32
MOA	375.1	309	iPnD	1:34:02.20		1.11
			iSn	34:38.40		-3.28
MORC	453.5	355	ePn	1:34:12.00		1.12
			eSn	34:59.24		0.14

41.

2004-05-11 time: 2:18:56.16 UTC ML= 1.5
lat: 45.704N lon: 18.179E h= 10.0 km
erh= 3.8km erz= 4.0km
nr= 6 gap=334 rms=0.21
Locality: Croatia
Comments:

sta	dist	azm	phase	hr mn	sec	res
RHK3	21.3	16	ePgD	2:19:00.10		-0.26
			eSg	19:03.80		0.17
RHK1	44.2	349	iPgD	2:19:04.10		-0.16
			eSg	19:10.50		-0.07
PKS9	98.4	5	iPgC	2:19:14.10		0.27
			eSg	19:27.60		-0.01

42.

2004-05-11 time: 13:39:53.39 UTC ML= 1.1
lat: 47.153N lon: 19.150E h= 0.1 km
erh= ***km erz= ***km
nr= 6 gap=168 rms=0.59
Locality: Apaj
Comments:

sta	dist	azm	phase	hr mn	sec	res
PKS7	11.8	176	iPgC	13:39:55.10		-0.39
			eSg	39:58.20		1.07
PKS8	47.2	230	iPgD	13:40:01.70		-0.12
			eSg	40:19.70		11.31
PENC	71.6	8	ePgC	13:40:06.50		0.33
PKS9	91.5	227	ePg	13:40:09.60		-0.13

43.

2004-05-15 time: 10:48:20.20 UTC ML= 2.2
lat: 45.874N lon: 17.194E h= 10.0 km
erh= 4.5km erz= 2.7km
nr= 6 gap=318 rms=0.30
Locality: Croatia
Comments:

sta	dist	azm	phase	hr mn	sec	res
RHK1	72.3	70	ePgC	10:48:33.40		0.16
			eSg	48:43.80		0.39
RHK3	82.2	89	iPgC	10:48:34.90		-0.08
			eSg	48:45.80		-0.71
PKS9	115.3	47	iPnD	10:48:40.50		0.17
			eSn	48:55.20		-0.83

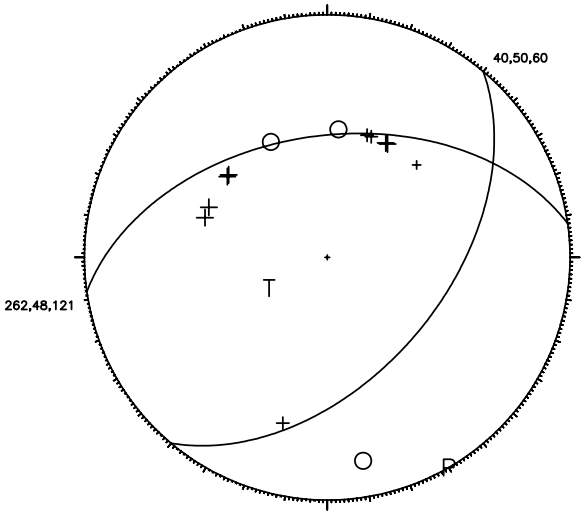
44.

2004-05-18 time: 21:33:22.02 UTC ML= 3.2
lat: 45.693N lon: 18.177E h= 12.8 km
erh= 1.7km erz= 1.6km
nr= 44 gap=121 rms=0.54
Locality: Croatia
Comments:

sta	dist	azm	phase	hr mn	sec	res
RHK3	22.5	15	ePgC	21:33:26.50		-0.14
			eSg	33:30.60		0.35
RHK1	45.4	350	iPgD	21:33:30.50		0.06
			eSg	33:36.80		-0.21
PKS9	99.7	5	eP*	21:33:40.10		0.37
			eS*	33:53.90		0.36
PKS7	168.5	27	iPnC	21:33:48.30		-0.12
			eSn	34:12.80		3.78
PKSN	186.8	44	iPnC	21:33:55.10		4.40
			eSn	34:19.00		5.93
PKSG	189.6	5	iPnD	21:33:51.50		0.45
			eSn	34:18.90		5.21
BUD	209.4	18	ePnC	21:33:53.20		-0.32
			eSn	34:20.10		2.01
RHK6	235.0	20	ePnC	21:33:56.40		-0.31
SRO	235.9	3	ePn	21:33:58.30		1.47
			eSn	34:25.20		1.22
ARSA	267.4	310	iPnC	21:34:00.40		-0.35
			iSn	34:32.50		1.53
PLE	279.9	160	ePn	21:34:02.68		0.37
			eSn	34:33.44		-0.30
PSZ	280.0	28	iPnC	21:34:01.60		-0.72
			eSn	34:44.60		10.84
UPM	282.8	168	ePn	21:34:02.42		-0.25
			eSn	34:34.25		-0.13
NVLJ	288.8	244	iPn	21:34:02.88		-0.54
			iSn	34:32.98		-2.73
ZST	290.0	344	iPn	21:34:03.90		0.33
			iSn	34:33.30		-2.69
OBKA	294.8	288	iPnC	21:34:03.50		-0.67
			iSn	34:38.20		1.15
BRY	311.7	175	ePn	21:34:06.58		0.31
			eSn	34:40.32		-0.47
VYHS	315.4	9	iPn	21:34:07.00		0.26
			eSn	34:40.20		-1.42
STON	315.8	187	iPn	21:34:06.64		-0.15
			iSn	34:42.24		0.53
VKA	319.0	334	iPnD	21:34:07.50		0.32
NKY	326.7	168	ePn	21:34:08.10		-0.04
			eSn	34:43.45		-0.68
VOY	334.7	276	ePn	21:34:10.90		1.75
			eSn	34:57.00		11.09
IVA	342.3	156	ePn	21:34:10.02		-0.07
			eSn	34:47.22		-0.37
HCY	361.5	176	ePn	21:34:12.57		0.08
			eSn	34:51.04		-0.82
TTG	372.9	167	ePn	21:34:14.17		0.27
			eSn	34:53.77		-0.60
PVY	373.1	157	ePn	21:34:13.94		0.01
			eSn	34:53.53		-0.89
BUM	381.3	171	ePn	21:34:15.20		0.24
			eSn	34:55.83		-0.42
MOA	383.0	309	iPnC	21:34:15.20		0.03
			iSn	34:57.80		1.18
KBA	402.3	293	iPnC	21:34:16.90		-0.68
			iSn	35:03.00		2.09
VRAC	419.3	343	Pn	21:34:19.86		0.17
			Sn	35:03.29		-1.38
ULC	423.3	168	ePn	21:34:20.59		0.40
			eSn	35:04.85		-0.72

Hypocenter Parameters **Földrengés paraméterek**

CRVS	434.8	35	ePn	21:34:21.70	0.08
MORC	456.5	354	ePn	21:34:24.33	-0.01
OKC	460.8	360	ePn	21:34:24.00	-0.87
			eSn	35:11.70	-2.19
GERE	487.3	316	Pn	21:34:31.08	2.90
			Sn	35:20.86	1.08
KHC	516.3	318	ePn	21:34:32.10	0.32
			eSn	35:24.70	-1.50
DPC	536.0	345	ePn	21:34:33.90	-0.34
			eSn	35:27.40	-3.18
CII	540.3	215	Pn	21:34:33.79	-0.99
PRU	549.7	330	ePn	21:34:34.20	-1.75
			eSn	35:32.20	-1.41
CPI2	552.4	214	ePn	21:34:39.43	3.14
UPC	559.1	343	ePn	21:34:34.90	-2.22
			eSn	35:31.90	-3.80
SDI	565.5	218	ePn	21:34:39.98	2.06
SGG	568.5	213	ePn	21:34:41.02	2.73
MRLC	590.3	202	ePn	21:34:42.21	1.19
CSSN	594.7	205	ePn	21:34:42.05	0.48
MLR	606.6	92	Pn	21:34:46.73	3.68
DAVO	658.5	281	Pn	21:34:52.90	3.39
			Sn	35:55.30	-2.46
NKC	661.7	320	ePn	21:34:57.60	7.68
			eSn	35:55.50	-2.98
MOX	735.8	318	ePn	21:34:58.90	-0.26
NOA	769.8	345	Pn	21:37:05.48	-2.60



45.

2004-05-18 time: 23:00:54.63 UTC ML= 1.1
lat: 45.669N lon: 18.125E h= 1.2 km
erh= 5.4km erz=62.8km
nr= 6 gap=333 rms=0.38
Locality: Croatia
Comments:

sta	dist	azm	phase	hr mn	sec	res
RHK3	26.3	22	iPgD	23:00:59.10		-0.23
			eSg	01:02.90		-0.10
RHK1	47.5	355	ePgD	23:01:03.00		-0.11
			eSg	01:09.40		-0.33
PKS9	102.7	7	ePg	23:01:13.80		0.83
			eSg	01:27.60		0.32

46.

2004-05-21 time: 1:02:10.74 UTC ML= 0.5
lat: 45.932N lon: 18.330E h= 10.0 km
erh=95.2km erz=69.2km
nr= 6 gap=217 rms=0.54
Locality: Kisherend
Comments:

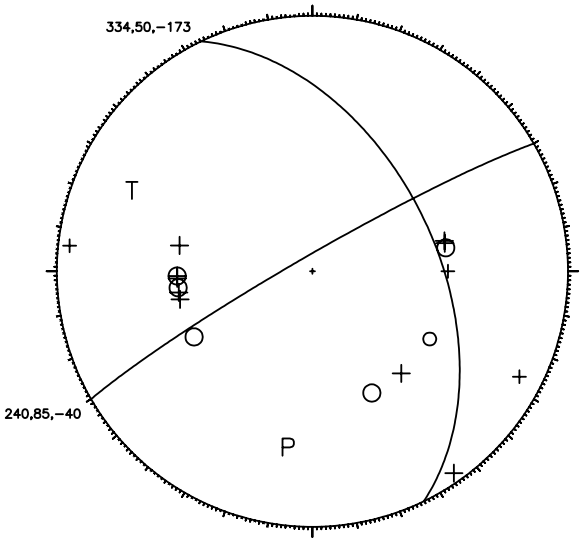
sta	dist	azm	phase	hr mn	sec	res
RHK3	7.8	231	iPgD	1:02:13.20		0.20
			eSg	02:17.20		2.43
RHK1	26.9	312	iPgD	1:02:15.20		-0.67
			eSg	02:20.40		0.53
PKS8	108.5	14	ePnC	1:02:30.10		0.08
			eSn	02:45.70		0.64

47.

2004-05-25 time: 7:30:14.92 UTC ML= 3.8
lat: 47.479N lon: 17.141E h= 8.3 km
erh= 1.2km erz= 1.4km
nr= 32 gap= 40 rms=0.36
Locality: Beled
Comments: felt 5-6 EMS

sta	dist	azm	phase	hr mn	sec	res
SOP	49.3	297	ePgC	7:30:24.30		0.45
			eSg	30:30.10		-0.72
ZST	79.8	358	iPg	7:30:28.90		-0.34
			eSg	30:38.10		-2.31
PKSG	94.8	96	ePgC	7:30:31.90		-0.01
			eSg	30:44.00		-1.16
SRO	95.6	67	iPg	7:30:32.00		-0.06
			iSg	30:44.80		-0.63
VKA	106.9	325	iPgC	7:30:34.10		0.04
			iSg	30:48.80		-0.19
ARSA	124.8	258	iPnC	7:30:36.30		-0.15
			iSn	30:51.60		-1.65
PKS9	131.6	139	iPnC	7:30:37.30		0.00
			eSn	30:51.80		-2.96
PKS8	134.2	120	ePnD	7:30:37.50		-0.13
			eSn	30:52.60		-2.74
BUD	141.9	90	ePnC	7:30:39.50		0.91
			eSn	30:56.30		-0.76
RHK5	147.3	80	iPnD	7:30:39.50		0.24
			eSn	30:57.40		-0.85
RHK6	160.1	82	ePn	7:30:41.20		0.35
			eSn	31:01.70		0.62
PENC	164.6	78	iPnC	7:30:41.50		0.08
			eSn	31:02.00		-0.08
RHK1	169.5	155	ePn	7:30:41.70		-0.33
VYHS	169.6	48	ePn	7:30:40.90		-1.14
			eSn	31:03.90		0.71
BISS	178.7	239	iPn	7:30:43.40		0.22
PERS	180.1	239	ePn	7:30:43.30		-0.05
PKSM	181.5	141	iPn	7:30:43.00		-0.53
PKS2	192.1	125	ePn	7:30:44.80		-0.05
			eSn	31:08.40		0.21
RHK3	196.2	154	iPnD	7:30:45.60		0.24
			eSn	31:10.20		1.10
VRAC	207.4	349	Pn	7:30:46.61		-0.14
PSZ	212.4	77	iPnC	7:30:47.40		0.02
			eSn	31:09.80		-2.89
MOA	219.8	281	iPnC	7:30:48.80		0.50
			iSn	31:18.70		4.36
OBKA	224.7	241	iPnD	7:30:48.10		-0.81
			iSn	31:20.60		5.17
SISC	230.9	195	iPn	7:30:49.50		-0.18
			iSn	31:14.30		-2.50
LJU	255.6	231	ePn	7:30:58.10		5.34
VISS	256.5	223	ePn	7:30:52.30		-0.58
MORC	257.2	7	ePn	7:30:53.24		0.27
OKC	272.5	16	ePn	7:30:55.10		0.22
			eSn	31:24.20		-1.84
CEY	284.0	227	ePn	7:30:56.60		0.30
			eSn	31:26.20		-2.39
KBA	290.7	261	iPnC	7:30:58.00		0.87
			iSn	31:40.60		10.54
VOY	295.7	237	ePn	7:30:57.30		-0.46
			eSn	31:43.80		12.62
GERE	297.5	301	Pn	7:30:58.84		0.85
GEC2	297.5	301	ePn	7:30:58.90		0.91
			eSn	31:38.90		7.31
RAC	299.8	15	ePn	7:31:05.30		7.03

		eSn	31:30.10	-1.99
ROBS	309.0	244 ePn	7:31:00.00	0.58
PTCC	312.1	248 ePn	7:31:00.26	0.45
		eSn	31:33.37	-1.45
KHC	321.9	305 ePn	7:31:01.70	0.68
		eSn	31:44.20	7.21
DPC	324.9	349 ePn	7:31:01.70	0.30
		eSn	31:35.60	-2.06
PRU	338.3	326 ePn	7:31:03.40	0.33
		eSn	31:49.00	8.37
FVI	345.6	254 ePn	7:31:05.07	1.08
		eSn	31:38.05	-4.21
UPC	346.8	346 ePn	7:31:04.90	0.77
CRVS	358.1	64 ePn	7:31:05.10	-0.45
OJC	361.8	33 ePn	7:31:06.00	-0.01
WET	366.4	300 ePn	7:31:07.40	0.82
		eSn	31:59.30	12.43
NVLJ	368.7	208 iPn	7:31:07.48	0.62
		iSn	31:46.78	-0.60
KSP	379.2	351 ePn	7:31:08.80	0.63
		eSn	31:46.20	-3.51
PVCC	387.8	331 ePn	7:31:11.10	1.85
SCE	413.9	263 iPnD	7:31:14.50	1.99
WTTA	416.4	267 iPnC	7:31:11.50	-1.32
		iSn	31:58.30	0.32
MOTA	455.9	268 iPnD	7:31:16.20	-1.53
		iSn	32:06.20	-0.53
NKC	460.9	312 ePn	7:31:18.60	0.24
		eSn	32:26.30	18.46
KWP	475.6	60 ePn	7:31:21.10	0.91
GRA1	501.3	299 ePn	7:31:24.00	0.61
		eSn	32:39.50	22.69
CLL	521.1	325 iPn	7:31:26.50	0.63
BRMO	526.9	258 ePn	7:31:28.68	2.09
MABI	530.4	253 ePn	7:31:27.00	-0.03
MOX	535.8	311 ePn	7:31:28.10	0.40
DAVA	548.7	268 iPnC	7:31:27.70	-1.61
		iSn	32:25.80	-1.53
DAVO	561.5	263 Pn	7:31:31.98	1.08
TOD	659.5	291 Pn	7:31:43.30	0.18
BFO	665.5	278 ePn	7:31:43.60	-0.27
FELD	687.5	274 Pn	7:31:46.00	-0.62



48.

2004-06-02 time: 7:45:07.71 UTC ML= 1.6
lat: 47.435N lon: 18.419E h= 0.0 km
erh= ---km erz= ---km
nr= 3 gap=342 rms=0.31
Locality: Várgesztes
Comments: explosion

sta	dist	azm	phase	hr mn	sec	res
PKSG	5.3	204	ePgC	7:45:08.30		-0.35
			eSg	45:09.40		0.01
PKS9	94.9	186	ePgC	7:45:25.00		0.35

49.

2004-06-02 time: 7:46:21.00 UTC ML= 1.8
lat: 47.431N lon: 18.399E h= 0.0 km
erh= ---km erz= ---km
nr= 4 gap=357 rms=0.34
Locality: Gánt
Comments: explosion

sta	dist	azm	phase	hr mn	sec	res
PKSG	4.4	188	iPgC	7:46:21.60		-0.20
			eSg	46:22.80		0.38
PKS9	94.3	186	ePgC	7:46:38.30		0.45
			eSg	46:50.50		-0.48

50.

2004-06-04 time: 12:26:03.55 UTC ML= 1.9
lat: 45.909N lon: 18.695E h= 0.1 km
erh= 7.5km erz= 861km
nr= 5 gap=235 rms=0.39
Locality: Udvar
Comments:

sta	dist	azm	phase	hr mn	sec	res
RHK3	34.5	266	iPgD	12:26:09.70		-0.01
			eSg	26:13.60		-0.92
RHK1	52.5	293	ePgD	12:26:13.60		0.66
			eSg	26:20.10		-0.16
PKS2	76.1	32	eSg	12:26:27.60		-0.16

51.

2004-06-05 time: 2:15:23.61 UTC ML= 2.0
lat: 45.648N lon: 18.132E h= 8.1 km
erh= 4.0km erz= 2.8km
nr= 7 gap=335 rms=0.21
Locality: Croatia
Comments:

sta	dist	azm	phase	hr mn	sec	res
RHK3	28.4	19	ePgD	2:15:28.80		-0.08
			eSg	15:32.80		-0.19
RHK1	49.9	355	iPgD	2:15:32.70		0.06
			eSg	15:39.20		-0.49
PKS9	105.0	6	ePgD	2:15:42.60		0.18
			eSg	15:57.50		0.40
PKSG	194.9	6	ePnC	2:15:53.80		-0.11
			eSn	16:21.20		3.65

52.

2004-06-07 time: 2:08:00.28 UTC ML= 1.2
lat: 45.638N lon: 18.077E h= 7.3 km
erh= 8.8km erz= 4.4km
nr= 9 gap=312 rms=0.65
Locality: Croatia
Comments:

sta	dist	azm	phase	hr mn	sec	res

```
RHK3  31.0  26   ePgD   2:08:05.70   -0.27
                 eSg      08:09.70   -0.70
RHK1  50.8 360   iPgD   2:08:09.60    0.16
                 eSg      08:16.10   -0.48
PKS9 106.6   8   ePgC   2:08:20.20    0.84
                 eSg      08:34.40    0.15
PKS8 145.5  19   ePnC   2:08:23.50   -1.01
                 eSn      08:40.10   -3.31
PKS6 157.0  47   eSn    2:08:46.90    0.93
```

53.

```
 2004-06-08  time: 19:16:46.40 UTC  ML= 1.7
   lat: 45.797N  lon: 18.771E  h= 17.2 km
                 erh=31.3km    erz=24.6km
   nr=  8        gap=288       rms=0.79
   Locality: Croatia
   Comments:

sta   dist azm  phase  hr mn  sec     res
RHK3  41.6 284   iPgC  19:16:54.40   -0.04
                 eSg      17:00.70   -0.01
RHK1  63.5 301   ePg   19:16:58.40    0.25
                 eSg      17:06.50   -0.82
PKS9  95.7 337   iP*C  19:17:03.80    0.71
                 eS*      17:16.80    0.69
PKS8 120.5 357   ePn   19:17:03.90   -2.35
                 eSn      17:21.00   -0.73
```

54.

```
 2004-06-12  time:  9:59:21.72 UTC  ML= 2.2
   lat: 48.657N  lon: 19.119E  h= 16.8 km
                 erh= 1.3km    erz= 0.8km
   nr= 10        gap=173       rms=0.21
   Locality: Slovak Republic
   Comments:

sta   dist azm  phase  hr mn  sec     res
VYHS  27.6 229   iPg    9:59:27.60    0.10
                 eSg      59:31.80   -0.20
PSZ  100.3 145   ePn    9:59:39.14    0.03
                 eSn      59:52.62   -0.06
OKC  149.2 332   ePn    9:59:45.80    0.59
                 eSn    10:00:03.60    0.08
ZST  157.8 251   ePn    9:59:45.80   -0.48
                 eSn    10:00:05.50    0.06
MORC 169.4 317   ePn    9:59:47.86    0.13
                 eSn    10:00:07.80   -0.22
```

55.

```
 2004-06-14  time: 10:07:01.27 UTC  ML= 0.7
   lat: 47.408N  lon: 18.416E  h=  0.0 km
                 erh=23.5km    erz= 2.3km
   nr=  5        gap=294       rms=0.45
   Locality: Gánt
   Comments: explosion

sta   dist azm  phase  hr mn  sec     res
PKSG   2.6 228   iPgC  10:07:03.10   -0.02
                 eSg      07:04.10   -0.45
PKS8  62.0 161   eSg   10:07:21.20   -0.04
PKSM 134.0 173   ePnC  10:07:24.60    0.86
                 eSn      07:40.30   -0.96
```

56.

```
 2004-06-14  time: 10:07:50.25 UTC  ML= 1.0
   lat: 47.352N  lon: 18.395E  h=  0.0 km
                 erh= ---km    erz= ---km
   nr=  4        gap=184       rms=0.23
   Locality: Gánt
   Comments: explosion

sta   dist azm  phase  hr mn  sec     res
PKSG   4.5 356   iPgC  10:07:51.50   -0.05
                 eSg      07:52.50   -0.06
PKSM 128.1 172   ePnC  10:08:12.90    0.37
                 eSn      08:29.40   -0.50
```

57.

```
 2004-06-14  time: 23:26:44.75 UTC  ML= 1.5
   lat: 46.251N  lon: 19.633E  h=  5.8 km
                 erh= 4.1km    erz= 3.1km
   nr= 12        gap=276       rms=0.53
   Locality: Öttömös
   Comments:

sta   dist azm  phase  hr mn  sec     res
PKS6  39.1 352   iPgC  23:26:51.80    0.00
                 eSg      26:57.90    0.59
PKSN  74.0  14   ePg   23:26:55.60   -2.40
                 eSg      27:07.60   -0.74
PKS7  95.6 338   iPgC  23:27:02.20    0.35
                 eSg      27:15.30    0.11
PKS8 101.2 314   ePgD  23:27:02.80   -0.05
                 eSg      27:15.90   -1.07
PKS9 110.6 290   ePg   23:27:04.80    0.27
                 eSg      27:20.00    0.05
PKSG 158.3 323   iPnD  23:27:10.70   -0.08
                 eSn      27:32.10    1.02
```

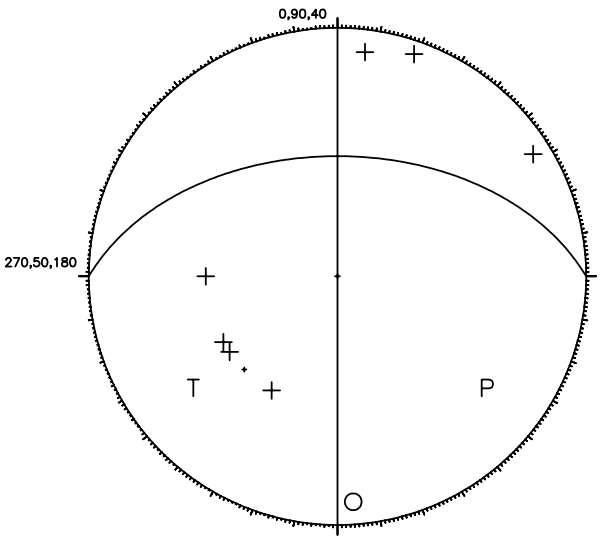
58.

```
 2004-06-15  time:  9:56:22.57 UTC  ML= 1.2
   lat: 45.549N  lon: 17.860E  h=  5.0 km
                 erh= ---km    erz= ---km
   nr=  4        gap=336       rms=0.16
   Locality: Croatia
   Comments:

sta   dist azm  phase  hr mn  sec     res
RHK3  48.5  39   ePg    9:56:31.30    0.02
RHK1  62.8  15   iPgD   9:56:33.70   -0.12
                 eSg      56:43.10    0.50
PKS9 119.8  16   ePnC   9:56:44.00    0.11
```

59.

```
 2004-06-19  time: 10:48:06.43 UTC  ML= 2.5
   lat: 47.391N  lon: 19.956E  h= 10.0 km
                 erh= 3.7km    erz= 2.3km
   nr= 24        gap=153       rms=0.94
   Locality: Portelek
   Comments:

sta   dist azm  phase  hr mn  sec     res
PKSN  55.3 187   iPgC  10:48:16.60    0.14
                 eSg      48:24.50    0.22
PSZ   58.8 356   iPgD  10:48:17.30    0.22
                 eSg      48:25.10   -0.30
PKS7  71.3 238   iPgC  10:48:19.30    0.02
                 eSg      48:28.60   -0.71
PKS6  92.8 199   iPgC  10:48:22.80   -0.30
                 eSg      48:34.80   -1.30
PKS8 112.5 240   iPnC  10:48:25.10   -1.11
                 eSn      48:38.70   -2.95
PKS2 114.8 210   iPnC  10:48:26.40   -0.10
                 eSn      48:40.00   -2.15
PKSG 118.2 270   iPnC  10:48:28.50    1.58
                 eSn      48:41.70   -1.20
VYHS 148.5 326   ePn   10:48:30.70    0.00
                 eSn      48:48.60   -1.02
PKS9 155.8 235   iPnC  10:48:33.00    1.40
                 eSn      48:52.20    0.96
PKSM 165.1 217   ePn   10:48:33.90    1.14
                 eSn      48:54.50    1.19
CRVS 202.0  34   ePn   10:48:37.30   -0.07
                 eSn      48:59.70   -1.80
RHK1 203.7 225   ePnC  10:48:41.30    3.72
```

		eSn	49:06.00	4.12



60.

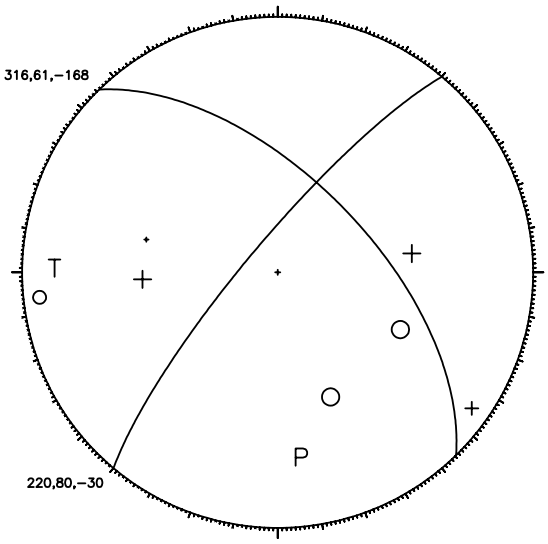
2004-06-21 time: 21:42:27.98 UTC ML= 1.8
lat: 47.323N lon: 17.379E h= 13.4 km
erh= 3.2km erz= 2.8km
nr= 17 gap=108 rms=0.83
Locality: Mezőlak
Comments:

sta	dist	azm	phase	hr mn	sec	res
SOP	73.7	303	iPgC	21:42:41.90		0.55
PKSG	76.8	84	ePg	21:42:40.90		-1.00
			eSg	42:51.80		-0.96
ZST	99.3	348	eP*	21:42:46.30		0.72
			eS*	42:58.80		-0.50
PKS8	110.2	117	iPnC	21:42:46.70		-0.34
			eSn	43:00.40		-1.52
RHK5	134.2	72	iPnC	21:42:50.60		0.56
			eSn	43:07.70		0.46
ARSA	140.6	267	iPnC	21:42:50.50		-0.34
			iSn	43:07.90		-0.77
RHK1	146.5	159	iPnC	21:42:53.20		1.63
			eSn	43:09.80		-0.16
VYHS	169.8	40	ePn	21:42:54.10		-0.37
			eSn	43:17.40		2.26
MOA	241.4	284	iPnC	21:43:02.10		-1.30
			iSn	43:31.00		-0.03

61.

2004-06-22 time: 0:34:28.65 UTC ML= 1.9
lat: 47.314N lon: 17.330E h= 10.0 km
erh= 5.2km erz= 5.0km
nr= 17 gap=110 rms=1.08
Locality: Mihályháza
Comments:

sta	dist	azm	phase	hr mn	sec	res
SOP	71.1	305	ePgC	0:34:42.00		0.52
			eSg	34:50.60		-0.88
PKSG	80.6	84	ePgD	0:34:42.50		-0.66
			eSg	34:52.80		-1.68
ZST	99.5	350	ePg	0:34:46.60		0.09
			eSg	34:58.80		-1.64
PKS8	113.2	115	iPnD	0:34:48.00		-0.52
			eSn	35:01.70		-2.31
BUD	129.3	82	iPnC	0:34:52.00		1.47
ARSA	136.8	267	iPnC	0:34:51.40		-0.07
			iSn	35:08.20		-1.07
RHK1	147.0	157	iPnD	0:34:54.30		1.56
			eSn	35:11.30		-0.22
PKSM	158.3	141	ePn	0:34:53.30		-0.85
			eSn	35:10.10		-3.94
VYHS	172.9	41	ePn	0:34:57.20		1.23
PSZ	204.2	71	Pn	0:35:01.20		1.33
MOA	238.0	284	iPnC	0:35:09.00		4.91
KHC	344.2	306	ePn	0:35:18.00		0.67

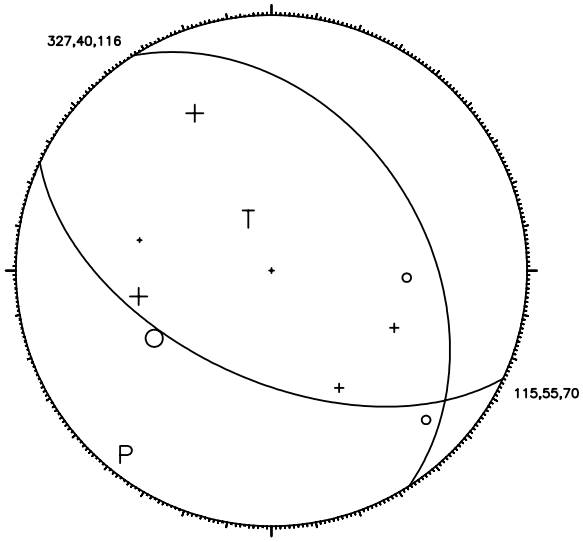


62.

2004-06-25 time: 2:34:04.48 UTC ML= 2.1
lat: 47.439N lon: 16.930E h= 11.8 km
erh= 1.8km erz= 2.3km
nr= 29 gap= 62 rms=0.69
Locality: Csér
Comments:

sta	dist	azm	phase	hr mn	sec	res
SOP	39.0	314	ePgD	2:34:12.10		0.35
			eSg	34:17.00		-0.42
ZST	85.2	9	ePg	2:34:19.70		-0.14
			eSg	34:30.70		-1.11
VKA	102.6	334	iP*C	2:34:23.30		0.57
			iS*	34:37.10		0.13
ARSA	108.3	259	iPnC	2:34:22.70		-0.82
			iSn	34:35.40		-2.96
PKSG	110.4	93	ePnD	2:34:23.90		0.13
			eSn	34:38.40		-0.42
SRO	112.0	68	ePn	2:34:24.30		0.32
			eSn	34:38.40		-0.78
PKS8	146.4	115	ePnC	2:34:28.60		0.34
			eSn	34:45.10		-1.71
PERS	164.2	237	iPn	2:34:30.67		0.19
RHK1	173.1	150	ePnC	2:34:32.50		0.91
			eSn	34:54.20		1.47
DOBS	181.6	218	iPn	2:34:32.72		0.06
VYHS	184.5	51	ePn	2:34:32.90		-0.11
GOLS	187.5	212	iPn	2:34:32.97		-0.42
MOA	205.3	283	iPnC	2:34:38.50		2.89
LEGS	206.5	217	iPn	2:34:35.40		-0.36
OBKA	208.6	240	iPnD	2:34:36.50		0.48
			iSn	35:02.00		1.38
PDKS	211.3	224	iPn	2:34:36.59		0.24
CRES	211.8	212	iPn	2:34:36.01		-0.41
PSZ	228.9	77	ePn	2:34:40.40		1.85
LJU	240.4	230	iPn	2:34:40.27		0.29
CEY	269.3	225	iPn	2:34:43.76		0.17
KHC	311.9	307	ePn	2:34:53.70		4.80

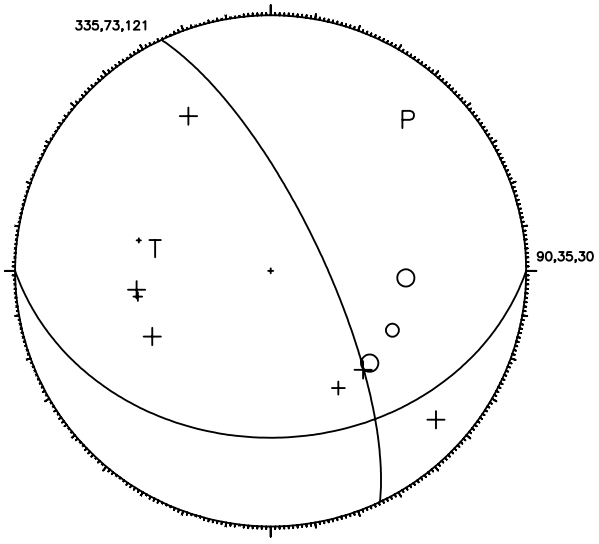
Hypocenter Parameters **Földrengés paraméterek**



63.

2004-06-25 time: 18:12:45.09 UTC ML= 2.6
lat: 47.439N lon: 16.959E h= 10.0 km
erh= 1.6km erz= 2.0km
nr= 39 gap= 62 rms=0.73
Locality: Répceszemere
Comments:

sta	dist	azm	phase	hr mn sec	res
SOP	40.6	312	iPgC	18:12:52.90	0.34
			eSg	12:57.50	-0.88
ZST	84.8	7	ePg	18:13:00.20	-0.15
			eSg	13:12.20	-0.05
VKA	103.6	332	iP*C	18:13:04.00	0.34
			iS*	13:18.20	0.05
PKSG	108.2	93	iPnD	18:13:04.60	0.27
			eSn	13:19.10	-0.24
SRO	110.0	68	ePn	18:13:04.90	0.34
			eSn	13:19.30	-0.44
ARSA	110.5	259	iPnC	18:13:03.50	-1.13
PKS9	138.0	133	iPnD	18:13:08.40	0.34
			eSn	13:28.60	2.63
PKS8	144.4	116	ePnD	18:13:09.00	0.15
			eSn	13:25.60	-1.78
GROS	155.4	226	iPn	18:13:09.50	-0.72
PERS	166.1	237	iPn	18:13:11.20	-0.36
RHK1	171.9	150	ePnC	18:13:12.70	0.41
			eSn	13:35.00	1.50
VYHS	182.8	50	iPn	18:13:13.40	-0.24
DOBS	183.0	218	iPn	18:13:16.58	2.91
PKSM	187.3	137	iPnC	18:13:13.60	-0.61
			eSn	13:38.40	1.48
GOLS	188.7	213	iPn	18:13:14.20	-0.18
MOA	207.4	283	iPnC	18:13:19.20	2.49
			iSn	13:43.90	2.52
LEGS	207.9	217	iPn	18:13:16.07	-0.70
OBKA	210.6	241	iPnC	18:13:17.40	0.30
			iSn	13:41.60	-0.47
CRES	213.1	213	iPn	18:13:16.77	-0.65
PSZ	226.8	76	ePn	18:13:19.24	0.12
MORC	263.5	9	ePn	18:13:23.55	-0.15
			Sn	13:52.33	-1.49
CEY	270.9	226	iPn	18:13:24.80	0.17
KBA	276.5	262	iPnC	18:13:26.00	0.67
			iSn	13:55.40	-1.31
OKC	280.7	18	ePn	18:13:26.60	0.75
VOY	281.8	236	ePn	18:13:24.70	-1.28
			eSn	14:04.00	6.13
GEC2	288.5	303	ePn	18:13:28.30	1.48
KHC	313.6	307	ePn	18:13:31.20	1.25
			eSn	14:01.50	-3.44
DPC	327.1	352	ePn	18:13:32.60	0.97
PRU	334.7	328	Pn	18:13:39.60	7.02
			eSn	14:19.80	10.18
WET	357.3	302	ePn	18:13:38.00	2.60
CRVS	372.3	64	ePn	18:13:37.60	0.33

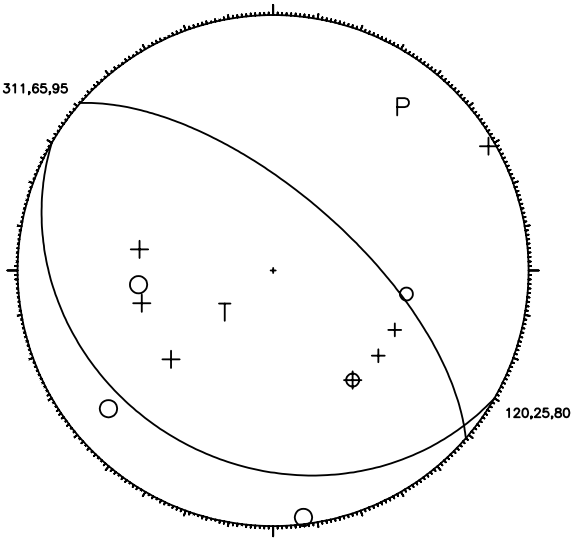


64.

2004-06-28 time: 9:39:09.74 UTC ML= 2.7
lat: 47.615N lon: 16.437E h= 3.6 km
erh= 2.3km erz= 2.4km
nr= 24 gap= 55 rms=0.58
Locality: Austria
Comments: felt 4 EMS

sta	dist	azm	phase	hr mn sec	res
SOP	11.8	50	ePgD	9:39:12.60	0.65
			eSg	39:14.20	0.53
VKA	72.8	353	iPgD	9:39:22.70	-0.05
			iSg	39:31.90	-1.00
ARSA	80.0	240	iPgC	9:39:23.60	-0.44
			iSg	39:33.40	-1.79
ZST	81.5	38	iPg	9:39:23.60	-0.71
			eSg	39:33.70	-1.98
SRO	142.5	81	ePn	9:39:35.20	1.12
			eSn	39:50.60	-2.47
GROS	146.7	209	iPn	9:39:34.12	-0.49
PERS	148.0	223	iPn	9:39:35.10	0.34
PKSG	149.3	100	ePnD	9:39:34.60	-0.33
			eSn	39:52.50	-2.08
MOA	164.9	279	iPnC	9:39:37.50	0.62
			iSn	39:58.90	0.85
PKS9	180.6	129	ePnC	9:39:39.10	0.26
PKS8	188.3	116	ePnC	9:39:39.50	-0.29
			eSn	40:00.50	-2.74
GOLS	188.8	199	iPn	9:39:40.44	0.58
OBKA	188.9	229	iPnC	9:39:39.20	-0.67
			iSn	40:05.40	2.02
VYHS	203.8	61	ePn	9:39:40.10	-1.63
RHK1	210.1	144	ePnD	9:39:42.10	-0.41
			eSn	40:07.90	-0.16
CRES	212.6	201	iPn	9:39:43.14	0.32
PKSM	229.2	133	ePn	9:39:44.30	-0.60
			eSn	40:08.60	-3.72
RHK3	236.8	144	iPnC	9:39:46.00	0.15
KBA	241.2	256	iPnC	9:39:47.60	1.21
			iSn	40:12.90	-2.07
MORC	253.8	19	ePn	9:39:48.57	0.61
PSZ	261.4	83	ePn	9:39:47.50	-1.40
			eSn	40:16.50	-2.95
KHC	270.7	309	ePn	9:39:51.00	0.94
			eSn	40:27.20	5.68

OKC	277.3	27	ePn	9:39:51.10	0.21
PRU	298.4	332	Pn	9:39:55.00	1.48
			eSn	40:25.30	-2.36
DPC	304.3	358	eSn	9:40:36.00	7.03
WTTA	364.2	264	iPnD	9:40:00.50	-1.23
			iSn	40:39.30	-2.98
BRG	405.3	333	ePn	9:40:06.40	-0.45
NKC	412.6	315	ePn	9:40:12.10	4.34
			eSn	41:07.40	14.39
CLL	480.2	329	ePn	9:40:33.00	16.81
			iSn	41:25.30	17.27
MOX	487.2	314	ePn	9:40:32.50	15.43
			eSn	41:28.50	18.92



65.

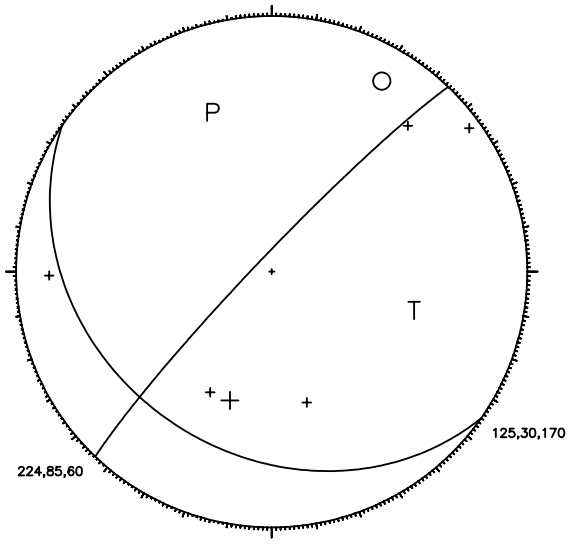
2004-06-28 time: 11:50:23.12 UTC ML= 2.2
lat: 47.624N lon: 16.375E h= 5.0 km
erh=25.8km
Locality: Austria

Comments:
Reported by NEIC

66.

2004-06-29 time: 0:35:47.77 UTC ML= 1.3
lat: 47.915N lon: 19.453E h= 8.1 km
erh= 4.1km erz= 2.0km
nr= 16 gap=216 rms=0.68
Locality: Szanda
Comments:

sta	dist	azm	phase	hr mn	sec	res
PENC	18.9	223	ePgC	0:35:51.50		0.06
			eSg	35:54.80		0.50
RHK6	30.9	210	iPgD	0:35:53.50		0.03
			eSg	35:57.90		-0.01
PSZ	33.0	89	ePgC	0:35:53.20		-0.64
			eSg	35:57.50		-1.07
PKSG	98.8	234	ePgC	0:36:05.60		0.14
			eSg	36:18.00		-1.27
PKS7	99.0	193	ePg	0:36:05.90		0.40
			eSg	36:19.10		-0.24
PKSN	117.4	165	ePnC	0:36:09.70		1.29
			eSn	36:24.50		-0.02
PKS8	129.3	207	ePnC	0:36:09.50		-0.39
			eSn	36:25.60		-1.55
PKSM	199.2	198	iPnC	0:36:19.60		1.00
			eSn	36:40.60		-2.05



67.

2004-07-02 time: 9:57:01.73 UTC ML= 0.7
lat: 45.849N lon: 18.422E h= 1.3 km
erh= 1.8km erz=15.2km
nr= 6 gap=265 rms=0.17
Locality: Nagyharsány
Comments:

sta	dist	azm	phase	hr mn	sec	res
RHK3	13.9	288	ePg	9:57:04.00		-0.22
			eSg	57:06.00		-0.17
RHK1	38.5	315	iPgC	9:57:08.80		0.19
			eSg	57:13.70		-0.27
PKSM	43.7	23	iPgC	9:57:09.60		0.06
			eSg	57:15.50		-0.14

68.

2004-07-07 time: 8:33:02.51 UTC ML= 1.3
lat: 47.398N lon: 18.422E h= 0.0 km
erh= 5.7km erz=11.5km
nr= 6 gap=268 rms=0.26
Locality: Gánt
Comments: explosion

sta	dist	azm	phase	hr mn	sec	res
PKSG	2.5	254	iPgC	8:33:02.70		-0.31
			eSg	33:03.80		0.41
PKS8	60.9	162	iPgC	8:33:13.50		0.12
			eSg	33:21.10		-0.76
PKS9	90.8	187	iPgC	8:33:18.90		0.17
			eSg	33:31.40		0.02

69.

2004-07-09 time: 8:33:12.71 UTC ML= 1.8
lat: 46.237N lon: 16.544E h= 21.2 km
erh= 6.7km erz= 6.1km
nr= 8 gap=166 rms=0.48
Locality: Croatia
Comments:

sta	dist	azm	phase	hr mn	sec	res
GOLS	75.4	251	iPg	8:33:26.80		0.73
DOBS	83.6	263	iPg	8:33:26.50		-0.81
GROS	84.0	287	iPg	8:33:27.70		0.32
CRES	95.8	242	iPn	8:33:29.30		0.28
LEGS	100.1	251	iPn	8:33:29.20		-0.37
PERS	118.3	292	iPn	8:33:31.80		-0.04
RHK1	119.0	98	ePn	8:33:31.50		-0.43
			eSn	33:47.10		0.18

70.

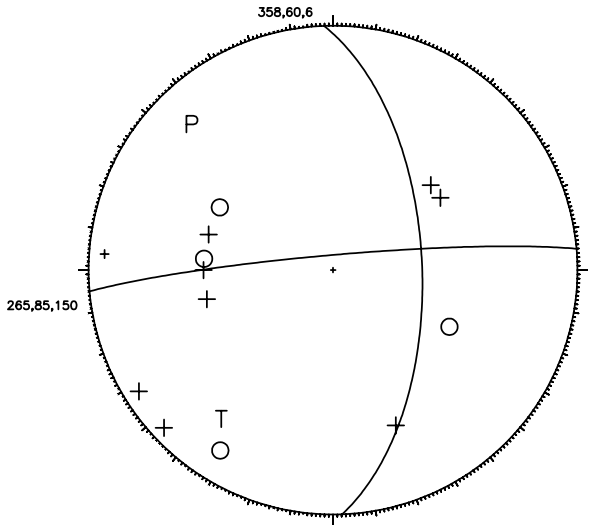
2004-07-15 time: 3:16:23.12 UTC ML= 1.0
lat: 45.720N lon: 18.154E h= 0.8 km
erh= 6.1km erz=83.0km
nr= 6 gap=329 rms=0.45
Locality: Croatia
Comments:

sta	dist	azm	phase	hr mn	sec	res
RHK3	20.2	22	ePgC	3:16:26.70		-0.03
			eSg	16:28.00		-1.55
RHK1	42.2	351	iPgC	3:16:30.30		-0.35
			eSg	16:36.50		-0.02
PKS9	96.9	6	ePgC	3:16:40.90		0.49
			eSg	16:54.60		0.69

71.

2004-07-20 time: 22:13:25.90 UTC ML= 2.5
lat: 47.091N lon: 18.115E h= 10.0 km
erh= 1.3km erz= 1.4km
nr= 39 gap= 54 rms=0.56
Locality: Berhida
Comments: felt 4-5 EMS

sta	dist	azm	phase	hr mn	sec	res
PKSG	39.4	32	iPgD	22:13:33.00		-0.15
			eSg	13:38.30		-0.51
PKS7	79.6	94	ePgC	22:13:40.70		0.48
			eSg	13:51.60		0.20
BUD	81.4	58	iPgC	22:13:40.10		-0.44
			eSg	13:51.60		-0.37
SRO	81.6	11	ePg	22:13:41.10		0.52
			eSg	13:51.90		-0.14
RHK5	98.9	47	iPgC	22:13:43.20		-0.44
			eSg	13:57.10		-0.38
PKSM	105.8	158	iP*C	22:13:44.90		0.10
			eS*	13:57.70		-1.84
RHK1	110.8	182	ePn	22:13:46.10		0.63
			eSn	13:59.80		-0.94
PENC	117.4	49	iPnC	22:13:45.80		-0.49
			eSn	14:02.00		-0.20
PKS6	123.4	116	iPnD	22:13:47.30		0.27
			eSn	14:03.60		0.08
RHK3	134.1	175	ePn	22:13:48.90		0.52
			eSn	14:04.20		-1.71
SOP	134.7	299	iPnD	22:13:49.30		0.85
			eSn	14:03.50		-2.53
PKSN	135.1	99	ePn	22:13:50.60		2.11
			eSn	14:07.60		1.49
ZST	144.5	328	iPn	22:13:49.90		0.24
			eSn	14:06.90		-1.30
PSZ	162.6	56	iPnC	22:13:52.60		0.68
			eSn	14:12.30		0.08
VYHS	165.0	19	ePn	22:13:52.60		0.37
			eSn	14:12.40		-0.37
ARSA	197.3	275	iPnD	22:13:56.20		-0.05
			iSn	14:19.10		-0.83
GROS	211.5	251	iPn	22:13:58.10		0.07
GOLS	225.6	238	ePn	22:13:59.60		-0.19
DOBS	228.1	243	ePn	22:13:59.70		-0.39
CRES	248.0	235	ePn	22:14:02.20		-0.37
LEGS	249.4	239	iPn	22:14:02.30		-0.45
OBKA	279.8	257	iPnC	22:14:07.10		0.56
			iSn	14:38.50		0.25
MOA	302.1	286	iPnC	22:14:09.30		-0.03
			iSn	14:42.80		-0.40
KBA	362.2	270	iPnC	22:14:16.50		-0.32
			iSn	14:56.40		-0.14
DPC	385.6	340	ePn	22:14:20.50		0.76
			eSn	15:00.90		-0.83
KHC	406.9	304	ePn	22:14:22.90		0.51
			eSn	15:05.40		-1.05



72.

2004-07-24 time: 4:30:42.29 UTC ML= 1.6
lat: 46.288N lon: 16.567E h= 10.0 km
erh= 6.8km erz= 4.7km
nr= 12 gap=139 rms=0.89
Locality: Croatia
Comments:

sta	dist	azm	phase	hr mn	sec	res
GOLS	79.1	247	iPg	4:30:56.00		-0.53
GROS	84.2	283	iPg	4:30:58.70		1.27
DOBS	86.1	260	iPg	4:30:57.40		-0.37
CRES	100.1	239	ePg	4:30:59.40		-0.86
LEGS	103.7	249	iP*	4:31:00.00		-0.87
PERS	117.9	289	iPn	4:31:03.70		0.95
RHK1	118.2	100	ePnC	4:31:03.90		1.12
			eSn	31:18.30		-0.46
ARSA	133.4	323	iPnD	4:31:04.00		-0.68
			iSn	31:20.70		-1.44
OBKA	157.2	279	iPnC	4:31:08.20		0.56
			iSn	31:28.40		0.99

73.

2004-07-25 time: 8:11:12.95 UTC ML= 1.9
lat: 46.282N lon: 16.482E h= 7.0 km
erh= 4.0km erz= 3.4km
nr= 8 gap=136 rms=0.35
Locality: Croatia
Comments:

sta	dist	azm	phase	hr mn	sec	res
DOBS	79.5	259	iPg	8:11:27.10		-0.10
GCIS	82.0	235	iPg	8:11:27.10		-0.54
CRES	94.1	237	iPg	8:11:30.10		0.29
PERS	112.0	291	iPg	8:11:33.10		0.11
PDKS	116.8	259	iPn	8:11:34.10		0.45
RHK1	124.5	100	ePn	8:11:34.40		-0.22
			eSn	11:47.90		-3.62
ARSA	130.2	326	iPnC	8:11:35.60		0.27
			iSn	11:52.30		-0.48

74.

2004-07-26 time: 7:41:58.95 UTC ML= 1.3
lat: 47.471N lon: 18.451E h= 0.0 km
erh= 1.2km erz= 6.4km
nr= 5 gap=318 rms=0.31
Locality: Várgesztes
Comments: explosion

```
sta   dist azm  phase  hr mn  sec     res
PKSG   9.9 207   ePgC   7:42:00.40   -0.32
                 eSg      42:01.70   -0.40
PKS8  68.0 165   ePgC   7:42:10.90   -0.20
                 eSg      42:20.60    0.03
PKS9  99.1 188   iPgC   7:42:17.00    0.35
```

75.

```
 2004-07-28  time: 10:49:18.67 UTC  ML=
   lat: 47.511N  lon: 16.400E  h=  1.7 km
                 erh= 3.6km    erz= 1.8km
   nr=  8        gap=187       rms=0.28
   Locality: Austria
   Comments:

sta   dist azm  phase  hr mn  sec     res
SOP   22.6  32   iPgC  10:49:22.60   -0.11
ARSA  72.3 246   iPgC  10:49:31.60    0.03
                 iSg      49:41.60   -0.04
ZST   92.6  35   eSg   10:49:48.10    0.00
MOA  164.6 283   iPnC  10:49:46.80    0.80
                 iSn      50:07.00   -0.32
VYHS 212.1  59   ePn   10:49:51.60   -0.33
                 eSn      50:17.90    0.02
```

76.

```
 2004-08-03  time: 12:06:36.62 UTC  ML=
   lat: 48.418N  lon: 19.088E  h= 10.0 km
                 erh=27.6km    erz=10.3km
   nr=  5        gap=198       rms=0.51
   Locality: Slovak Republic
   Comments:

sta   dist azm  phase  hr mn  sec     res
VYHS  20.4 294   ePg   12:06:40.60   -0.08
                 eSg      06:43.80   -0.05
PSZ   81.8 133   ePgC  12:06:51.90    0.57
                 eSg      07:01.40   -1.41
ZST  149.3 260   eSn   12:07:20.00   -0.01
```

77.

```
 2004-08-07  time: 18:37:22.76 UTC  ML= 1.3
   lat: 47.602N  lon: 18.400E  h=  0.3 km
                 erh= 5.2km    erz= 288km
   nr= 10        gap=193       rms=0.94
   Locality: Vértesszőlős
   Comments:

sta   dist azm  phase  hr mn  sec     res
PKSG  23.4 182   iPgC  18:37:26.10   -0.84
                 eSg      37:29.20   -1.00
PKS8  83.1 165   iPgC  18:37:38.70    1.10
                 eSg      37:46.60   -2.58
VYHS 104.4  18   ePg   18:37:42.50    1.10
                 eSg      37:54.40   -1.53
PKS9 113.2 185   iPgC  18:37:43.30    0.31
                 eSg      37:58.60   -0.16
PSZ  117.4  73   ePg   18:37:43.90    0.17
                 eSg      37:59.30   -0.78
```

78.

```
 2004-08-10  time:  8:44:57.76 UTC  ML= 1.3
   lat: 45.779N  lon: 18.037E  h= 10.0 km
                 erh= ---km    erz= ---km
   nr=  4        gap=311       rms=0.66
   Locality: Cún
   Comments:

sta   dist azm  phase  hr mn  sec     res
RHK3  20.7  54   iPgC   8:45:02.00    0.14
RHK1  35.2   4   iPgC   8:45:03.80   -0.50
                 eSg      45:06.40   -3.00
PKS9  91.7  12   ePgC   8:45:15.00    0.76
```

79.

```
 2004-08-10  time: 12:15:00.04 UTC  ML= 0.8
   lat: 45.965N  lon: 18.236E  h=  7.5 km
                 erh= 6.0km    erz=13.3km
   nr=  5        gap=147       rms=0.20
   Locality: Szalánta
   Comments:

sta   dist azm  phase  hr mn  sec     res
RHK3   8.7 171   iPgC  12:15:02.10    0.01
RHK1  19.2 319   iPgC  12:15:03.70   -0.02
                 eSg      15:06.40   -0.18
PKS2  95.5  52   ePg   12:15:16.90   -0.24
PKS8 107.0  18   ePg   12:15:19.70    0.50
```

80.

```
 2004-08-10  time: 13:15:00.01 UTC  ML= 0.5
   lat: 45.895N  lon: 18.096E  h=  2.2 km
                 erh= 9.4km    erz=29.1km
   nr=  6        gap=262       rms=0.76
   Locality: Hegyszentmárton
   Comments:

sta   dist azm  phase  hr mn  sec     res
RHK3  12.2  93   iPgC  13:15:02.20   -0.02
                 eSg      15:04.10    0.16
RHK1  22.3 355   iPgC  13:15:03.50   -0.51
                 eSg      15:06.00   -1.14
PKS9  78.2  10   ePgD  13:15:14.90    0.92
                 eSg      15:32.90    8.01
```

81.

```
 2004-08-10  time: 15:15:00.07 UTC  ML= 0.4
   lat: 45.928N  lon: 18.066E  h=  0.3 km
                 erh= ---km    erz= ---km
   nr=  4        gap=255       rms=0.60
   Locality: Tengeri
   Comments:

sta   dist azm  phase  hr mn  sec     res
RHK3  15.0 107   iPgC  15:15:02.30   -0.45
RHK1  18.6   1   iPgC  15:15:03.30   -0.09
                 eSg      15:04.80   -1.18
PKS9  75.1  13   iPgC  15:15:14.30    0.82
```

82.

```
 2004-08-10  time: 15:59:59.46 UTC  ML= 0.0
   lat: 45.912N  lon: 18.086E  h= 10.0 km
                 erh= 6.0km    erz= 5.4km
   nr=  6        gap=168       rms=0.81
   Locality: Tengeri
   Comments:

sta   dist azm  phase  hr mn  sec     res
RHK3  13.2 102   ePgC  16:00:02.50    0.09
                 eSg      00:04.70   -0.01
RHK1  20.3 357   iPgC  16:00:03.10   -0.40
                 eSg      00:04.70   -1.96
PKS9  76.5  11   ePgC  16:00:14.70    1.47
JAVS 234.5 269   iPn   16:00:34.60    0.15
```

83.

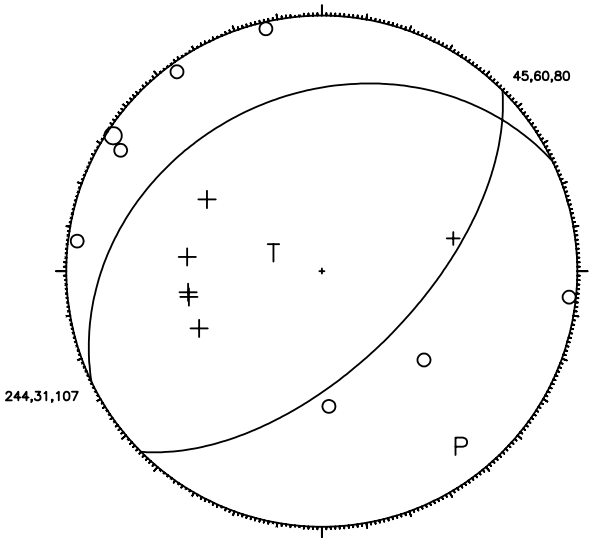
```
 2004-08-13  time: 18:24:13.70 UTC  ML= 1.0
   lat: 47.207N  lon: 18.215E  h= 10.0 km
                 erh= 7.3km    erz= 5.7km
   nr=  8        gap=208       rms=0.67
   Locality: Csór
   Comments:
```

sta	dist	azm	phase	hr mn sec	res
PKSG	24.5	33	ePg	18:24:17.90	-0.52
			eSg	24:22.70	0.60
PKS8	50.6	136	ePgD	18:24:22.90	-0.01
			eSg	24:30.10	0.01
PKS9	69.1	176	ePg	18:24:25.80	-0.36
			eSg	24:38.50	2.61
RHK1	124.1	185	ePnD	18:24:35.50	0.57
			eSn	24:50.00	-1.49

84.

2004-08-17 time: 18:00:34.91 UTC ML= 3.4
lat: 47.578N lon: 17.942E h= 6.1 km
erh= 1.5km erz= 1.6km
nr= 47 gap= 69 rms=0.94
Locality: Kisbér
Comments: felt 4-5 EMS

sta	dist	azm	phase	hr mn sec	res
SRO	38.3	47	ePg	18:00:43.00	1.17
			eSg	00:48.30	1.07
PKSG	39.7	121	ePgD	18:00:42.10	0.02
			eSg	00:47.70	0.03
BUD	82.2	97	ePgD	18:00:49.70	0.08
			eSg	01:00.20	-0.90
ZST	93.1	318	ePg	18:00:51.70	0.13
			eSg	01:03.80	-0.76
PKS8	95.6	144	ePgD	18:00:51.50	-0.52
			eSg	01:04.40	-0.96
RHK6	98.8	84	ePg	18:00:50.60	-2.00
			eSg	01:05.40	-0.99
PENC	103.4	77	ePg	18:00:53.40	0.00
			eSg	01:08.10	0.28
SOP	104.6	276	ePgD	18:00:53.70	0.07
			eSg	01:06.80	-1.42
PKS7	109.4	123	iPgD	18:00:55.10	0.61
			eSg	01:09.40	-0.35
SMOL	110.9	340	ePg	18:00:55.00	0.26
			eSg	01:08.70	-1.51
PKS9	113.1	167	ePgD	18:00:55.20	0.06
			eSg	01:09.90	-1.01
KOLL	116.5	17	ePn	18:00:55.50	-0.18
			eSn	01:09.60	-2.28
VYHS	121.8	33	ePn	18:00:56.00	-0.34
			eSn	01:11.40	-1.66
VKA	143.4	302	iPnC	18:00:59.20	0.16
			iSn	01:18.10	0.24
PSZ	151.3	76	ePnC	18:01:00.50	0.48
			eSn	01:18.90	-0.71
PKSN	164.3	117	ePn	18:01:03.80	2.16
			eSn	01:24.70	2.20
PKS6	164.3	131	ePnD	18:01:01.70	0.05
RHK1	165.2	177	ePnD	18:01:03.30	1.55
			eSn	01:22.90	0.21
LIKS	185.1	28	ePn	18:01:08.80	4.56
			eSn	01:30.00	2.89
ARSA	186.1	259	iPnC	18:01:04.80	0.43
			iSn	01:26.70	-0.64
RHK3	189.3	173	ePn	18:01:04.50	-0.26
			eSn	01:26.80	-1.25
KECS	214.8	62	ePn	18:01:07.50	-0.44
MORC	246.3	353	ePn	18:01:13.07	1.20
OKC	251.7	3	ePn	18:01:12.90	0.35
			eSn	01:40.30	-1.61
MOA	277.5	276	iPnC	18:01:20.40	4.64
			iSn	01:54.70	7.08
OBKA	283.9	245	iPnC	18:01:18.20	1.64
			iSn	01:54.70	5.66
DPC	330.3	339	ePn	18:01:23.80	1.45
			eSn	01:57.40	-1.95
GEC2	345.2	294	ePn	18:01:24.70	0.50
			eSn	02:01.40	-1.25
KBA	351.9	261	iPnC	18:01:25.10	0.06
			iSn	02:03.10	-1.04
PRU	366.5	317	ePn	18:01:27.10	0.25
			eSn	02:05.20	-2.17
KHC	366.6	298	ePn	18:01:27.50	0.63
			eSn	02:05.30	-2.11
PTCC	372.6	250	ePn	18:01:29.80	2.18
FVI	406.8	254	ePn	18:01:34.63	2.74
WET	413.7	295	ePn	18:01:34.20	1.46
KWP	419.2	57	ePn	18:01:35.30	1.88
BRG	468.1	322	Pn	18:01:45.50	5.98
CLL	548.1	319	ePn	18:01:51.00	1.50
			eSn	03:16.00	28.32



85.

2004-08-17 time: 22:51:48.15 UTC ML= 1.0
lat: 47.633N lon: 18.100E h= 2.8 km
erh=22.5km erz= 152km
nr= 6 gap=327 rms=0.91
Locality: Nagyigmánd
Comments:

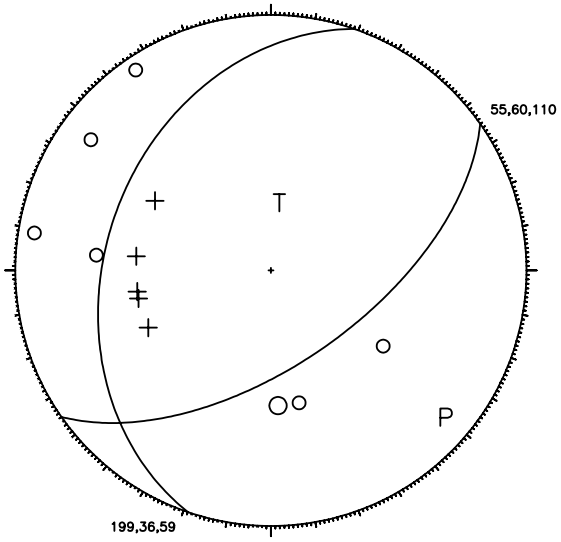
sta	dist	azm	phase	hr mn sec	res
PKSG	34.7	141	ePgD	22:51:54.40	0.04
			eSg	51:59.80	0.59
PKS8	94.6	153	ePgD	22:52:05.10	0.05
			eSg	52:17.00	-1.23
PKS9	117.1	173	ePg	22:52:08.70	-0.37
			eSg	52:29.50	4.11

86.

2004-08-18 time: 9:01:23.21 UTC ML= 3.2
lat: 47.596N lon: 17.974E h= 10.0 km
erh= 1.9km erz= 1.8km
nr= 38 gap= 68 rms=0.92
Locality: Kerékteleki
Comments: felt 5 EMS

sta	dist	azm	phase	hr mn sec	res
SRO	35.1	47	iPg	9:01:30.90	1.17
			eSg	01:36.20	1.39
PKSG	38.8	126	ePgD	9:01:29.80	-0.56
			eSg	01:35.50	-0.44
BUD	80.1	99	ePgD	9:01:37.60	-0.02
			eSg	01:48.10	-0.75
ZST	93.2	316	iPg	9:01:39.50	-0.45
			eSg	01:51.30	-1.71
PKS8	95.9	146	ePgD	9:01:39.20	-1.23
			eSg	01:52.00	-1.86
PENC	100.5	78	ePg	9:01:41.40	0.15
			eSg	01:55.70	0.37
SOP	106.8	275	eP*D	9:01:41.60	-0.67
			eS*	01:53.60	-3.53

PKS7	108.5	124	ePnD	9:01:42.90	0.40
			eSn	01:57.20	-0.35
SMOL	109.8	338	ePn	9:01:42.70	0.04
			eSn	01:56.60	-1.23
KOLL	113.8	16	ePn	9:01:43.20	0.04
			eSn	01:57.60	-1.11
PKS9	114.6	168	ePnD	9:01:43.10	-0.15
			eSn	01:57.50	-1.39
VYHS	118.7	33	iPn	9:01:43.70	-0.07
			eSn	01:59.10	-0.71
VKA	144.3	301	iPnC	9:01:48.00	1.04
			iSn	02:06.00	0.51
RHK1	167.1	177	iPnD	9:01:51.50	1.70
			eSn	02:10.60	0.06
ARSA	188.9	258	iPnC	9:01:52.30	-0.21
			iSn	02:16.40	1.03
RHK3	191.0	174	ePn	9:01:53.10	0.31
			eSn	02:16.00	0.14
KECS	211.7	62	ePn	9:01:57.80	2.44
MORC	244.5	353	ePn	9:02:00.91	1.45
OKC	249.6	3	ePn	9:01:58.00	-2.08
			eSn	02:28.10	-0.74
MOA	279.6	276	iPnC	9:02:06.80	2.97
			iSn	02:42.50	6.99
OBKA	286.9	245	iPnC	9:02:04.80	0.06
			iSn	02:42.70	5.56
DPC	329.3	338	ePn	9:02:11.60	1.58
			eSn	02:40.80	-5.73
GEC2	346.5	294	ePn	9:02:12.70	0.53
KBA	354.6	261	iPnC	9:02:13.70	0.52
			iSn	02:50.90	-1.25
PRU	366.5	317	ePn	9:02:22.50	7.83
			eSn	02:52.10	-2.71
KHC	367.7	298	ePn	9:02:15.50	0.68
			eSn	02:53.30	-1.77



87.

2004-09-02 time: 16:40:32.37 UTC ML= 2.4
lat: 45.600N lon: 20.209E h= 10.0 km
erh= 9.0km erz= 8.2km
nr= 10 gap=294 rms=0.32
Locality: Serbia
Comments:

sta	dist	azm	phase	hr mn	sec	res
PKS6	121.8	336	ePnD	16:40:53.40		0.10
			eSn	41:09.80		0.17
PKSM	139.4	299	ePnC	16:40:55.50		0.00
			eSn	41:13.50		-0.04
RHK1	174.9	288	iPnD	16:40:59.90		-0.03
			eSn	41:20.80		-0.63
PKS8	184.8	320	ePnC	16:41:01.30		0.13
PKS9	185.2	306	ePn	16:41:01.70		0.48
PKSG	243.2	325	ePnD	16:41:08.70		0.25
PSZ	258.8	355	iPnC	16:41:09.50		-0.89
			eSn	41:37.00		-3.05
ZST	373.3	321	ePn	16:41:20.10		-4.56

88.

2004-09-02 time: 18:51:47.43 UTC ML= 1.6
lat: 45.795N lon: 20.436E h= 10.0 km
erh=72.6km erz=66.9km
nr= 8 gap=324 rms=0.45
Locality: Serbia
Comments:

sta	dist	azm	phase	hr mn	sec	res
PKS6	111.9	323	iPnD	18:52:07.20		0.06
			eSn	52:23.00		0.48
PKSM	146.5	288	ePnC	18:52:12.00		0.54
			eSn	52:30.00		-0.20
PKS7	170.3	325	ePnD	18:52:14.50		0.09
PKS8	181.3	312	ePnD	18:52:15.20		-0.59
PKS9	188.4	298	ePn	18:52:15.30		-1.37
PKSG	236.8	319	ePnC	18:52:22.60		-0.11

89.

2004-09-03 time: 8:45:24.90 UTC ML= 1.2
lat: 47.456N lon: 18.370E h= 0.0 km
erh= ---km erz= ---km
nr= 3 gap=352 rms=0.01
Locality: Oroszlány
Comments: explosion

sta	dist	azm	phase	hr mn	sec	res
PKSG	7.3	168	ePgC	8:45:26.20		0.00
			eSg	45:27.20		-0.02
PKS8	68.2	160	eSg	8:45:46.60		0.01

90.

2004-09-03 time: 8:46:14.11 UTC ML= 1.4
lat: 47.475N lon: 18.249E h= 0.0 km
erh= ---km erz= ---km
nr= 4 gap=337 rms=0.79
Locality: Bokod
Comments: explosion

sta	dist	azm	phase	hr mn	sec	res
PKSG	14.1	131	ePgC	8:46:16.30		-0.32
			eSg	46:17.00		-1.59
PKS8	73.8	154	ePg	8:46:28.20		0.92
			eSg	46:38.40		0.85

91.

2004-09-07 time: 9:17:39.28 UTC ML= 1.3
lat: 47.441N lon: 18.358E h= 0.0 km
erh= ---km erz= ---km
nr= 4 gap=332 rms=0.62
Locality: Oroszlány
Comments: explosion

sta	dist	azm	phase	hr mn	sec	res
PKSG	6.0	156	ePg	9:17:39.60		-0.74
			eSg	17:40.50		-0.67
PKS9	95.1	184	Pg	9:17:56.80		0.54
			eSg	18:10.00		0.49

92.

2004-09-07 time: 16:06:39.54 UTC ML= 1.6
lat: 48.158N lon: 19.333E h= 10.0 km
erh= 2.2km erz= 1.8km
nr= 11 gap=167 rms=0.40
Locality: Slovak Republic
Comments:

sta	dist	azm	phase	hr mn	sec	res
PENC	41.1	185	iPgC	16:06:47.20		0.11
			eSg	06:52.80		-0.18
PSZ	49.6	123	iPgC	16:06:48.60		0.02
			eSg	06:55.10		-0.53
VYHS	52.5	315	iPg	16:06:49.30		0.22
			eSg	06:54.80		-1.73
PKSG	110.7	220	ePnD	16:06:58.40		-0.70
			eSn	07:14.10		-0.25
PKS8	150.6	199	ePn	16:07:04.90		0.82
			eSn	07:23.70		0.49
ZST	166.0	271	eSn	16:07:26.80		0.18

93.

2004-09-10 time: 9:51:07.63 UTC ML=
lat: 48.246N lon: 18.858E h= 0.0 km
erh= 3.0km erz=17.6km
nr= 5 gap=136 rms=0.50
Locality: Slovak Republic
Comments: probably explosion

sta	dist	azm	phase	hr mn	sec	res
VYHS	27.7	357	iPg	9:51:13.10		0.22
			eSg	51:16.20		-0.78
SRO	62.9	220	iPg	9:51:18.80		-0.21
PSZ	85.4	115	ePgD	9:51:23.80		0.82
			eSg	51:34.00		-0.95

94.

2004-09-11 time: 18:28:07.25 UTC ML= 2.8
lat: 47.909N lon: 16.424E h= 7.3 km
erh= 2.2km erz= 2.3km
nr= 31 gap= 88 rms=1.05
Locality: Austria
Comments: felt 3 EMS

sta	dist	azm	phase	hr mn	sec	res
SOP	27.0	158	iPgD	18:28:13.30		1.05
			eSg	28:17.10		0.95
VKA	40.4	349	iPgD	18:28:14.90		0.32
			iSg	28:20.30		0.00
ZST	59.9	58	iPg	18:28:17.90		-0.12
			eSg	28:25.80		-0.62
ARSA	99.7	223	iPgC	18:28:24.60		-0.51
			iSg	28:36.50		-2.54
SMOL	100.4	48	iPg	18:28:24.80		-0.43
			eSg	28:38.60		-0.66
MOA	161.5	268	iPnC	18:28:33.80		0.31
			iSn	28:53.90		-0.05
KOLL	164.8	63	ePn	18:28:33.70		-0.19
VYHS	190.8	70	ePn	18:28:36.50		-0.63
OBKA	210.7	222	iPnC	18:28:40.80		1.19
			iSn	29:08.60		3.74
MORC	223.4	22	ePn	18:28:40.91		-0.29
			eSn	29:04.69		-2.99
GEC2	227.0	297	ePn	18:28:42.20		0.56
			eSn	29:09.50		1.03
OKC	249.0	31	eSn	18:29:10.60		-2.76
KBA	249.7	248	iPnD	18:28:44.10		-0.38
			iSn	29:12.90		-0.62
KHC	250.3	303	ePn	18:28:46.40		1.84
			eSn	29:16.40		2.74
PRU	269.2	329	ePn	18:28:49.00		2.08
			eSn	29:22.00		4.15
DPC	271.6	358	ePn	18:28:50.70		3.49
			eSn	29:23.00		4.62
UPC	290.6	354	ePn	18:28:54.00		4.43
			eSn	29:27.50		4.92
WET	295.7	298	ePn	18:28:53.40		3.18
			eSn	29:28.10		4.37
PVCC	321.1	335	ePn	18:28:58.40		5.01
			eSn	29:36.40		7.03

95.

2004-09-16 time: 8:57:57.61 UTC ML= 1.0
lat: 47.406N lon: 18.397E h= 0.0 km
erh= ---km erz= ---km
nr= 4 gap=324 rms=0.91
Locality: Gánt
Comments: explosion

sta	dist	azm	phase	hr mn	sec	res
PKSG	1.7	196	iPgC	8:57:57.30		-0.61
			eSg	57:58.40		0.25
PKS8	62.4	160	iPgC	8:58:09.70		0.95
			eSg	58:15.50		-1.94

96.

2004-09-16 time: 8:58:37.59 UTC ML= 1.2
lat: 47.429N lon: 18.464E h= 0.0 km
erh= ---km erz= ---km
nr= 4 gap=292 rms=0.10
Locality: Csákvár
Comments: explosion

sta	dist	azm	phase	hr mn	sec	res
PKSG	6.9	233	iPgC	8:58:38.90		0.07
			iSg	58:39.70		-0.09
PKS8	63.2	165	ePg	8:58:48.80		-0.09
			eSg	58:57.90		0.20

97.

2004-09-16 time: 12:30:30.35 UTC ML= 1.0
lat: 45.701N lon: 17.919E h= 18.4 km
erh= 9.9km erz= 3.5km
nr= 7 gap=324 rms=0.62
Locality: Croatia
Comments:

sta	dist	azm	phase	hr mn	sec	res
RHK3	33.2	51	ePgD	12:30:37.70		0.56
			eSg	30:41.90		-0.53
RHK1	45.3	15	ePgC	12:30:39.20		0.11
			eSg	30:45.40		-0.50
PKSM	79.7	45	eP*	12:30:43.30		-1.21
			eS*	30:56.80		1.25
PKS9	102.3	16	ePnC	12:30:47.80		0.01

98.

2004-09-16 time: 12:48:41.03 UTC ML=
lat: 48.223N lon: 19.078E h= 0.0 km
erh= 0.9km erz= 1.9km
nr= 7 gap=150 rms=0.48
Locality: Slovak Republic
Comments: probably explosion

sta	dist	azm	phase	hr mn	sec	res
VYHS	35.1	329	ePg	12:48:46.90		-0.40
			iSg	48:52.10		-0.08
PSZ	69.6	119	ePgC	12:48:53.60		0.14
			eSg	49:03.10		-0.06
SRO	73.0	231	ePg	12:48:54.10		0.03
			eSg	49:03.80		-0.44
ZST	146.9	269	eSn	12:49:27.80		1.79

99.

2004-09-17 time: 10:17:26.07 UTC ML= 0.4
lat: 45.736N lon: 18.247E h= 0.0 km
erh= 0.9km erz= 0.9km
nr= 5 gap=340 rms=0.02
Locality: Croatia
Comments: explosion

sta	dist	azm	phase	hr mn	sec	res
RHK3	16.9	1	ePgD	10:17:29.30		-0.03
			eSg	17:31.90		0.03
RHK1	42.1	341	iPgC	10:17:33.70		0.01
			eSg	17:39.60		-0.03
PKS9	94.6	1	ePg	10:17:43.00		0.00

100.

2004-09-17 time: 17:11:03.30 UTC ML= 1.1
lat: 45.666N lon: 18.291E h= 10.0 km
erh= 7.9km erz= 2.9km
nr= 7 gap=328 rms=0.31
Locality: Croatia
Comments:

sta	dist	azm	phase	hr mn	sec	res
RHK3	24.9	353	iPgD	17:11:07.90		-0.18
			eSg	11:12.10		0.28
RHK1	50.6	340	iPgD	17:11:12.50		0.00
			eSg	11:19.60		-0.08
PKS8	138.0	12	ePnC	17:11:26.90		0.64
			eSn	11:40.90		-3.27
PKSG	192.0	2	ePn	17:11:32.60		-0.39

101.

2004-09-23 time: 5:32:12.79 UTC ML= 3.5
lat: 48.261N lon: 18.845E h= 10.0 km
erh= 1.7km erz= 1.5km
nr= 45 gap= 61 rms=0.97
Locality: Slovak Republic
Comments:

sta	dist	azm	phase	hr mn	sec	res
VYHS	25.9	359	ePg	5:32:17.60		-0.14
			iSg	32:20.60		-1.01
PENC	61.7	148	ePgC	5:32:24.60		0.66
			iSg	32:32.40		-0.25
SRO	63.7	219	ePg	5:32:24.60		0.30
			iSg	32:32.70		-0.57
RHK5	64.9	165	ePgD	5:32:25.30		0.79
			eSg	32:33.70		0.05
RHK6	71.9	155	ePgC	5:32:26.40		0.64
			eSg	32:35.00		-0.87
PSZ	87.0	116	ePg	5:32:27.29		-1.14
BUD	87.5	171	ePgC	5:32:28.80		0.28
			eSg	32:39.70		-1.08
LIKS	89.8	12	iPg	5:32:30.00		1.08
			eSg	32:40.40		-1.11
PKSG	102.5	199	ePgC	5:32:31.20		0.02
			eSg	32:44.10		-1.42
SMOL	108.6	285	ePn	5:32:32.70		0.62
			iSn	32:46.70		-0.43
KECS	124.1	79	ePn	5:32:33.70		-0.31
			eSn	32:48.70		-1.87
ZST	129.7	267	iPn	5:32:35.10		0.39
			iSn	32:50.20		-1.61
PKS8	154.2	185	iPnD	5:32:38.60		0.82
			eSn	32:56.80		-0.47
SOP	182.4	249	ePn	5:32:42.10		0.81
			eSn	33:05.30		1.78
OKC	182.6	344	ePn	5:32:41.80		0.49
			eSn	33:02.60		-0.95
VKA	187.6	270	iPnC	5:32:42.20		0.27
			iSn	33:12.10		7.43
PKS9	191.0	193	ePnD	5:32:43.40		1.04
			eSn	33:12.70		7.28
MORC	193.6	331	ePn	5:32:42.62		-0.06
			eSn	33:00.01		-5.99
VRAC	202.3	305	Pn	5:32:43.89		0.12
RAC	208.1	347	ePn	5:32:49.70		5.21
			eSn	33:13.00		3.78
OJC	228.6	18	ePn	5:32:47.80		0.75
			eSn	33:11.30		-2.47
RHK1	247.9	194	iPnC	5:32:50.10		0.65
			eSn	33:18.70		0.65
RHK3	267.6	190	iPnD	5:32:52.80		0.89
			eSn	33:20.80		-1.63
ARSA	273.2	246	iPnC	5:32:53.40		0.79
			iSn	33:24.90		1.22
DPC	296.0	322	ePn	5:32:56.40		0.94
			eSn	33:36.70		7.97
KWP	321.4	62	ePn	5:33:00.90		2.28
GROS	322.2	232	iPn	5:32:59.10		0.38
UPC	323.6	321	ePn	5:32:59.60		0.71
PERS	334.2	237	ePn	5:33:01.10		0.88
KSP	341.4	327	ePn	5:33:02.10		0.99
MOA	344.4	262	iPnD	5:33:00.90		-0.59
			iSn	33:39.10		-0.37
PRU	368.2	301	ePn	5:33:04.70		0.25
			eSn	33:56.20		11.45
OBKA	378.4	239	iPnC	5:33:06.40		0.67
			iSn	34:05.80		18.78
GERE	385.2	280	Pn	5:33:07.41		0.83
			Sn	33:44.34		-4.19
KHC	399.6	284	ePn	5:33:09.40		1.03
			eSn	33:51.30		-0.42
PVCC	399.9	309	ePn	5:33:08.60		0.19
			eSn	33:51.20		-0.59
BRG	458.3	309	ePn	5:33:16.10		0.41
NKC	514.8	295	ePn	5:33:23.00		0.26
			eSn	34:38.60		21.30
CLL	540.2	309	iPn	5:33:26.10		0.20
			eSn	34:44.00		21.07
MOX	587.4	297	Pn	5:33:31.90		0.11
			Sn	34:58.10		24.69
MLR	622.8	120	Pn	5:33:41.83		5.63
DAVO	699.3	257	Pn	5:33:46.20		0.46
			Sn	34:56.00		-2.24

102.

2004-09-24 time: 9:21:13.52 UTC ML= 0.5
lat: 45.783N lon: 18.260E h= 6.5 km
erh= 7.9km erz= 5.5km
nr= 5 gap=336 rms=0.22
Locality: Matty
Comments:

sta	dist	azm	phase	hr mn	sec	res
RHK3	11.8	357	ePgC	9:21:15.60		-0.32
			eSg	21:18.00		0.20
RHK1	37.6	337	ePg	9:21:20.60		0.26
			eSg	21:25.60		-0.05
PKS9	89.4	1	ePgC	9:21:29.50		-0.03

103.

2004-09-24 time: 11:29:27.71 UTC ML=
lat: 48.350N lon: 18.296E h= 0.0 km
erh= ***km erz= ***km
nr= 5 gap=169 rms=1.07
Locality: Slovak Republic
Comments: probably explosion

sta	dist	azm	phase	hr mn	sec	res
VYHS	43.1	68	ePg	11:29:36.30		0.69
			eSg	29:40.00		-1.77
ZST	90.2	259	ePg	11:29:43.40		-0.53
PSZ	128.3	112	ePnC	11:29:50.30		0.84
			eSn	30:04.10		-2.33

104.

2004-09-28 time: 8:05:02.55 UTC ML= 2.8
lat: 47.551N lon: 16.322E h= 0.6 km
erh=53.6km erz=32.0km
nr= 5 gap=190 rms=0.43
Locality: Austria
Comments:

sta	dist	azm	phase	hr mn	sec	res
SOP	23.0	50	ePg	8:05:06.10		-0.56
ARSA	69.0	241	iPgC	8:05:14.90		0.03
			iSg	05:24.40		-0.07
MOA	157.8	282	iPnC	8:05:30.00		0.81
			iSn	05:49.60		-0.38

105.

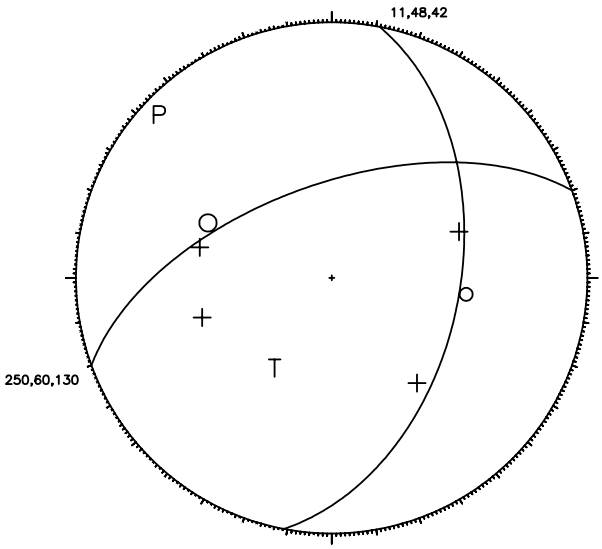
2004-09-29 time: 0:46:27.27 UTC ML= 2.0
lat: 47.907N lon: 19.511E h= 1.0 km
erh= 1.2km erz= 1.9km
nr= 22 gap=125 rms=0.47
Locality: Buják
Comments:

sta	dist	azm	phase	hr mn	sec	res
PENC	21.5	233	ePgC	0:46:31.30		0.19
			eSg	46:35.20		1.09
PSZ	28.7	87	iPgC	0:46:32.50		0.09
			eSg	46:36.50		0.09
RHK6	32.5	217	ePgD	0:46:33.20		0.13
			eSg	46:38.00		0.40
BUD	59.6	218	ePg	0:46:37.50		-0.41
			eSg	46:45.90		-0.31
VYHS	82.3	322	iPg	0:46:42.10		0.12
			eSg	46:52.50		-0.94
SRO	90.2	263	ePg	0:46:43.90		0.52
			eSg	46:55.60		-0.35
PKSG	101.8	236	ePgD	0:46:44.90		-0.55
			eSg	46:58.30		-1.33
PKSN	115.4	167	ePgC	0:46:48.00		0.11
			eSg	47:03.30		-0.67
SMOL	168.8	294	eSn	0:47:17.20		0.17
PKS9	173.9	212	ePn	0:46:55.60		-0.25
			eSn	47:19.80		1.66
ZST	182.4	280	ePn	0:46:56.60		-0.32
			eSn	47:21.70		1.66
PKSM	199.7	199	ePn	0:47:01.00		1.93

106.

2004-10-09 time: 18:14:39.13 UTC ML= 1.6
lat: 47.030N lon: 16.961E h= 10.0 km
erh= 4.7km erz= 5.3km
nr= 20 gap=112 rms=1.37
Locality: Mikosszéplak
Comments:

sta	dist	azm	phase	hr mn	sec	res
SOP	78.8	337	ePg	18:14:53.80		0.49
			eSg	15:02.40		-1.97
ARSA	111.8	283	iPnC	18:14:58.20		-0.63
			iSn	15:09.80		-4.39
PKS9	112.0	116	ePn	18:14:59.30		0.45
PKSG	115.5	70	iPnC	18:14:59.10		-0.19
			eSn	15:14.00		-1.02
ZST	130.1	5	ePn	18:15:03.50		2.39
			eSn	15:17.00		-1.25
PKS8	131.7	97	ePnD	18:15:00.70		-0.60
			eSn	15:16.60		-2.00
SRO	134.2	50	ePn	18:15:01.00		-0.61
			eSn	15:20.10		0.95
RHK1	134.4	141	iPnC	18:15:02.30		0.66
SMOL	168.7	12	ePn	18:15:07.10		1.18
			eSn	15:29.30		2.49
OBKA	193.1	253	iPnC	18:15:09.90		0.93
			iSn	15:32.40		0.16
MOA	222.8	294	iPnD	18:15:14.40		1.73
			iSn	15:40.50		1.68
KHC	343.7	313	ePn	18:15:20.00		-7.74
			eSn	16:16.10		10.44
DPC	372.2	353	ePn	18:15:31.70		0.40



107.

2004-10-12 time: 11:43:37.48 UTC ML=
lat: 47.495N lon: 16.436E h= 6.4 km
erh= 6.4km erz= 2.6km
nr= 6 gap=225 rms=0.71
Locality: Austria
Comments:

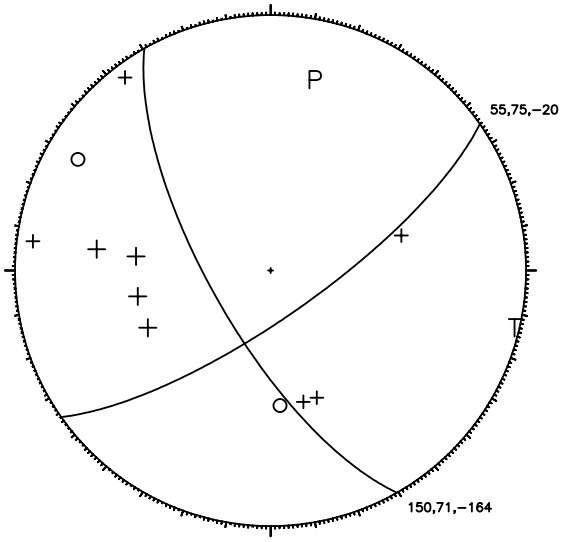
sta	dist	azm	phase	hr mn	sec	res
SOP	22.9	24	iPgD	11:43:41.60		-0.12
			eSg	43:44.40		-0.62
ARSA	74.1	248	iPgC	11:43:51.00		0.24
			iSg	44:00.00		-1.12
MOA	167.7	284	iPnC	11:44:05.90		1.30
			iSn	44:25.90		0.15

108.

2004-10-14 time: 9:44:51.66 UTC ML= 2.8
lat: 47.572N lon: 17.922E h= 10.0 km
erh= 2.1km erz= 2.1km
nr= 33 gap= 69 rms=0.94
Locality: Mezőörs
Comments: felt 4-5 EMS

sta	dist	azm	phase	hr mn	sec	res
SRO	39.7	48	iPg	9:44:59.60		0.63
			iSg	45:04.90		0.22
PKSG	40.6	120	ePgD	9:44:58.60		-0.53
			eSg	45:04.20		-0.76
BUD	83.6	97	ePgC	9:45:06.80		0.12
			eSg	45:16.70		-1.70
ZST	92.6	319	iPg	9:45:08.30		0.02
			eSg	45:19.80		-1.45
PKS8	96.0	143	ePgC	9:45:09.30		0.41
			eSg	45:20.60		-1.73
SOP	103.2	277	iP*C	9:45:10.30		0.13
			eS*	45:22.40		-2.22
SMOL	110.9	341	iPn	9:45:11.30		0.05
			eSn	45:25.40		-1.13
PKS9	112.9	166	ePnC	9:45:12.00		0.52
			eSn	45:26.20		-0.75
KOLL	117.5	18	iPn	9:45:11.80		-0.26
			eSn	45:26.20		-1.77

PSZ	152.8	75	ePnC	9:45:17.00	0.53
			eSn	45:35.40	-0.42
PKSM	160.9	160	ePnC	9:45:17.10	-0.37
			eSn	45:37.40	-0.21
RHK1	164.7	176	ePnD	9:45:20.20	2.26
			eSn	45:39.70	1.25
ARSA	184.6	259	iPnC	9:45:20.00	-0.42
			iSn	45:42.60	-0.26
RHK3	188.9	172	ePn	9:45:24.00	3.03
			eSn	45:45.20	1.37
KECS	216.4	62	ePn	9:45:26.60	2.21
MORC	246.7	353	ePn	9:45:31.18	3.01
MOA	276.1	276	iPnC	9:45:36.50	4.66
			iSn	46:11.10	7.92
OBKA	282.3	245	iPnC	9:45:29.40	-3.21
			iSn	46:00.10	-4.46
DPC	330.4	339	ePn	9:45:40.00	1.39
UPC	355.0	337	ePn	9:45:43.30	1.62
KHC	365.7	298	ePn	9:45:43.60	0.60
			eSn	46:35.20	12.14



109.

2004-10-16 time: 12:48:53.03 UTC ML= 1.4
lat: 46.183N lon: 17.277E h= 10.0 km
erh= 2.7km erz= 2.0km
nr= 8 gap=301 rms=0.97
Locality: Somogyudvarhely
Comments:

sta	dist	azm	phase	hr mn	sec	res
RHK1	62.2	99	ePgC	12:49:04.40		0.12
			eSg	49:12.30		-0.75
RHK3	82.2	113	iPgC	12:49:07.90		0.07
			eSg	49:18.80		-0.57
PKS9	89.2	60	ePgC	12:49:10.50		1.44
			eSg	49:23.10		1.54
PKS8	132.3	54	iPnC	12:49:14.20		-1.09
			eSn	49:30.30		-2.35

110.

2004-10-21 time: 12:05:25.99 UTC ML=
lat: 47.487N lon: 16.437E h= 4.5 km
erh= 5.3km erz= 2.2km
nr= 6 gap=226 rms=0.54
Locality: Austria
Comments:

sta	dist	azm	phase	hr mn	sec	res
SOP	23.6	23	ePgC	12:05:30.30		0.01
			eSg	05:33.20		-0.44
ARSA	73.9	249	iPgC	12:05:39.80		0.59
			iSg	05:48.70		-0.82
MOA	168.0	284	iPnC	12:05:53.90		0.50
			iSn	06:14.30		-0.47

111.

2004-10-22 time: 11:32:41.15 UTC ML=
lat: 48.538N lon: 20.780E h= 0.0 km
erh= 7.0km erz= 3.2km
nr= 6 gap=316 rms=0.44
Locality: Bódvalenke
Comments: probably explosion

sta	dist	azm	phase	hr mn	sec	res
KECS	22.6	254	ePg	11:32:45.00		-0.56
			eSg	32:49.10		0.09
PSZ	95.3	224	ePgC	11:32:58.20		-0.06
			eSg	33:12.00		0.40
VYHS	143.7	268	ePn	11:33:05.60		0.78
			eSn	33:22.90		-0.39

112.

2004-10-25 time: 11:09:04.01 UTC ML=
lat: 48.555N lon: 20.832E h= 0.0 km
erh=10.9km erz=85.8km
nr= 6 gap=174 rms=0.31
Locality: Hidvégardó
Comments: probably explosion

sta	dist	azm	phase	hr mn	sec	res
KECS	26.8	253	iPg	11:09:08.40		-0.41
			eSg	09:12.60		0.05
CRVS	60.3	50	iPg	11:09:15.10		0.31
			iSg	09:23.00		-0.19
PSZ	99.3	225	ePgC	11:09:22.10		0.35
			eSg	09:35.40		-0.18

113.

2004-10-28 time: 10:14:14.08 UTC ML=
lat: 48.344N lon: 19.809E h= 0.0 km
erh=20.4km erz=25.3km
nr= 5 gap=140 rms=0.25
Locality: Slovak Republic
Comments: probably explosion

sta	dist	azm	phase	hr mn	sec	res
PSZ	47.8	172	iPgC	10:14:22.90		0.01
VYHS	73.9	283	ePg	10:14:27.70		0.23
			eSg	14:37.10		-0.81
CRVS	136.7	63	ePn	10:14:36.40		-0.18
			eSn	14:54.40		0.27

114.

2004-11-10 time: 11:08:40.52 UTC ML= 1.8
lat: 47.460N lon: 18.399E h= 0.0 km
erh= ---km erz= ---km
nr= 4 gap=359 rms=0.26
Locality: Várgesztes
Comments: explosion

sta	dist	azm	phase	hr mn	sec	res
PKSG	7.6	185	ePgC	11:08:41.60		-0.27
			eSg	08:42.70		-0.23
PKS9	97.4	185	ePgC	11:08:58.20		0.28
			eSg	09:11.70		0.21

115.

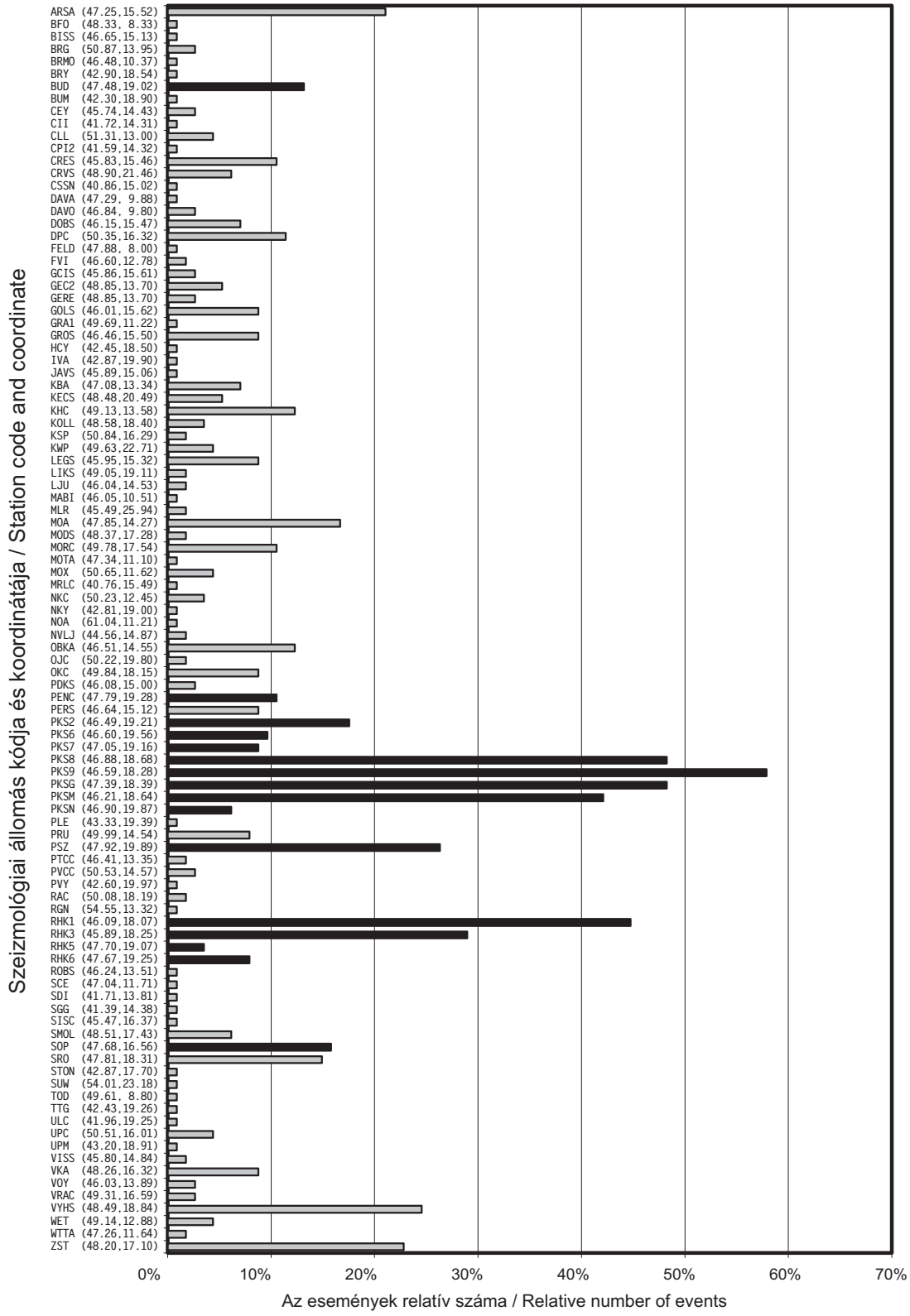
2004-12-30 time: 7:32:49.59 UTC ML= 2.1
lat: 45.960N lon: 16.165E h= 10.0 km
erh= 5.9km erz= 3.3km
nr= 13 gap=171 rms=0.74
Locality: Croatia
Comments:

sta	dist	azm	phase	hr mn sec	res
GCIS	44.4	256	iPgC	7:32:57.60	-0.12
			iSg	33:04.10	0.04
CRES	56.9	255	iPgC	7:32:59.80	-0.09
DOBS	57.8	291	iPgC	7:33:00.30	0.24
LEGS	65.7	269	iPgC	7:33:01.60	0.15
GROS	75.6	317	iPg	7:33:03.00	-0.21
VISS	104.5	260	iP*	7:33:07.70	-0.59
PERS	110.3	313	iPn	7:33:08.90	-0.19
OBKA	138.8	296	iPnC	7:33:13.90	1.25
			iSn	33:30.60	-0.04
RHK1	148.4	84	ePn	7:33:11.40	-2.45
			eSn	33:27.20	-5.57
ARSA	151.7	341	iPnC	7:33:15.90	1.65
			iSn	33:32.30	-1.19

116.

2004-12-31 time: 4:23:23.13 UTC ML= 1.7
lat: 46.058N lon: 17.156E h= 10.0 km
erh=36.9km erz=11.9km
nr= 7 gap=179 rms=1.34
Locality: Croatia
Comments:

sta	dist	azm	phase	hr mn sec	res
RHK1	70.9	87	ePg	4:23:35.50	-0.42
			eSg	23:42.50	-3.40
GOLS	118.8	267	ePn	4:23:44.00	0.31
GCIS	121.9	260	iPn	4:23:44.70	0.62
			iSn	23:58.80	-1.62
CRES	134.2	259	iPn	4:23:47.30	1.68
			eSn	24:02.00	-1.16



3.4. ábra Az egyes állomások részvétele a hipocentrum meghatározásban

Figure 3.4. Contribution of individual stations to the hypocenter determination

4.

JELENTŐS FÖLDRENGÉSEK 2004-BEN
(Magyarországon érezhető földrengések)

2004. május 25.	-	Beled
2004. július 20.	-	Berhida
2004. augusztus 17.	-	Kisbér
2004. augusztus 18.	-	Kerékteleki
2004. október 14.	-	Mezőörs

A MAKROSZEIZMIKUS INTENZITÁS MEGHATÁROZÁSA

A földrengés érezhető és épített környezetben okozott hatásainak összegyűjtése kérdőívek segítségével történt. Az összegyűjtött válaszok alapján került meghatározásra az intenzitás értéke (Zsíros et al, 1990 és Zsíros, 1994).

Az intenzitás leírása az *Európai Makroszeizmikus Skála (EMS)* szerint történik, mely részletesen megtalálható Grünthal (1998) munkájában. (*A Melléklet*)

4.

SIGNIFICANT EARTHQUAKES IN 2004

(Earthquakes that were felt in Hungary)

25 May 2004	-	Beled
20 July 2004	-	Berhida
17 August 2004	-	Kisbér
18 August 2004	-	Kerékteleki
14 October 2004	-	Mezőörs

METHOD USED FOR ESTIMATION OF INTENSITY

The earthquake effects (macroseismic observations) were gathered by questionnaires. Based on these reports the intensity values were estimated by a computer algorithm (Zsíros et al, 1990 and Zsíros, 1994).

The assigned intensities correspond to the *European Macroseismic Scale 1998 (EMS)* edited by Grünthal (1998). (APPENDIX A)

2004. május 25. - Beled / 25 May 2004 - Beled

FÉSZEKPARAMÉTEREK / HYPOCENTER PARAMETERS

Dátum / Date:	2004/05/25
Kipattanási idő / Origin Time:	07:30:14.9 UTC
Szélesség és hosszúság / Latitude and Longitude:	47.479 N 17.141 E (S.D. 1.2 km)
Mélység / Depth:	8 km (S.D. 1 km)
Magnitúdó / Magnitude:	3.8 ML
Maximális intenzitás / Maximum Intensity:	5-6 EMS

LEÍRÁS

Az év legerősebb magyarországi rengése május 25-én reggel pattant ki a Rába folyó völgyében. A 3.8 M_L magnitúdójú rengés érezhető volt mintegy 3000 km^2 területen. A legnagyobb megrázottságot (5-6 EMS) Beled, Dénesfa, Edve, Páli, Vág településekről jelentették. A rengés az epicentrum környékén kisebb épület károkat (kémény ledőlt, kisebb repedések a falakban) is okozott. A rengést több kisebb utórengés követte.

Az esemény szeizmogramja a 4.1. ábrán látható.

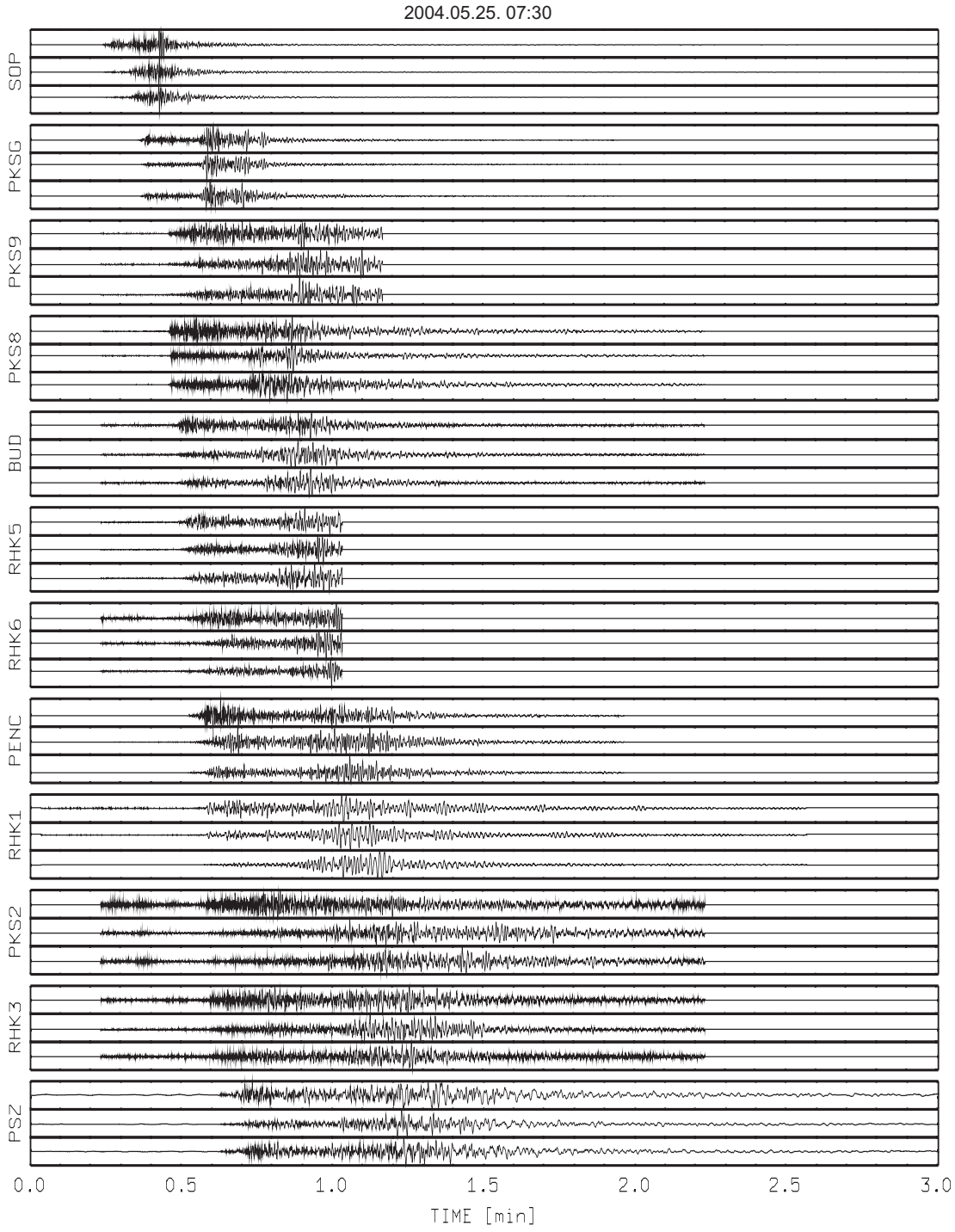
A rengés intenzitás eloszlását a 4.1. táblázat tartalmazza és a 4.2. ábra mutatja.

DISCUSSION

The highest magnitude (3.8 M_L) earthquake of the year was the Beled event in the Rába valley on May 25th. The earthquake was felt in an area of about 3000 km^2 in NW Hungary. The highest intensity values (5-6 EMS) were reported from Beled, Dénesfa, Edve, Páli, Vág. Minor damage (chimney went down, cracks in walls) was reported from the epicenter area. The main shock was followed by several smaller aftershocks.

Seismograms of the event are shown in Figure 4.1.

The intensity distribution of the event is shown in Table 4.1 and Figure 4.2.



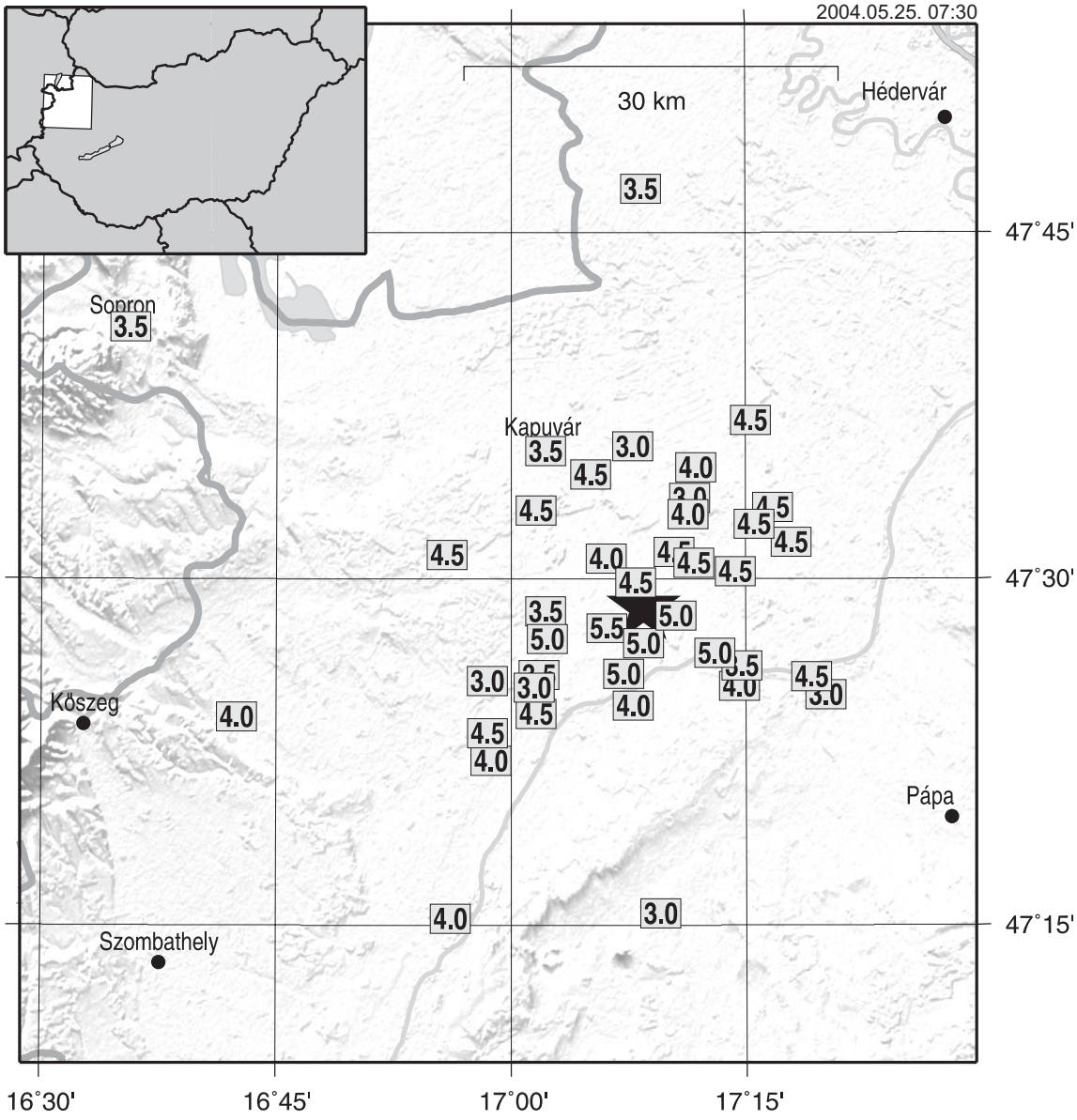
4.1. ábra A 2004. május 25-i, beledi földrengés (07:30:15 UTC) szeizmogramja

Figure 4.1. Seismograms of the Beled earthquake 25th May 2004 (07:30:15 UTC)

4.1. Táblázat
A 2004. május 25-i, beledi földrengés (07:30:15 UTC) intenzitás eloszlása

Table 4.1.
Intensity distribution of the Beled earthquake 25th May 2004 (07:30:15 UTC)

Helység / Location		Koordináta Coordinates		I	R	N
		Szélesség Latitude (N)	Hosszúság Longitude (E)	Intenzitás Intensity	Rel. megbízhatóság Rel. reliability	Jelentések száma No. of reports
1	Babót	47.576	17.084	4.5	34%	2
2	Beled	47.465	17.101	5.5	31%	2
3	Bogyoszló	47.559	17.190	3.0	29%	1
4	Cirák	47.477	17.036	3.5	36%	2
5	Celldömölk	47.259	17.158	3.0	31%	1
6	Csapod	47.518	16.931	4.5	34%	1
7	Csánig	47.431	17.029	3.5	42%	1
8	Csepreg	47.401	16.707	4.0	38%	1
9	Csorna	47.615	17.255	4.5	32%	2
10	Dénesfa	47.457	17.038	5.0	32%	1
11	Edve	47.454	17.140	5.0	54%	1
12	Egyházaskesző	47.417	17.334	3.0	36%	1
13	Hövej	47.550	17.026	4.5	31%	1
14	Jánossomorja	47.782	17.138	3.5	40%	1
15	Jobbaháza	47.581	17.196	4.0	36%	1
16	Kapuvár	47.593	17.036	3.5	37%	2
17	Kemenesszentpéter	47.423	17.242	4.0	33%	2
18	Magyarkeresztúr	47.520	17.173	4.5	32%	2
19	Mihályi	47.515	17.101	4.0	41%	2
20	Nick	47.403	17.026	4.5	32%	1
21	Páli	47.474	17.175	5.0	25%	1
22	Pápoc	47.409	17.129	4.0	39%	1
23	Pásztori	47.552	17.278	4.5	35%	1
24	Potyond	47.547	17.188	4.0	50%	1
25	Rábacsanak	47.527	17.298	4.5	28%	1
26	Rábakecöl	47.432	17.119	5.0	54%	2
27	Rábasebes	47.438	17.245	3.5	32%	1
28	Répcelak	47.422	17.024	3.0	25%	3
29	Répceszemere	47.427	16.974	3.0	33%	1
30	Sárvár	47.255	16.935	4.0	32%	1
31	Sopron	47.682	16.593	3.5	36%	1
32	Szárföld	47.596	17.129	3.0	27%	2
33	Szil	47.506	17.238	4.5	29%	3
34	Szilsárkány	47.540	17.258	4.5	30%	2
35	Uraiújfalu	47.369	16.978	4.0	43%	1
36	Vadosfa	47.498	17.132	4.5	33%	2
37	Vág	47.447	17.216	5.0	26%	2
38	Vámoscsalád	47.389	16.974	4.5	34%	2
39	Várkesző	47.430	17.319	4.5	36%	1
40	Zsebeháza	47.512	17.194	4.5	32%	1



4.2. ábra A 2004. május 25-i, beledi földrengés (07:30:15 UTC) intenzitás eloszlása (a csillag a műszeresen meghatározott epicentrumot jelöli)

Figure 4.2. Intensity distribution of the Beled earthquake 25th May 2004 (07:30:15 UTC) (star - instrumental epicentre)

2004. július 20. - Berhida / 20 July 2004 - Berhida

FÉSZEKPARAMÉTEREK / HYPOCENTER PARAMETERS

Dátum / Date:	2004/07/20
Kipattanási idő / Origin Time:	22:13:25.9 UTC
Szélesség és hosszúság / Latitude and Longitude:	47.091 N 18.115 E (S.D. 1.3 km)
Mélység / Depth:	10 km (S.D. 1 km)
Magnitúdó / Magnitude:	2.5 ML
Maximális intenzitás / Maximum Intensity:	4-5 EMS

LEÍRÁS

Július 20-án éjszaka 2.5 M_L magnitúdójú földrengés keltett riadalmat Berhida környékén. A rengés intenzitása 4-5 EMS fokra becsülhető (Berhida – Litér – Pétfürdő). A rengés csak viszonylag kis területen (100-150 km^2) volt érezhető.

Az esemény szeizmogramja a 4.3. ábrán látható.

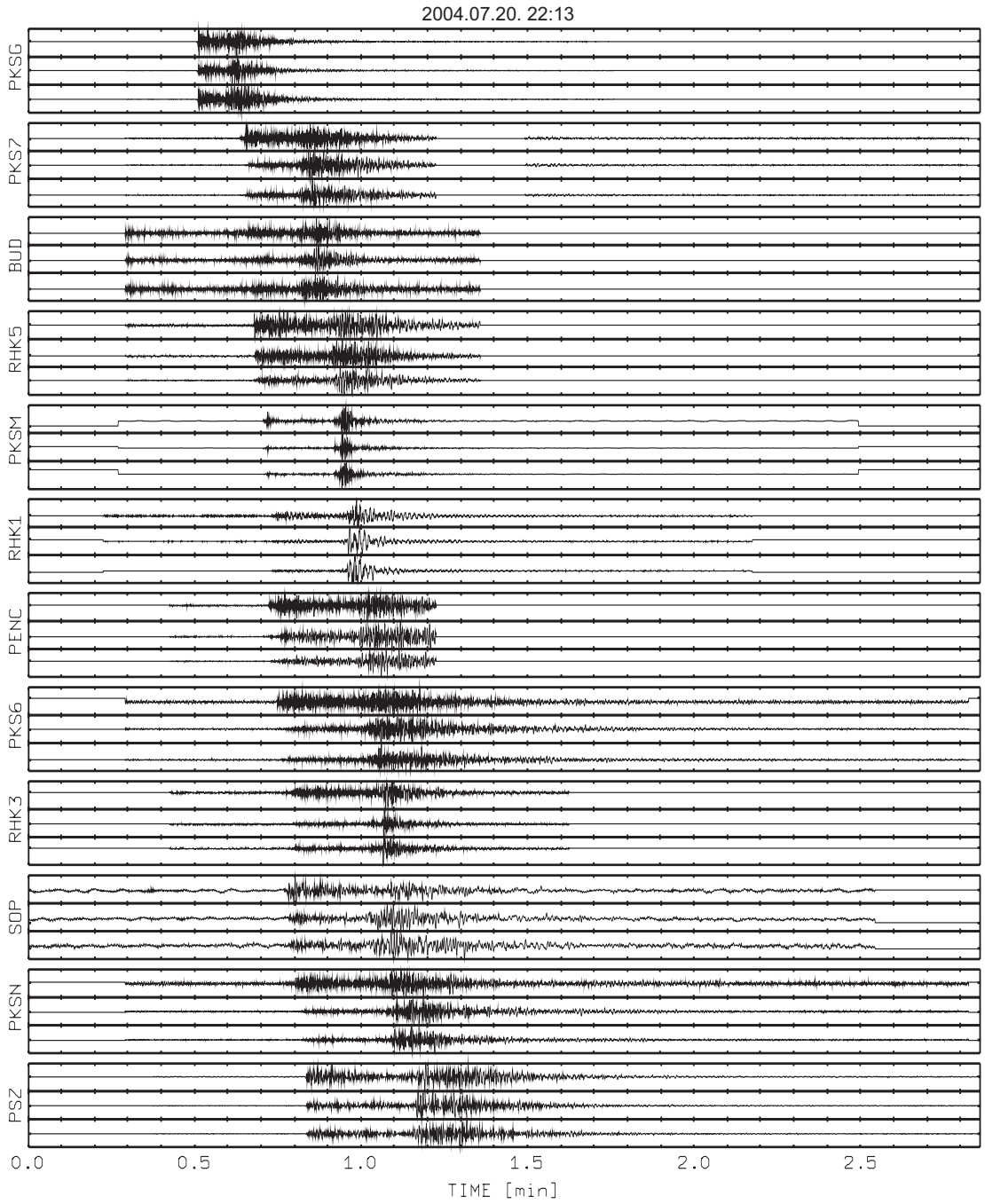
A rengés intenzitás eloszlását a 4.2. táblázat tartalmazza és a 4.4. ábra mutatja.

DISCUSSION

On July 20th night, a 2.5 M_L magnitude earthquake alarmed people in the N of Balaton region. The shock was felt in a relatively small area of 100-150 km^2 and produced reports of 4-5 EMS from Berhida – Litér – Pétfürdő.

Seismograms of the event are shown in Figure 4.3.

The intensity distribution of the event is shown in Table 4.2 and Figure 4.4.



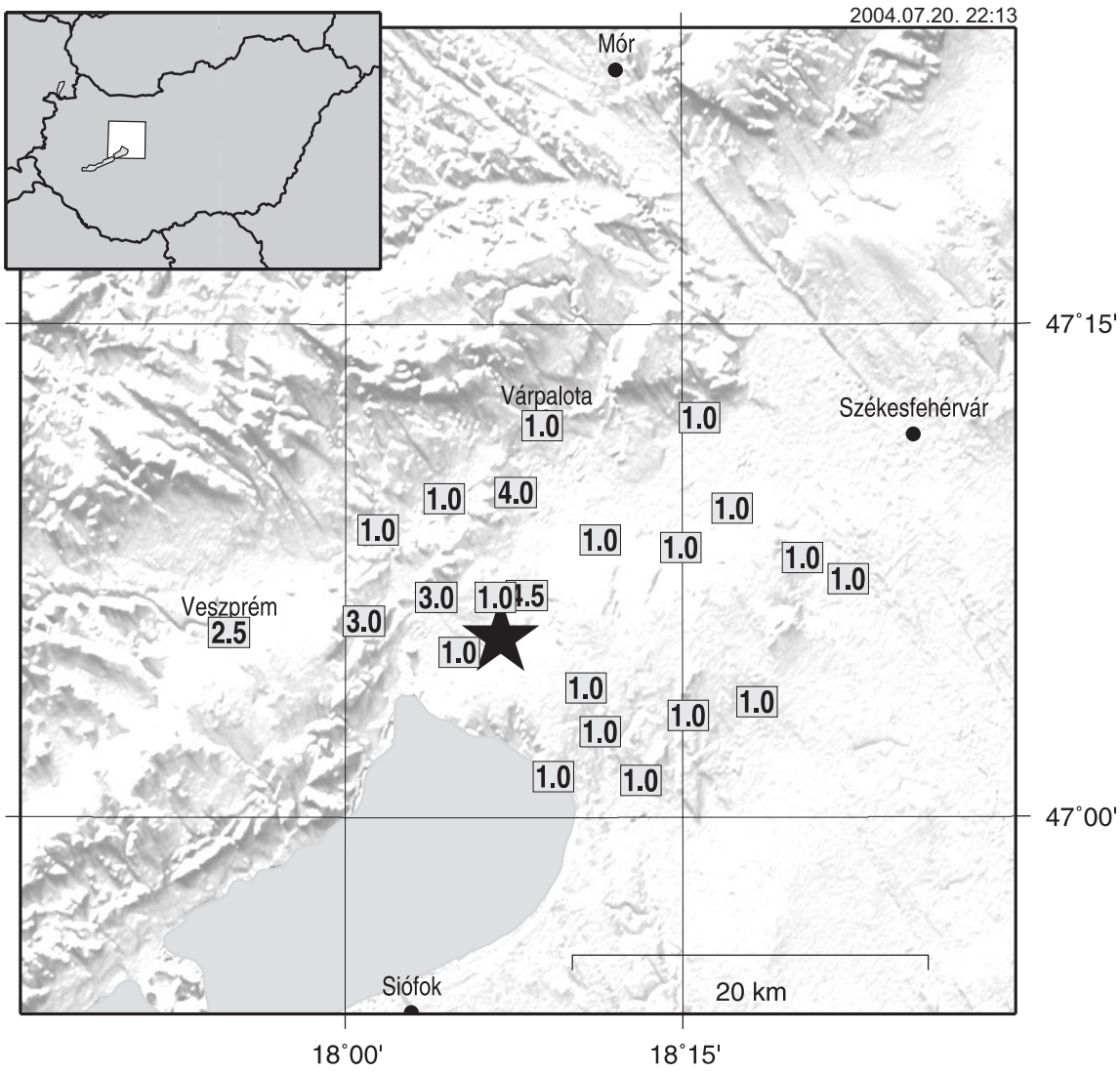
4.3. ábra A 2004. július 20-i, berhidai földrengés (22:13:26 UTC) szeizmogramja

Figure 4.3. Seismograms of the Berhida earthquake 20th July 2004 (22:13:26 UTC)

4.2. Táblázat
A 2004. július 20-i, berhidai földrengés (22:13:26 UTC) intenzitás eloszlása

Table 4.2.
Intensity distribution of the Berhida earthquake 20th July 2004 (22:13:26 UTC)

Helység / Location		Koordináta Coordinates		I	R	N
		Szélesség Latitude (N)	Hosszúság Longitude (E)	Intenzitás Intensity	Rel. megbízhatóság Rel. reliability	Jelentések száma No. of reports
1	Balatonfőkajár	47.019	18.218	1.0	0%	1
2	Balatonakarattya	47.021	18.153	1.0	0%	1
3	Berhida	47.113	18.134	4.5	38%	2
4	Csaják	47.044	18.188	1.0	0%	2
5	Csór	47.203	18.262	1.0	0%	2
6	Füle	47.052	18.253	1.0	0%	1
7	Hajmáskér	47.146	18.023	1.0	0%	2
8	Küngös	47.066	18.177	1.0	0%	1
9	Litér	47.100	18.013	3.0	26%	2
10	Nádasladány	47.137	18.248	1.0	0%	1
11	Öskü	47.162	18.072	1.0	0%	2
12	Ősi	47.141	18.188	1.0	0%	1
13	Papkeszi	47.084	18.083	1.0	0%	1
14	Peremarton	47.112	18.110	1.0	0%	1
15	Pétfürdő	47.165	18.126	4.0	38%	2
16	Polgárdi	47.059	18.304	1.0	0%	1
17	Sárkeszi	47.157	18.286	1.0	0%	1
18	Szabadbattyán	47.121	18.372	1.0	0%	1
19	Úrhida	47.132	18.338	1.0	0%	1
20	Várpalota	47.199	18.145	1.0	0%	2
21	Veszprém	47.094	17.913	2.5	50%	1
22	Vilonya	47.112	18.067	3.0	28%	2



4.4. ábra A 2004. július 20-i, berhidai földrengés (22:13:26 UTC) intenzitás eloszlása (a csillag a műszeresen meghatározott epicentrumot jelöli)

Figure 4.4. Intensity distribution of the Berhida earthquake 20th July 2004 (22:13:26 UTC) (star - instrumental epicentre)

2004. augusztus 17. - Kisbér / 17 August 2004 - Kisbér

FÉSZEKPARAMÉTEREK / HYPOCENTER PARAMETERS

Dátum / Date:	2004/08/17
Kipattanási idő / Origin Time:	18:00:34.9 UTC
Szélesség és hosszúság / Latitude and Longitude:	47.578 N 17.942 E (S.D. 1.5 km)
Mélység / Depth:	6.1 km (S.D. 2 km)
Magnitúdó / Magnitude:	3.4 ML
Maximális intenzitás / Maximum Intensity:	4-5 EMS

LEÍRÁS

Győr - Komárom térségében ebben az évben is több földrengés volt. 3.4 M_L magnitúdójú rengés pattant ki augusztus 17-én, mely mintegy 400 km^2 területen volt érezhető Győrtől DK-i irányban. A legnagyobb intenzitást (4-5 EMS) Kisbér, Bársonyos, Kerékteleki, Tárkány településekről jelentették.

Az esemény szeizmogramja a 4.5. ábrán látható.

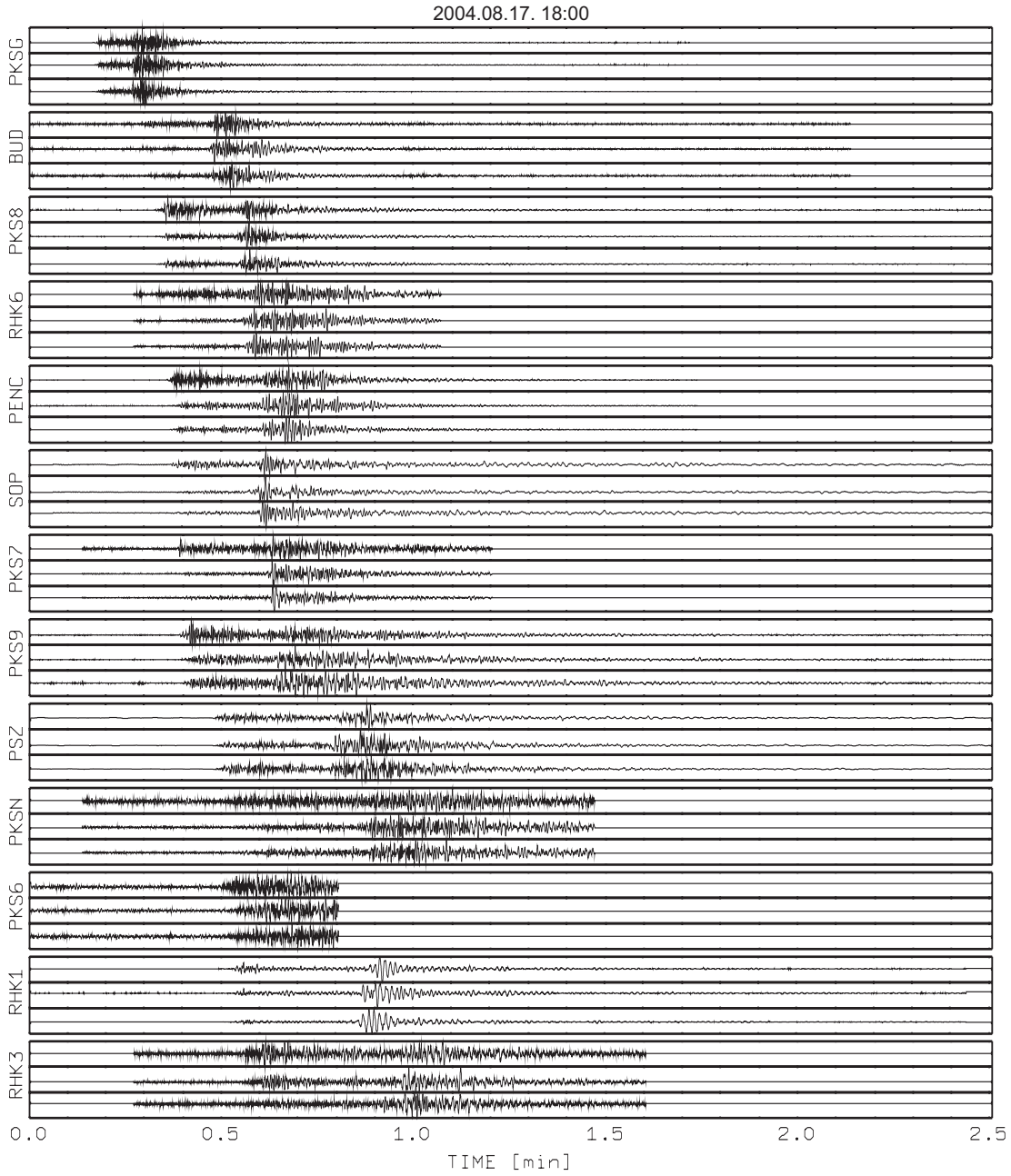
A rengés intenzitás eloszlását a 4.3. táblázat tartalmazza és a 4.6. ábra mutatja.

DISCUSSION

There were a number of earthquakes in the Győr - Komárom region in this year. 3.4 M_L magnitude event was felt in an area of 400 km^2 SE of Győr and produced reports of 4-5 EMS from Kisbér, Bársonyos, Kerékteleki, Tárkány.

Seismograms of the event are shown in Figure 4.5.

The intensity distribution of the event is shown in Table 4.3 and Figure 4.6.



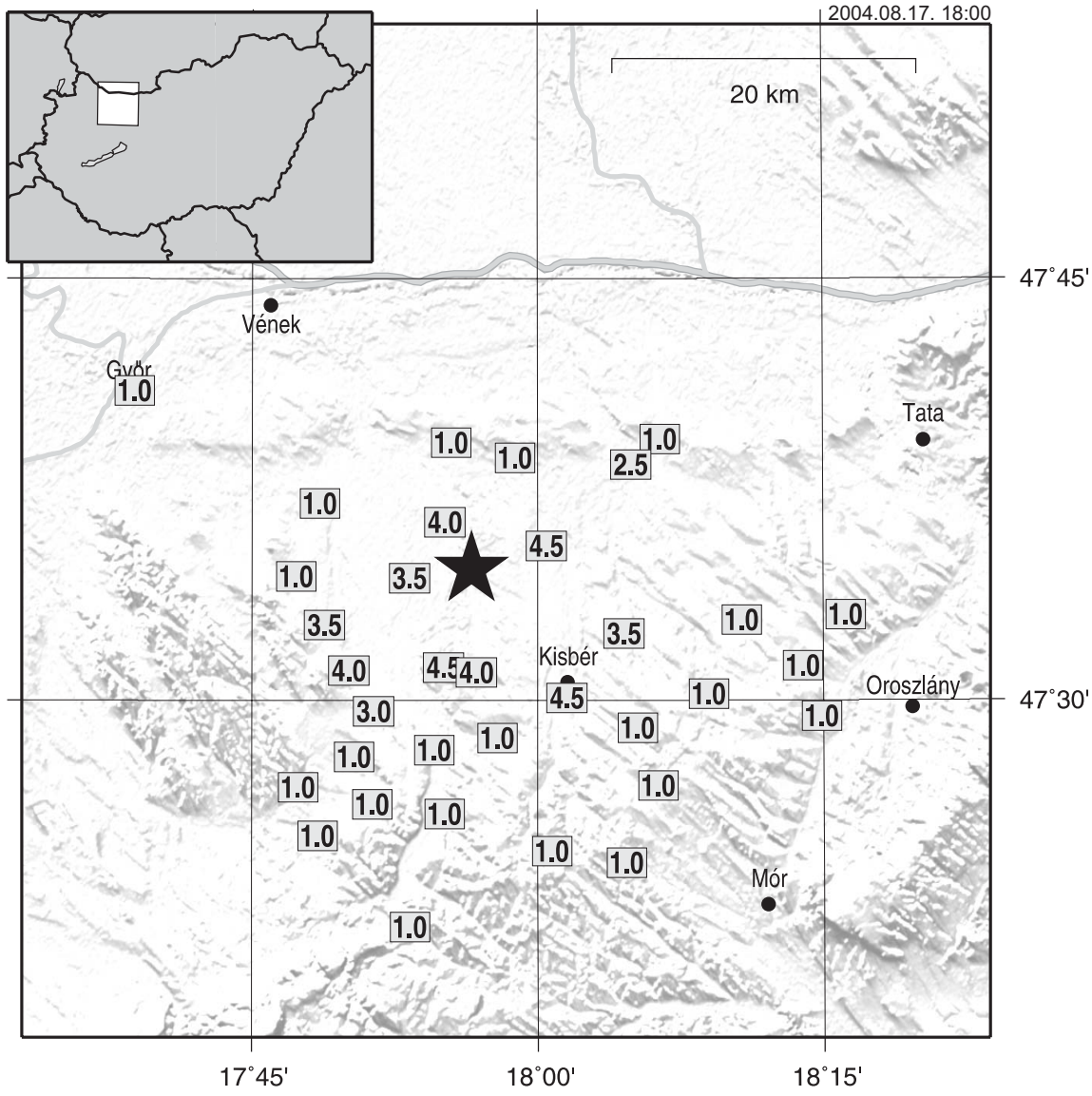
4.5. ábra A 2004. augusztus 17-i, kisbéri földrengés (18:00:35 UTC) szeizmogramja

Figure 4.5. Seismograms of the Kisbér earthquake 17th August 2004 (18:00:35 UTC)

4.3. Táblázat
A 2004. augusztus 17-i, kisbéri földrengés (18:00:35 UTC) intenzitás eloszlása

Table 4.3.
Intensity distribution of the Kisbér earthquake 17th August 2004 (18:00:35 UTC)

Helység / Location		Koordináta Coordinates		I	R	N
		Szélesség Latitude (N)	Hosszúság Longitude (E)	Intenzitás Intensity	Rel. megbízhatóság Rel. reliability	Jelentések száma No. of reports
1	Aka	47.404	18.076	1.0	0%	1
2	Ácsteszér	47.411	18.011	1.0	0%	1
3	Bakonybánk	47.471	17.908	1.0	0%	1
4	Bakonygyirót	47.420	17.806	1.0	0%	1
5	Bakonysárkány	47.450	18.104	1.0	0%	1
6	Bakonyszentkirály	47.366	17.887	1.0	0%	1
7	Bakonyszombathely	47.478	17.963	1.0	0%	1
8	Bana	47.653	17.923	1.0	0%	1
9	Bábolna	47.644	17.979	1.0	0%	2
10	Bársonyos	47.520	17.917	4.5	34%	2
11	Bokod	47.491	18.247	1.0	0%	1
12	Császár	47.504	18.148	1.0	0%	1
13	Dad	47.521	18.231	1.0	0%	2
14	Ete	47.540	18.075	3.5	32%	4
15	Győr	47.684	17.645	1.0	0%	1
16	Kerékteleki	47.517	17.946	4.0	23%	3
17	Kisbér	47.502	18.025	4.5	34%	1
18	Kisigmánd	47.655	18.106	1.0	0%	1
19	Kömlőd	47.551	18.268	1.0	0%	1
20	Lázi	47.467	17.838	1.0	0%	1
21	Mezőörs	47.573	17.887	3.5	43%	1
22	Nagyigmánd	47.640	18.081	2.5	50%	1
23	Nyalka	47.545	17.813	3.5	44%	1
24	Pázmándfalu	47.574	17.787	1.0	0%	1
25	Pér	47.617	17.808	1.0	0%	1
26	Réde	47.433	17.917	1.0	0%	2
27	Rétalap	47.606	17.918	4.0	40%	1
28	Románd	47.449	17.789	1.0	0%	2
29	Sikátor	47.439	17.854	1.0	0%	2
30	Szákszend	47.548	18.177	1.0	0%	2
31	Táp	47.518	17.834	4.0	35%	2
32	Tápszentmiklós	47.494	17.856	3.0	38%	2
33	Tárkány	47.592	18.007	4.5	30%	2
34	Vérteskethely	47.484	18.086	1.0	0%	2



4.6. ábra A 2004. augusztus 17-i, kisbéri földrengés (18:00:35 UTC) intenzitás eloszlása (a csillag a műszeresen meghatározott epicentrumot jelöli)

Figure 4.6. Intensity distribution of the Kisbér earthquake 17th August 2004 (18:00:35 UTC) (star - instrumental epicentre)

2004. augusztus 18. - Kerékteleki / 18 August 2004 - Kerékteleki

FÉSZEKPARAMÉTEREK / HYPOCENTER PARAMETERS

Dátum / Date:	2004/08/18
Kipattanási idő / Origin Time:	09:01:23.2 UTC
Szélesség és hosszúság / Latitude and Longitude:	47.596 N 17.974 E (S.D. 1.9 km)
Mélység / Depth:	10 km (S.D. 2 km)
Magnitúdó / Magnitude:	3.2 ML
Maximális intenzitás / Maximum Intensity:	5 EMS

LEÍRÁS

Kevesebb, mint egy nappal az előző rengés után, ugyanazon forrászónában, viszonylag kis területen (100-150 km^2) volt érezhető augusztus 18-án Kerékteleki, Nyúl, Mezőörs, Táp környékén egy 3.2 M_L magnitúdójú földrengés, melynek legnagyobb becsült intenzitása 5 EMS volt.

Az esemény szeizmogramja a 4.7. ábrán látható.

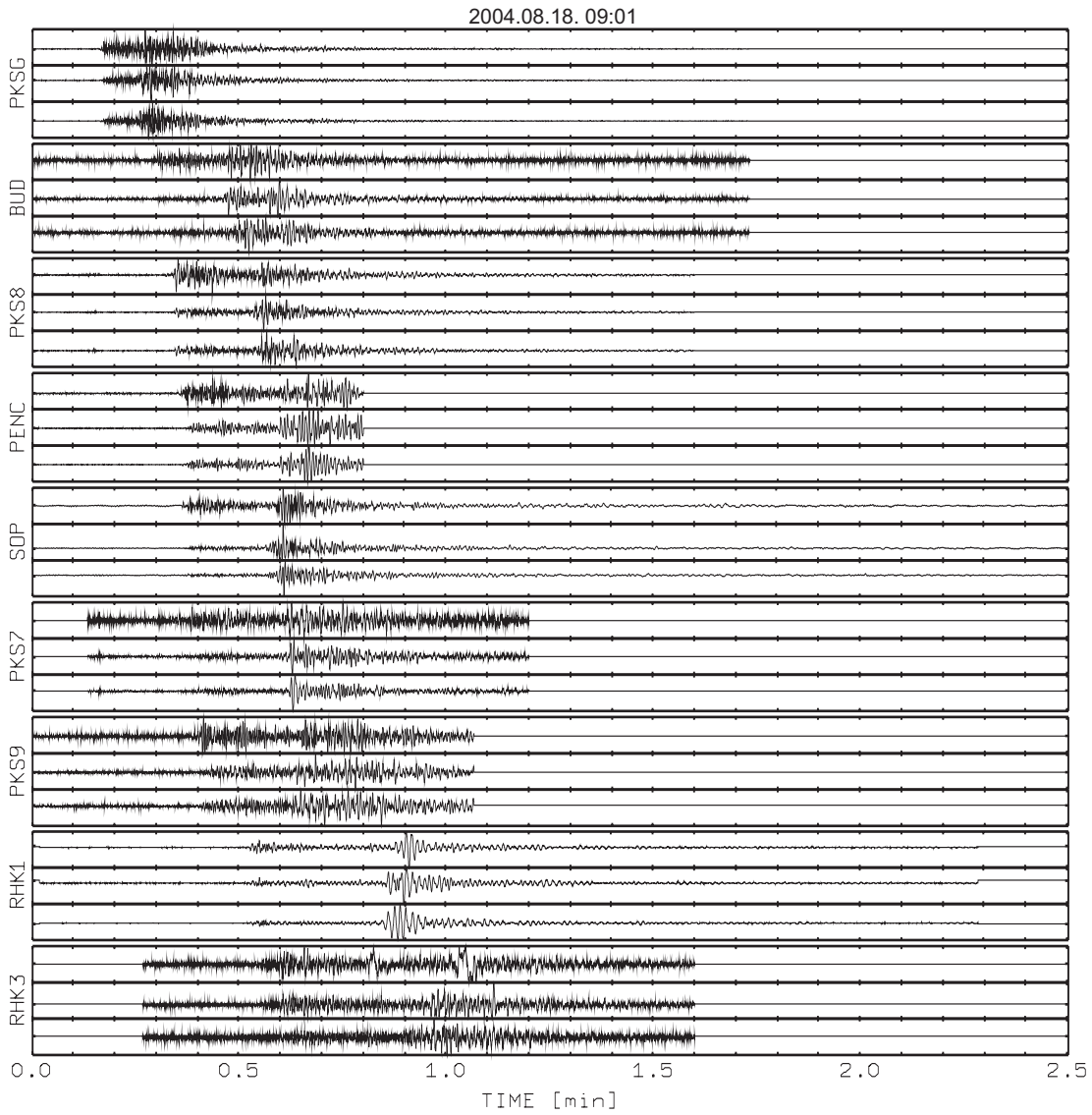
A rengés intenzitás eloszlását a 4.4. táblázat tartalmazza és a 4.8. ábra mutatja.

DISCUSSION

Less than one day after the Kisbér earthquake, a slightly smaller magnitude event (3.2 M_L) was felt and reported from Kerékteleki, Nyúl, Mezőörs, Táp, from a relatively small area of 100-150 km^2. The highest intensity was estimated 5 EMS in Kerékteleki.

Seismograms of the event are shown in Figure 4.7.

The intensity distribution of the event is shown in Table 4.4 and Figure 4.8.



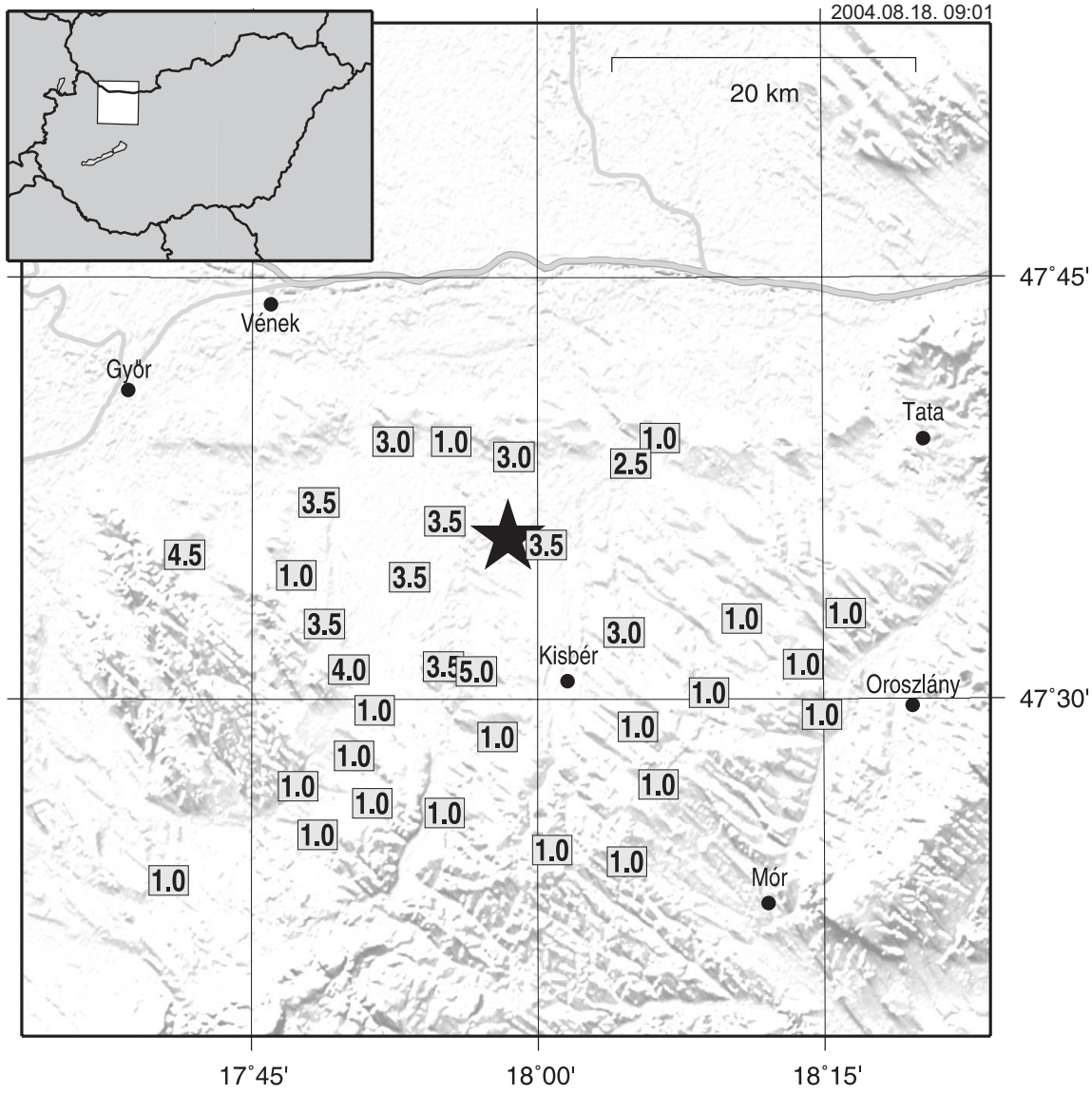
4.7. ábra A 2004. augusztus 18-i, kerékteleki földrengés (09:01:23 UTC) szeizmogramja

Figure 4.7. Seismograms of the Kerékteleki earthquake 18th August 2004 (09:01:23 UTC)

4.4. Táblázat
A 2004. augusztus 18-i, kerékteleki földrengés (09:01:23 UTC) intenzitás eloszlása

Table 4.4.
Intensity distribution of the Kerékteleki earthquake 18th August 2004 (09:01:23 UTC)

Helység / Location		Koordináta Coordinates		I	R	N
		Szélesség Latitude (N)	Hosszúság Longitude (E)	Intenzitás Intensity	Rel. megbízhatóság Rel. reliability	Jelentések száma No. of reports
1	Aka	47.404	18.076	1.0	0%	1
2	Ácsteszér	47.411	18.011	1.0	0%	1
3	Bakonygyirót	47.420	17.806	1.0	0%	1
4	Bakonysárkány	47.450	18.104	1.0	0%	1
5	Bakonyszentiván	47.393	17.676	1.0	0%	1
6	Bakonyszombathely	47.478	17.963	1.0	0%	1
7	Bana	47.653	17.923	1.0	0%	1
8	Bábolna	47.644	17.979	3.0	38%	2
9	Bársonyos	47.520	17.917	3.5	35%	2
10	Bokod	47.491	18.247	1.0	0%	1
11	Bőny	47.653	17.873	3.0	36%	2
12	Császár	47.504	18.148	1.0	0%	1
13	Dad	47.521	18.231	1.0	0%	2
14	Ete	47.540	18.075	3.0	27%	1
15	Kerékteleki	47.517	17.946	5.0	23%	3
16	Kisigmánd	47.655	18.106	1.0	0%	1
17	Kömlőd	47.551	18.268	1.0	0%	1
18	Lázi	47.467	17.838	1.0	0%	2
19	Mezőörs	47.573	17.887	3.5	38%	2
20	Nagyigmánd	47.640	18.081	2.5	50%	1
21	Nyalka	47.545	17.813	3.5	42%	1
22	Nyúl	47.586	17.690	4.5	33%	1
23	Pázmándfalu	47.574	17.787	1.0	0%	1
24	Pér	47.617	17.808	3.5	43%	2
25	Réde	47.433	17.917	1.0	0%	1
26	Rétalap	47.606	17.918	3.5	35%	1
27	Románd	47.449	17.789	1.0	0%	2
28	Sikátor	47.439	17.854	1.0	0%	2
29	Szákszend	47.548	18.177	1.0	0%	2
30	Táp	47.518	17.834	4.0	38%	2
31	Tápszentmiklós	47.494	17.856	1.0	0%	2
32	Tárkány	47.592	18.007	3.5	38%	2
33	Vérteskethely	47.484	18.086	1.0	0%	2



4.8. ábra A 2004. augusztus 18-i, kerékteleki földrengés (09:01:23 UTC) intenzitás eloszlása (a csillag a műszeresen meghatározott epicentrumot jelöli)

Figure 4.8. Intensity distribution of the Kerékteleki earthquake 18th August 2004 (09:01:23 UTC) (star - instrumental epicentre)

2004. október 14. - Mezőörs / 14 October 2004 - Mezőörs

FÉSZEKPARAMÉTEREK / HYPOCENTER PARAMETERS

Dátum / Date:	2004/10/14
Kipattanási idő / Origin Time:	09:44:51.7 UTC
Szélesség és hosszúság / Latitude and Longitude:	47.572 N 17.922 E (S.D. 2.1 km)
Mélység / Depth:	10 km (S.D. 2 km)
Magnitúdó / Magnitude:	2.8 ML
Maximális intenzitás / Maximum Intensity:	4-5 EMS

LEÍRÁS

Az augusztus 17-i és 18-i rengést követően október 14-én reggel újabb kisebb (2.8 M_L) földrengést éreztek és jelentettek Mezőörs, Ács, Nyúl, Kerékteleki környékéről. Az esemény nagyon kis területen volt érezhető, a legnagyobb intenzitás 4-5 EMS volt.

Az esemény szeizmogramja a 4.9. ábrán látható.

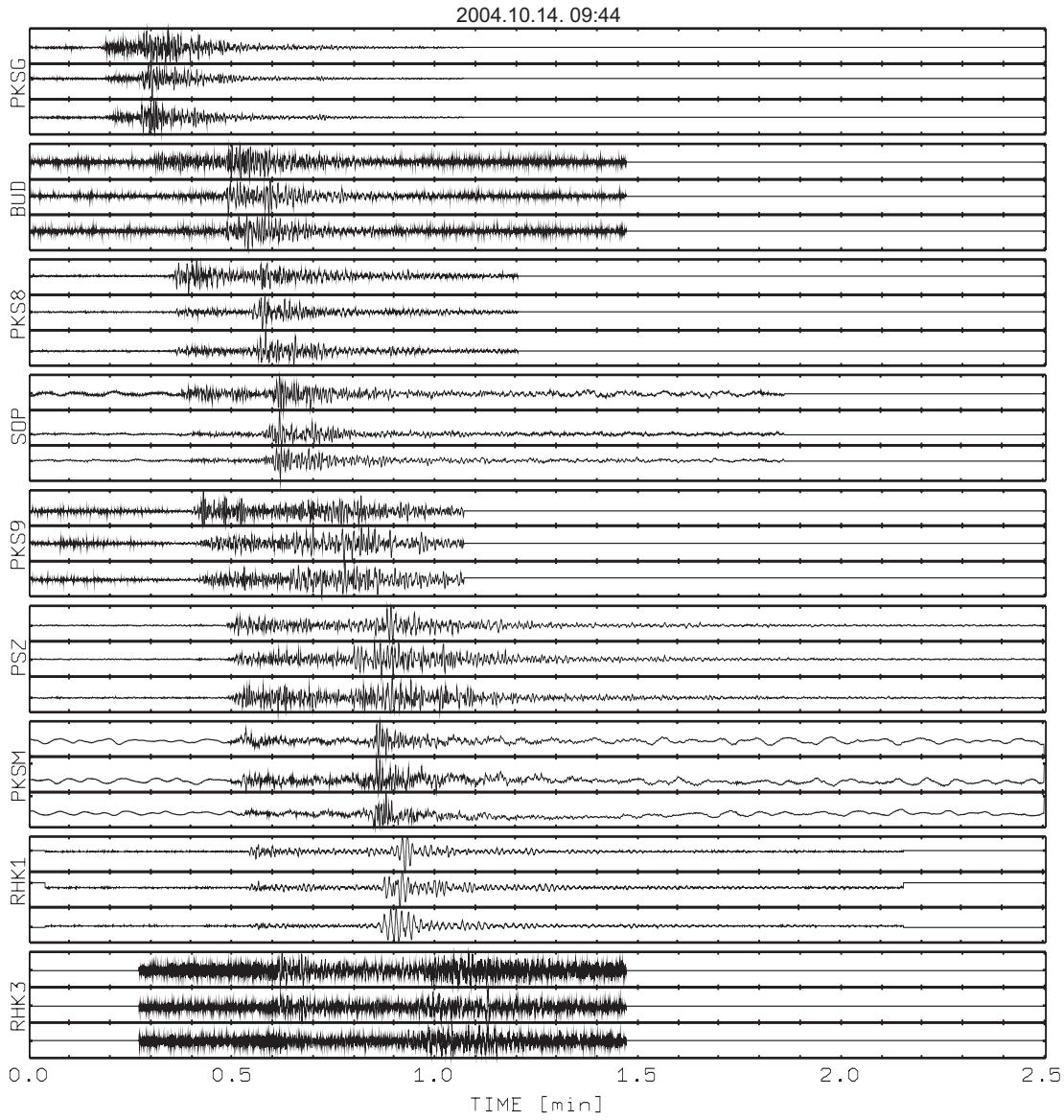
A rengés intenzitás eloszlását a 4.5. táblázat tartalmazza és a 4.10. ábra mutatja.

DISCUSSION

Following the August 17th and 18th earthquakes, in the morning October 14th, an other small magnitude (2.8 M_L) event was felt and produced reports of intensity 4-5 EMS from a very small area at Mezőörs, Ács, Nyúl, Kerékteleki.

Seismograms of the event are shown in Figure 4.9.

The intensity distribution of the event is shown in Table 4.5 and Figure 4.10.



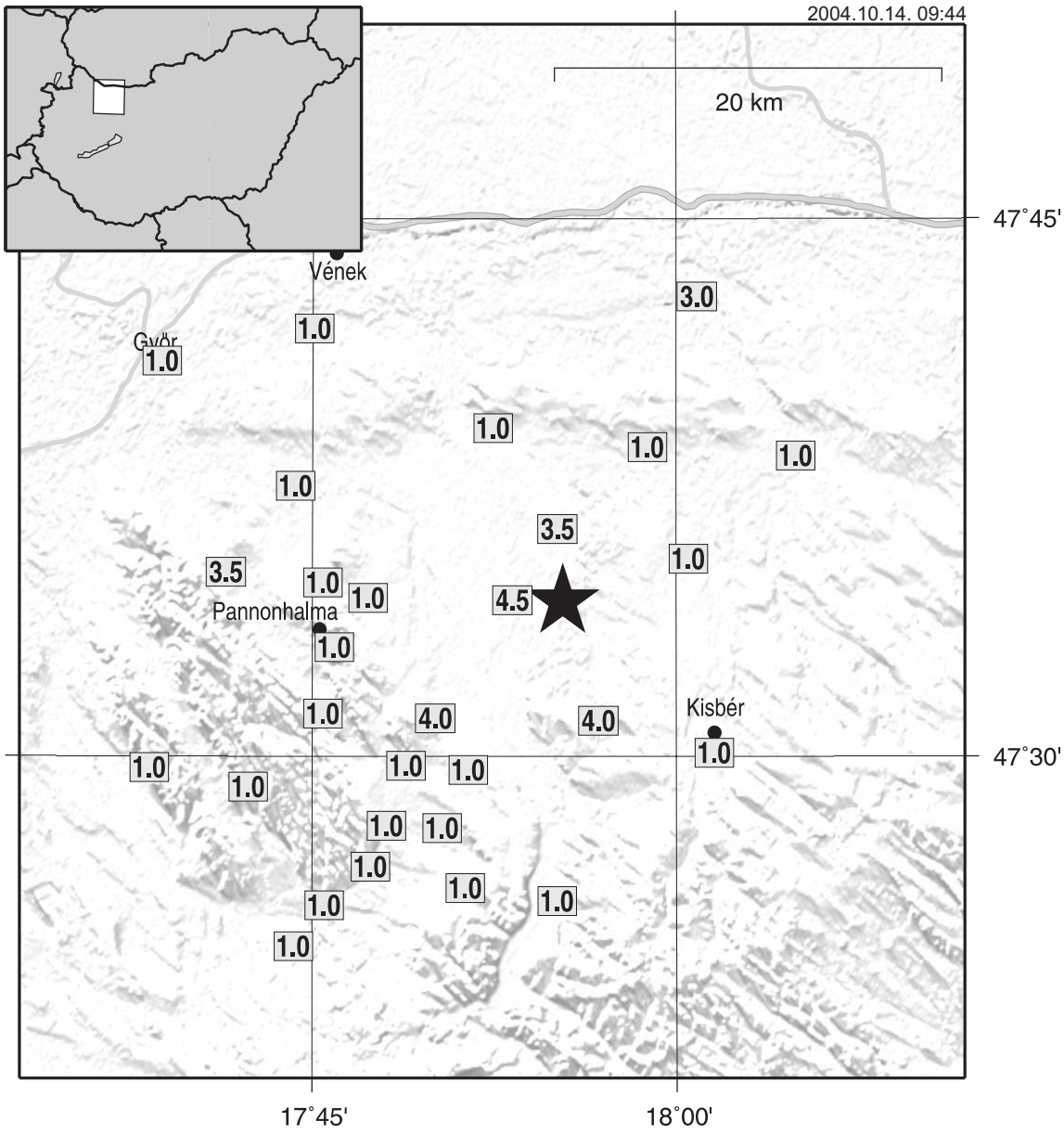
4.9. ábra A 2004. október 14-i, mezőörsi földrengés (09:44:52 UTC) szeizmogramja

Figure 4.9. Seismograms of the Mezőörs earthquake 14th October 2004 (09:44:52 UTC)

4.5. Táblázat
A 2004. október 14-i, mezőörsi földrengés (09:44:52 UTC) intenzitás eloszlása

Table 4.5.
Intensity distribution of the Mezőörs earthquake 14th October 2004 (09:44:52 UTC)

Helység / Location		Koordináta Coordinates		I	R	N
		Szélesség Latitude (N)	Hosszúság Longitude (E)	Intenzitás Intensity	Rel. megbízhatóság Rel. reliability	Jelentések száma No. of reports
1	Ács	47.714	18.014	3.0	38%	1
2	Bakonypéterd	47.468	17.800	1.0	0%	1
3	Bakonytamási	47.412	17.736	1.0	0%	1
4	Bábolna	47.644	17.979	1.0	0%	2
5	Bőny	47.653	17.873	1.0	0%	1
6	Gic	47.431	17.757	1.0	0%	2
7	Győr	47.684	17.645	1.0	0%	2
8	Győrasszonyfa	47.496	17.813	1.0	0%	1
9	Győrság	47.581	17.756	1.0	0%	1
10	Győrszentiván	47.699	17.750	1.0	0%	2
11	Kajárpéc	47.495	17.637	1.0	0%	1
12	Kerékteleki	47.517	17.946	4.0	31%	1
13	Kisbér	47.502	18.025	1.0	0%	2
14	Lázi	47.467	17.838	1.0	0%	1
15	Mezőörs	47.573	17.887	4.5	36%	1
16	Nagyigmánd	47.640	18.081	1.0	0%	1
17	Nyúl	47.586	17.690	3.5	39%	2
18	Pannonhalma	47.551	17.764	1.0	0%	1
19	Pázmándfalu	47.574	17.787	1.0	0%	2
20	Ravazd	47.520	17.756	1.0	0%	1
21	Réde	47.433	17.917	1.0	0%	2
22	Rétalap	47.606	17.918	3.5	39%	1
23	Románd	47.449	17.789	1.0	0%	1
24	Sikátor	47.439	17.854	1.0	0%	1
25	Sokorópátka	47.486	17.705	1.0	0%	1
26	Táp	47.518	17.834	4.0	35%	2
27	Tápszentmiklós	47.494	17.856	1.0	0%	2
28	Tárkány	47.592	18.007	1.0	0%	1
29	Töltéstava	47.626	17.737	1.0	0%	1



4.10. ábra A 2004. október 14-i, mezőörsi földrengés (09:44:52 UTC) intenzitás eloszlása (a csillag a műszeresen meghatározott epicentrumot jelöli)

Figure 4.10. Intensity distribution of the Mezőörs earthquake 14th October 2004 (09:44:52 UTC) (star - instrumental epicentre)

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A MELLÉKLET

EURÓPAI MAKROSZEIZMIKUS SKÁLA (EMS)

1 ☞ **Nem érezhető**

Nem érezhető, még a legkedvezőbb körülmények között sem.

2 ☞ **Alig érezhető**

A rezgést csak egy-egy, elsősorban fekvő ember érzi, különösen magas épületek felsőbb emeletein.

3 ☞ **Gyenge**

A rezgés gyenge, néhány ember érzi, főleg épületen belül. A fekvő emberek lengést vagy gyenge remegést éreznek.

4 ☞ **Széles körben érezhető**

A rengést épületen belül sokan érzik, a szabadban kevesen. Néhány ember felébred. A rezgés mértéke nem ijesztő. Ablakok, ajtók, edények megcsörrennek, felfüggesztett tárgyak lengenek.

5 ☞ **Erős**

A rengést épületen belül a legtöbben érzik, a szabadban csak néhányan. Sok alvó ember felébred, néhányan a szabadba menekülnek. Az egész épület remeg, a felfüggesztett tárgyak nagyon lengenek. Tányérok, poharak összekoccannak. A rezgés erős. Felül nehéz tárgyak felborulnak. Ajtók, ablakok kinyílanak vagy bezáródnak.

6 ☞ **Kisebb károkat okozó**

Épületen belül szinte mindenki, szabadban sokan érzik. Épületben tartózkodók közül sokan megijednek, és a szabadba menekülnek. Kisebb tárgyak leesnek. Hagyományos épületek közül sokban keletkezik kisebb kár, hajszálrepedés a vakolatban, kisebb vakolatdarabok lehullanak.

7 ☞ **Károkat okozó**

A legtöbb ember megrémül, és a szabadba menekül. Bútorok elmozdulnak, a polcokról sok tárgy leesik. Sok hagyományos épület szenved mérsékelt sérülést: kisebb repedések keletkeznek a falakban, kémények ledőlnek.

8 ☞ **Súlyos károkat okozó**

Bútorok felborulnak. Sok hagyományos épület megsérül: kémények ledőlnek, a falakban nagy repedések keletkeznek, néhány épület részlegesen összedől.

9 ☞ **Pusztító**

Oszlopok, műemlékek ledőlnek vagy elferdülnek. Sok hagyományos épület részlegesen, néhány teljesen rombadől.

10 ☞ **Nagyon pusztító**

Sok hagyományos épület összedől.

11 ☞ **Elsöprő**

A legtöbb épület összedől.

12 ☞ **Teljesen elsöprő**

Gyakorlatilag minden építmény megsemmisül.

(Részletesen lásd: Grünthal, 1998)

APPENDIX A

EUROPEAN MACROSEISMIC SCALE (EMS)

1 ☞ **Not felt**

Not felt, even the most favourable circumstances.

2 ☞ **Scarcely felt**

Vibration is felt only by individual people at rest in houses, especially on upper floors of buildings.

3 ☞ **Weak**

The vibration is weak and is felt indoors by a few people. People at rest feel a swaying or light trembling.

4 ☞ **Largely observed**

The earthquake is felt indoors by many people, outdoors by very few. A few people are awakened. The level of vibration is not frightening. Windows, doors and dishes rattle. Hanging objects swing.

5 ☞ **Strong**

The earthquake is felt indoors by most, outdoors by few. Many sleeping people awake. A few run outdoors. Buildings tremble throughout. Hanging objects swing considerably. China and glasses clatter together. The vibration is strong. Top heavy objects topple over. Doors and windows swing open or shut.

6 ☞ **Slightly damaging**

Felt by most indoors and many outdoors. Many people in buildings are frightened and run outdoors. Small objects fall. Slight damage to many ordinary buildings eg. fine cracks in plaster and small pieces of plaster fall.

7 ☞ **Damaging**

Most people are frightened and run outdoors. Furniture is shifted and objects fall from shelves in large numbers. Many ordinary buildings suffer moderate damage: small cracks in walls, partial collapse of chimneys.

8 ☞ **Heavily damaging**

Furniture may be overturned. Many ordinary buildings suffer damage: chimneys fall, large cracks appear in walls and few buildings may partially collapse.

9 ☞ **Destructive**

Monuments and columns fall or are twisted. Many ordinary buildings partially collapse and few collapse completely.

10 ☞ **Very destructive**

Many ordinary buildings collapse.

11 ☞ **Devastating**

Most ordinary buildings collapse.

12 ☞ **Completely devastating**

Practically all structures above and below ground are heavily damaged or destroyed.

(For details see Grünthal, 1998)

B MELLÉKLET

A VILÁG JELENTŐS FÖLDRENGÉSEI

2004

Forrás:

U.S. Geological Survey
National Earthquake Information Center
(USGS - NEIC)

APPENDIX B

SIGNIFICANT EARTHQUAKES OF THE WORLD

2004

Source:

U.S. Geological Survey
National Earthquake Information Center
(USGS - NEIC)

Halálos áldozatot követelő földrengések a világon 2004-ben

Deaths from Earthquakes in 2004

Dátum Date	Ország, terület Region	Magnitúdó Magnitude	Áldozatok száma Number killed
2004/01/01	Bali Region, Indonesia	5.8	1
2004/02/05	Papua, Indonesia	7.0	37
2004/02/14	Pakistan	5.5	24
2004/02/16	Southern Sumatra, Indonesia	5.1	5
2004/02/24	Burundi	4.7	3
2004/02/24	Strait of Gibraltar	6.4	631
2004/03/01	Eastern Turkey	3.8	6
2004/03/25	Eastern Turkey	5.6	10
2004/04/05	Hindu Kush Region, Afghanistan	6.6	3
2004/05/01	Taiwan	5.2	2
2004/05/08	Pakistan	4.4	1
2004/05/28	Northern Iran	6.3	35
2004/07/01	Eastern Turkey	5.4	18
2004/07/12	Slovenia	5.0	1
2004/07/18	North Island of New Zealand	5.6	1
2004/07/18	Central Afghanistan	5.1	2
2004/07/30	Eastern Turkey	4.8	1
2004/08/10	Hindu Kush Region, Afghanistan	6.0	2
2004/08/10	Sichuan-Yunnan Region, China	5.1	4
2004/08/11	Eastern Turkey	5.7	1
2004/09/07	Catamarca, Argentina	6.4	1
2004/09/15	Bali Region, Indonesia	5.2	1
2004/10/23	West Coast of Honshu, Japan	6.6	40
2004/11/11	Kepulauan Alor, Indonesia	7.5	34
2004/11/20	Costa Rica	6.4	8
2004/11/21	Leeward Islands	6.3	1
2004/11/26	Papua, Indonesia	7.1	32
2004/12/01	Papua, Indonesia	5.5	1
2004/12/26	West Coast of Northern Sumatra	9.0	283 106
	Összesen / Total		284 012

A 7.0 vagy annál nagyobb magnitúdójú földrengések a világon 2004-ben

Earthquakes of magnitude 7.0 and greater in 2004

	Év Year	Hónap Month	Nap Day	Idő Time (UTC)	Szélesség Latitude	Hosszúság Longitude	Mélység Depth (km)	Magnitúdó Magnitude	Ország, terület Region
1	2004	01	03	16:23:21.0	-22.253	169.683	22	7.1	Southeast of the Loyalty Islands
2	2004	02	05	21:05:02.8	-3.615	135.538	17	7.0	Papua, Indonesia
3	2004	02	07	02:42:35.2	-4.003	135.023	10	7.3	South Coast of Papua, Indonesia
4	2004	07	15	04:27:14.7	-17.656	-178.760	566	7.1	Fiji Region
5	2004	07	25	14:35:19.0	-2.427	103.981	582	7.3	Southern Sumatra, Indonesia
6	2004	09	05	10:07:07.8	33.059	136.635	14	7.2	South Coast of Western Honshu, Japan
7	2004	09	05	14:57:18.5	33.192	137.064	10	7.4	South Coast of Honshu, Japan
8	2004	11	11	21:26:41.1	-8.152	124.868	10	7.5	Kepulauan Alor, Indonesia
9	2004	11	15	09:06:56.5	4.695	-77.508	15	7.2	Near the West Coast of Colombia
10	2004	11	22	20:26:23.9	-46.676	164.721	10	7.1	West Coast of the South Island, N.Z.
11	2004	11	26	02:25:03.3	-3.609	135.404	10	7.1	Papua, Indonesia
12	2004	11	28	18:32:14.1	43.006	145.119	39	7.0	Hokkaido, Japan Region
13	2004	12	23	14:59:03.6	-50.145	160.365	10	8.1	North of Macquarie Island
14	2004	12	26	00:58:53.4	3.300	95.963	30	9.0	West Coast of Northern Sumatra
15	2004	12	26	04:21:29.6	6.880	92.945	39	7.1	Nicobar Islands, India Region

A 6.5 vagy annál nagyobb magnitúdójú, és a jelentősebb károkat okozó földrengések a világon 2004-ben

Earthquakes of magnitude 6.5 or greater or ones that caused fatalities, injuries or substantial damage in 2004

DÁTUM	IDŐ Ó M S	KOORDINÁTA SZÉL	HOSSZ	MÉLYSÉG KM	MAG		ÁLLOMÁS SZÁM	RÉGIÓ, TOVÁBBI MAGNITÚDÓK, MEGJEGYZÉSEK
DATE UTC	ORIGIN TIME UTC HR MN SEC	GEOGRAPHIC COORDINATES LAT	LONG	DEPTH	MAG	SD	NO. STA USED	REGION, ADDITIONAL MAGNITUDES AND COMMENTS
JAN 01	20 59 31.9	8.310 S	115.788 E	45	5.8	1.0	119	BALI REGION, INDONESIA. MW 5.8 (GS), 5.8 (HRV). mb 5.5 (GS). MS 5.4 (GS). Mo 6.6*10**17 Nm (HRV), 5.6*10**17 Nm (GS). At least one person killed, 22 injured and 2,000 buildings damaged on Lombok. At least seven people injured and 4,000 buildings damaged on Bali. Felt (VI) at Karangasem, Bali and (V) at Mataram, Lombok.
JAN 03	16 23 21.0	22.253 S	169.683 E	22 G	7.1	1.1	597	SOUTHEAST OF THE LOYALTY ISLANDS. MW 7.1 (HRV), 6.8 (GS). mb 6.4 (GS). MS 7.1 (GS). ME 7.1 (GS). Mo 5.9*10**19 Nm (HRV), 1.6*10**19 Nm (GS), 8.2*10**19 Nm (PPT). Es 8.7*10**14 Nm (GS). Felt on Mare and at Noumea, New Caledonia.
JAN 10	18 38 14.8	36.852 N	3.418 E	10 G	4.5	1.0	190	NORTHERN ALGERIA. mb 4.5 (GS). MS 4.4 (GS). ML 4.6 (LDG). Three hundred people injured and additional damage to buildings in the Algiers-Boumerdes area previously weakened by the event of May 21, 2003.
JAN 25	11 43 11.8	16.830 S	174.196 W	130 D	6.7	0.8	732	TONGA. MW 6.7 (GS), 6.7 (HRV). mb 6.4 (GS). ME 6.6 (GS). Mo 1.1*10**19 Nm (GS), 1.1*10**19 Nm (HRV). Es 1.6*10**14 Nm (GS). Felt in the Vava'u Group.
JAN 28	22 15 30.7	3.120 S	127.400 E	17	6.7	1.1	243	SERAM, INDONESIA. MW 6.7 (GS), 6.7 (HRV). mb 6.0 (GS). MS 6.5 (GS). ME 7.0 (GS). ML 6.7 (DJA). Mo 1.2*10**19 Nm (GS), 1.1*10**19 Nm (HRV), 9.1*10**18 Nm (PPT). Es 6.4*10**14 Nm (GS). Felt (V) at Namlea, Buru and (II) on Ambon. A local tsunami was observed at Namlea.
FEB 04	11 59 47.6	8.358 N	82.877 W	29 D	6.1	0.9	465	PANAMA-COSTA RICA BORDER REGION. MW 6.1 (GS), 6.1 (HRV). mb 5.6 (GS). MS 5.9 (GS). ME 6.8 (GS). Mo 1.6*10**18 Nm (HRV), 1.5*10**18 Nm (GS). Es 3.1*10**14 Nm (GS). Four people injured, three houses damaged and a bridge collapsed in Chiriqui, Panama. Felt in Bocas del Toro, Panama. Felt strongly in southern Costa Rica, the Valle Central and at Limon.
FEB 05	21 05 02.8	3.615 S	135.538 E	17	7.0	1.0	367	PAPUA, INDONESIA. MW 7.0 (HRV), 6.8 (GS). mb 6.1 (GS). MS 7.1 (GS). ME 6.7 (GS). Mo 3.4*10**19 Nm (HRV), 1.8*10**19 Nm (GS), 7.2*10**19 Nm (PPT). Es 2.8*10**14 Nm (GS). At least 37 people killed, 682 injured, 2,678 buildings damaged or destroyed and nine bridges damaged in the epicentral area. The airport runway was damaged and power outages occurred in the Nabire area. Felt (VI) at Nabire, (V) at Enarotali and (IV) at Manokwari. Also felt at Tembagapura.
FEB 07	02 42 35.2	4.003 S	135.023 E	10 G	7.3	1.0	390	NEAR THE SOUTH COAST OF PAPUA, INDONESIA. MW 7.3 (GS), 7.3 (HRV), 7.1 (OBN). mb 6.2 (GS). MS 7.5 (GS). ME 7.5 (GS). Mo 9.7*10**19 Nm (GS), 1.0*10**20 Nm (HRV), 7.2*10**20 Nm (PPT), 5.0*10**19 Nm (OBN). Es 4.0*10**15 Nm (GS). Additional damage in the Nabire area.
FEB 08	08 58 51.8	3.665 S	135.339 E	26	6.7	1.1	256	PAPUA, INDONESIA. MW 6.7 (HRV), 6.5 (GS). mb 5.7 (GS). MS 6.9 (GS). ME 6.6 (GS). Mo 7.2*10**18 Nm (GS), 1.2*10**19 Nm (HRV). Es 1.5*10**14 Nm (GS). Felt (VI) at Nabire.
FEB 11	08 15 03.8	31.675 N	35.551 E	27 D	5.3	0.9	386	DEAD SEA REGION. MW 5.3 (HRV). mb 5.1 (GS). MS 4.8 (GS). ML 5.2 (GII). Mo 1.1*10**17 Nm (HRV). Four people injured in western Jordan and a landslide occurred at Ma'in. Minor damage to buildings at Jerusalem, Petah-Tiqwa, Tel Aviv and in the Nablus area. Felt from Cairo, Egypt to Lebanon.

FEB 14 10 30 22.1 34.774 N 73.216 E 11 G 5.5 0.9 353 PAKISTAN. MW 5.5 (GS), 5.4 (HRV). mb 5.4 (GS). MS 5.2 (GS). Mo 1.9*10**17 Nm (GS), 1.6*10**17 Nm (HRV). At least 24 people killed, including 14 by landslides, and about 40 injured in the Balakot-Batgram-Mansehra area. More than 1,420 buildings collapsed, 5,379 damaged and roads cracked and blocked by landslides in the area. About 20 percent of water wells damaged in Manshera. Felt throughout the North-West Frontier Province. Power and telephone cables damaged at Srinagar, Kashmir. Also felt at Gulmarg, Kashmir and Kabul, Afghanistan.

FEB 14 11 56 57.5 34.798 N 73.206 E 11 G 5.4 0.8 369 PAKISTAN. MW 5.4 (GS), 5.3 (HRV). mb 5.4 (GS). MS 5.1 (GS). Mo 1.2*10**17 Nm (GS), 1.1*10**17 Nm (HRV). Casualties and damage included with the event at 10:30 UTC.

FEB 16 14 44 39.9 0.466 S 100.655 E 56 5.1 0.9 199 SOUTHERN SUMATRA, INDONESIA. MW 5.1 (HRV). mb 5.2 (GS). MS 4.5 (GS). Mo 4.6*10**16 Nm (HRV). At least 5 people killed, 7 injured and more than 100 houses damaged in the Padangpanjang area. Felt (V) at Padangpanjang; (IV) at Batusangkar, Bukittingi and Padang; (II) at Pekanbaru.

FEB 21 02 34 42.7 58.425 S 14.963 W 10 G 6.6 1.3 102 EAST OF THE SOUTH SANDWICH ISLANDS. MW 6.6 (GS), 6.6 (HRV). mb 6.0 (GS). MS 6.5 (GS). Mo 9.5*10**18 Nm (HRV), 8.4*10**18 Nm (GS), 1.5*10**19 Nm (PPT).

FEB 22 06 46 27.0 1.559 S 100.488 E 42 G 6.0 0.8 611 SOUTHERN SUMATRA, INDONESIA. MW 6.0 (GS), 6.0 (HRV). mb 6.3 (GS). MS 5.7 (GS). ME 6.3 (GS). Mo 1.3*10**18 Nm (GS), 1.2*10**18 Nm (HRV). Es 6.6*10**13 Nm (GS). One person injured, four houses badly damaged and many houses slightly damaged in Pesisir Selatan. Felt (V) at Padang and (III) at Bengkulu, Bukittinggi, Kapahiang and Padangpanjang. Felt on Singapore.

FEB 24 02 14 34.0 3.393 S 29.558 E 10 A 4.7 1.0 71 BURUNDI. mb 4.7 (GS). Three people killed and at least 24 houses destroyed at Ruyaga. Felt strongly at Bujumbura. Also felt at Bukavu, Congo; Kigali, Rwanda; Kabanga, Tanzania.

FEB 24 02 27 46.2& 35.142 N 3.997 W 0 G 6.4 786 STRAIT OF GIBRALTAR. <MDD>. MW 6.4 (GS), 6.4 (HRV). mb 6.2 (GS). MS 6.4 (GS). ME 6.9 (GS). Mo 4.8*10**18 Nm (GS), 3.9*10**18 Nm (HRV). Es 5.9*10**14 Nm (GS). At least 628 people killed, 926 injured, 2,539 homes destroyed and more than 15,000 people homeless in the Al Hoceima-Imzourene-Beni Abdallah area, Morocco. Maximum intensity IX in the Imzourene-Ait Kamra area. Ground cracks and landslides were observed between Ajdir and Beni Abdallah and maximum horizontal acceleration of 0.24g was recorded near Imzourene. Felt from Tetouan to Nador and as far south as Fes. Felt (V) at Melilla and (III) in many parts of southern Spain from Algeciras to Roquetas de Mar. Felt (II) at Cordoba, Granada, Huelva, Jaen and Madrid. Also felt in Gibraltar. Several aftershocks killed at least three people and destroyed previously weakened buildings. This earthquake occurred near the eastern end of the Rif mountain belt, which is part of the diffuse boundary between the African and Eurasian plates. The moment tensors and pattern of surface cracks indicate left-lateral strike-slip faulting on a buried NE-SW trending fault. This quake occurred near the epicenter of the magnitude 6.0 Al Hoceima earthquake of May 26, 1994, that injured one person and caused significant damage to adobe buildings. Special reports for this earthquake are available on the website http://www.emsc-csem.org.

FEB 25 12 44 57.4 35.278 N 4.113 W 10 D 5.3 1.1 283 STRAIT OF GIBRALTAR. MW 5.3 (HRV). mb 4.9 (GS). MS 4.9 (GS). Mo 8.9*10**16 Nm (HRV). Casualties and damage are included with the event at 02:24 UTC. Felt (III) at Melilla and (II) at Estepona, Spain.

FEB 26 12 07 04.2 35.233 N 4.182 W 11 D 5.0 1.1 272 STRAIT OF GIBRALTAR. MW 5.0 (HRV). mb 4.8 (GS). MS 4.5 (GS). Mo 3.1*10**16 Nm (HRV). Casualties and damage are included with the event at 02:24 UTC. Felt (III) at Melilla and (II) at Benalmedena, Spain.

MAR 01 23 55 19.0& 38.058 N 38.277 E 5 G 3.8 6 EASTERN TURKEY. <ISK>. MD 3.8 (ISK). At least six people killed at Celikhan.

MAR 24 01 53 49.4 45.382 N 118.256 E 19 D 5.5 0.9 447 EASTERN NEI MONGOL, CHINA. MW 5.5 (GS), 5.4 (HRV). mb 5.6 (GS). MS 5.2 (GS). Mo 1.9*10**17 Nm (GS), 1.5*10**17 Nm (HRV). At least 100 people injured and 38,000 buildings damaged in the Bayan Ul Hot-Uliastai area. Felt at Chaoyang, Chengde and

Baicheng. Damage from this earthquake and the aftershocks estimated at 74 million U.S. dollars.

MAR 25 19 30 49.0 39.930 N 40.812 E 10 G 5.6 1.1 237 EASTERN TURKEY. MW 5.6 (GS), 5.6 (HRV). mb 5.0 (GS). MS 5.4 (GS). Mo 2.9*10**17 Nm (HRV), 2.4*10**17 Nm (GS). At least ten people killed, 46 injured and 45 buildings damaged or destroyed in Erzurum.

MAR 28 03 51 10.0& 39.847 N 40.874 E 5 5.6 509 EASTERN TURKEY. <ISK>. MW 5.6 (HRV), 5.5 (GS). mb 5.3 (GS). MS 5.3 (GS). ML 5.3 (ISK). Mo 2.7*10**17 Nm (HRV), 2.1*10**17 Nm (GS). At least 12 people injured, more than 50 buildings in 10 villages damaged or destroyed and many livestock killed in the Askale area.

APR 03 23 02 00.8 36.428 N 141.008 E 31 G 6.0 0.7 528 NEAR THE EAST COAST OF HONSHU, JAPAN. MW 6.0 (HRV), 5.9 (GS). mb 5.7 (GS). MS 5.6 (GS). ME 5.3 (GS). Mo 8.9*10**17 Nm (GS), 1.0*10**18 Nm (HRV). Es 2.2*10**12 Nm (GS). At least one person slightly injured at Naka. Felt strongly in Chiba, Fukushima, Ibaraki, Miyagi, Saitama and Tochigi Prefectures. Felt in much of east-central Honshu. Recorded (4 JMA) in Ibaraki and Tochigi; (3 JMA) in Chiba, Fukushima, Gumma, Miyagi, Saitama and Tokyo; (2 JMA) in Iwate, Kanagawa, Nagano, Niigata, Shizuoka, Yamagata and Yamanashi; (1 JMA) in Akita and Aomori Prefectures.

APR 05 21 24 04.0 36.512 N 71.029 E 187 D 6.6 1.0 728 HINDU KUSH REGION, AFGHANISTAN. MW 6.6 (GS), 6.5 (HRV). mb 6.4 (GS). Mo 7.5*10**18 Nm (GS), 6.2*10**18 Nm (HRV). At least one person killed in the Shahr-e Bozorg area and two people killed at Kabul. At least five people injured in Pakistan. Felt at Delhi and Guragon, India; Srinigar, Kashmir; Islamabad and Lahore, Pakistan; Dushanbe, Tajikistan; Tashkent, Uzbekistan.

APR 09 15 23 35.0 13.174 S 167.198 E 228 D 6.5 1.1 424 VANUATU. MW 6.5 (GS), 6.4 (HRV). mb 5.8 (GS). Mo 5.5*10**18 Nm (GS), 4.5*10**18 Nm (HRV).

APR 13 21 47 23.0& 40.729 N 31.629 E 5 4.1 116 WESTERN TURKEY. <ISK>. mb 4.1 (GS). ML 4.6 (ISK). Four people injured jumping from buildings in the Bolu area.

APR 23 01 50 30.2 9.362 S 122.839 E 66 D 6.7 1.1 386 SAVU SEA. MW 6.7 (GS), 6.7 (HRV). mb 6.5 (GS). Mo 1.1*10**19 Nm (GS), 1.1*10**19 Nm (HRV), 9.5*10**18 Nm (PPT). Minor damage at Kupang, Timor. Felt (IV) at Maumere and (II) at Rote, Flores; (III) at Sabu, Timor; (III) at Waingapu, Sumba. Felt in much of Timor. Also felt at Darwin, Kununurra and Wyndham, Australia.

MAY 01 07 56 13.6 24.101 N 121.589 E 44 5.2 0.9 168 TAIWAN. mb 5.2 (GS). MS 5.1 (GS). At least 2 people killed and 1 injured by a rockslide in Hua-lien County. Bridge collapsed at Taroko Gorge National Park. Felt in most parts of the Island. Recorded (7 TAP) in Hua-lien; (5 TAP) in I-lan; (3 TAP) in Nan-t'ou, T'ai-chung and Yun-lin; (2 TAP) in Chia-i, Hsin-chu, Miao-li, T'ai-pei, T'ai-tung and T'ao-yuan; (1 TAP) in Kao-hsiung and T'ai-nan.

MAY 03 04 36 50.1 37.665 S 73.420 W 21 G 6.6 1.3 216 NEAR THE COAST OF CENTRAL CHILE. MW 6.6 (GS), 6.6 (HRV). mb 5.9 (GS). MS 6.5 (GS). ME 6.1 (GS). ML 6.4 (GUC). Mo 8.4*10**18 Nm (GS), 1.0*10**19 Nm (HRV), 8.4*10**18 Nm (PPT). Es 3.6*10**13 Nm (GS). Minor damage (VI)and power outages occurred at Canete. Felt (VI) at Angol, Concepcion, Los Angeles, Talcahuano and Victoria; (V) at Lebu, Lonquimay, Temuco, Valdivia and Villarica; (IV) at Cauquenes, Chillan, Linares and Talca; (III) at Curico, Osorno, Rancagua and San Fernando; (II) at Santiago. Also felt at Chiguayante.

MAY 08 20 11 44.6 30.173 N 66.981 E 10 G 4.4 0.9 40 PAKISTAN. mb 4.4 (GS). At least one person killed, about 30 injured and minor damage to some buildings in the Quetta area.

MAY 28 12 38 44.2 36.249 N 51.622 E 17 G 6.3 0.9 704 NORTHERN IRAN. MW 6.3 (HRV), 6.2 (GS). mb 6.2 (GS). MS 6.4 (GS). ME 6.1 (GS). Mo 3.3*10**18 Nm (HRV), 2.5*10**18 Nm (GS). Es 3.1*10**13 Nm (GS). At least 35 people killed, 400 injured and many buildings damaged in Mazandaran and Qazvin Provinces. Some of the deaths were caused by landslides on the Tehran-Chalus road. Infrastructures damaged in the epicentral area. Minor damage reported in Tehran. Felt in much of central and northern Iran.

MAY 29 20 56 09.6 34.251 N 141.406 E 16 G 6.5 1.0 352 OFF THE EAST COAST OF HONSHU, JAPAN. MW 6.5 (GS), 6.3 (HRV). mb 5.6 (GS). MS 6.6 (GS). ME 5.9 (GS). Mo 6.9*10**18 Nm (GS), 3.2*10**18 Nm (HRV). Es 1.8*10**13 Nm (GS). Felt along the coast of eastern Honshu. Recorded (1 JMA) in Chiba, Kanagawa, Miyagi

and Shizuoka Prefectures.

JUN 10 15 19 57.7 55.682 N 160.003 E 189 D 6.9 0.8 798 KAMCHATKA PENINSULA, RUSSIA. MW 6.9 (GS), 6.9 (HRV). mb 6.1 (GS). Mo 2.9*10**19 Nm (GS), 2.3*10**19 Nm (HRV), 4.1*10**19 Nm (PPT).

JUN 28 09 49 47.0& 54.800 N 134.250 W 20 G 6.8 772 QUEEN CHARLOTTE ISLANDS REGION. <PGC>. MW 6.8 (GS), 6.8 (HRV). mb 5.9 (GS). MS 6.8 (GS). ME 6.8 (GS). Mo 1.9*10**19 Nm (GS), 1.8*10**19 Nm (HRV), 2.8*10**19 Nm (PPT). Es 3.0*10**14 Nm (GS). Felt strongly on the northern Queen Charlotte Islands. Also felt throughout the rest of the Queen Charlotte Islands and along the northwest coast of British Columbia at Kitimat, Prince Rupert, Stewart and Terrace. Felt (VI) at Craig; (V) at Klawock, Metlakatla and Petersburg; (IV) at Hyder, Juneau and Ketchikan; (III) at Sitka and Wrangell, Alaska.

JUL 01 22 30 09.3 39.766 N 43.979 E 5 G 5.4 1.1 422 EASTERN TURKEY. mb 5.4 (GS). MS 4.8 (GS). At least 18 people killed and 21 injured in the Dogubeyazit area.

JUL 12 13 04 07.1 46.296 N 13.641 E 8 5.0 1.0 476 SLOVENIA. mb 5.0 (GS). MS 4.9 (GS). ML 5.7 (STR), 5.6 (LDG), 5.6 (BRG), 5.5 (FBB), 5.5 (FUR), 5.4 (ZAMG), 5.4 (PDG), 4.9 (LJU). One person killed and 5 injured by a rockslide in the Bovec area. Some houses destroyed and others damaged at Kobarid. Felt in Ljubljana. Felt in northeastern Italy as far south as Venice and southern Austria as far northeast as Vienna. Also felt at Zagreb, Croatia; Munich, Germany; Prague, Czech Republic.

JUL 15 04 27 14.7 17.656 S 178.760 W 566 D 7.1 0.9 208 FIJI REGION. MW 7.1 (HRV), 7.0 (GS). mb 6.4 (GS). Mo 4.8*10**19 Nm (HRV), 4.1*10**19 Nm (GS).

JUL 18 04 22 22.6& 38.000 S 176.510 E 5 5.6 92 NORTH ISLAND OF NEW ZEALAND. <WEL>. MW 5.6 (GS), 5.4 (HRV). mb 5.1 (GS). MS 5.1 (GS). Mo 2.5*10**17 Nm (GS), 1.5*10**17 Nm (HRV). One person killed and two injured in the Rotorua-Tauranga area. Five houses heavily damaged at Lake Roto Ma. Landslides occurred on the highway between Lake Rotoiti and Lake Roto Ma. Felt from Tauranga to Whakatane. This is the largest of a series of earthquakes in the Lake Rotoiti area.

JUL 18 08 31 45.8 33.426 N 69.524 E 10 G 5.1 1.4 216 CENTRAL AFGHANISTAN. mb 5.1 (GS). MS 4.8 (GS). Two people killed, 40 injured and hundreds of houses destroyed in Paktia Province.

JUL 25 14 35 19.0 2.427 S 103.981 E 582 D 7.3 0.9 641 SOUTHERN SUMATRA, INDONESIA. MW 7.3 (GS), 7.3 (HRV). mb 6.8 (GS). Mo 9.8*10**19 Nm (GS), 1.0*10**20 Nm (HRV). Felt (IV) at Bengkulu and (III) at Padangpanjang. Felt (III) at Bandung, Bogor, Sawahan and Sukabumi; (II) at Jakarta, Java. Also felt (III) at Mataram, Lombok. Felt throughout Bali, Java, Lombok and Sumatra. Also felt in southern Johor, Malaysia and on Singapore.

JUL 28 03 56 28.6 0.443 S 133.091 E 13 D 6.5 1.1 305 NEAR THE NORTH COAST OF PAPUA, INDONESIA. MW 6.5 (HRV), 6.4 (GS). mb 6.0 (GS). MS 6.3 (GS). Mo 5.8*10**18 Nm (HRV), 4.6*10**18 Nm (GS). Felt (IV) at Manokwari and Sorong.

JUL 30 07 14 07.8& 39.634 N 43.966 E 5 4.8 132 EASTERN TURKEY. <ISK>. mb 4.8 (GS). MS 4.0 (GS). At least one person killed, 5 injured and some houses damaged in the Dogubeyazit area.

AUG 04 03 01 07.5 36.833 N 27.815 E 10 G 5.5 1.3 412 DODECANESE ISLANDS, GREECE. MW 5.5 (GS), 5.5 (HRV). mb 5.1 (GS). MS 5.2 (GS). ML 5.4 (ATH). Mo 2.3*10**17 Nm (HRV), 1.9*10**17 Nm (GS). Fifteen people injured at Bodrum, Turkey. Felt at Akyaka, Datca, Didim, Fethiye, Gocek, Marmaris and Mugla, Turkey. Also felt on Kos and Rhodes.

AUG 10 01 47 32.8 36.444 N 70.796 E 207 D 6.0 0.9 492 HINDU KUSH REGION, AFGHANISTAN. MW 6.0 (GS), 6.0 (HRV). mb 5.3 (GS). Mo 1.2*10**18 Nm (HRV), 1.1*10**18 Nm (GS). At least two people injured in Mansehra, Pakistan. Felt in Balkh, Kabul, Kondoz and Takhar, Afghanistan. Also felt at Chitral, Islamabad, Lahore, Peshawar, Rawalpindi and Swat, Pakistan; Dushanbe, Tajikistan; Gurgaon, India; Ashgabat, Turkmenistan; and Tashkent, Uzbekistan.

AUG 10 10 26 14.7 27.266 N 103.873 E 6 * 5.1 1.2 203 SICHUAN-YUNNAN-GUIZHOU REGION, CHINA. mb 5.1 (GS). MS 5.1 (GS). At least 4 people killed, nearly 200 seriously injured, 400 slightly injured, more than 120,000 homeless, 18,556 houses destroyed and 65,601 damaged in Ludian County, Yunnan. Twenty-two reservoirs damaged in Yunnan Province.

AUG 11 15 48 26.8 38.377 N 39.261 E 7 5.7 1.1 487 EASTERN TURKEY. MW 5.7 (HRV), 5.6 (GS). mb 5.3 (GS). MS 5.5 (GS).

Mo 3.4*10**17 Nm (HRV), 2.8*10**17 Nm (GS). One person killed, 11 people injured and several houses damaged in the Elazig-Sivrice area.

AUG 28 13 41 27.9 34.931 S 70.387 W 1 6.5 1.0 298 LIBERTADOR O'HIGGINS, CHILE. MW 6.5 (GS), 6.5 (HRV). mb 6.1 (GS). MS 6.3 (GS). ML 6.2 (GUC). MD 6.2 (SJA). Mo 6.7*10**18 Nm (GS), 6.3*10**18 Nm (HRV), 9.0*10**18 Nm (PPT). Power outages occurred at Cauquenes, Curico, San Javier and Talca. Felt (VI) at Curico, Romeral, Talca and Vichuquen; (V) at Cauquenes, Linares, Quillota, Rancagua, Santiago, Valparaiso and Vina del Mar; (IV) at Chillan, Concepcion, Los Andes, Quilpue and San Felipe; (III) at Cabildo; (II) at Los Angeles. Also felt (IV) at General Alvear and San Rafael; (III) at Mendoza, Neuquen and Santa Rosa; (II) at Buenos Aires and Cordoba, Argentina.

SEP 05 10 07 07.8 33.070 N 136.618 E 14 G 7.2 0.9 643 NEAR S. COAST OF WESTERN HONSHU, JAPAN. MW 7.2 (HRV), 7.0 (GS). mb 6.7 (GS). MS 7.0 (GS). ME 7.3 (GS). Mo 7.9*10**19 Nm (HRV), 4.0*10**19 Nm (GS), 5.2*10**19 Nm (PPT). Es 1.9*10**15 Nm (GS). At least four people injured in the Kyoto area. Felt in much of southwestern Japan and as far northeast as Tokyo. A local tsunami was generated with a wave height (peak-to-trough) of about 51 cm in Wakayama Prefecture. Recorded (5L JMA) in Mie, Nara and Wakayama; (4 JMA) in Aichi, Gifu, Hyogo, Kyoto, Osaka and Shiga; (3 JMA) in Chiba, Fukui, Hiroshima, Kanagawa, Nagano, Okayama, Shimane, Shizuoka, Tokyo, Tottori and Yamanashi; (2 JMA) in Gumma, Ishikawa, Saitama, Tochigi, Toyama and Yamaguchi; (1 JMA) in Ibaraki, Miyagi and Niigata Prefectures. Recorded (3 JMA) in Kagawa, Kochi and Tokushima; (2 JMA) in Ehime Prefectures, Shikoku. Recorded (1 JMA) in Kagoshima, Kumamoto, Miyazaki and Oita Prefectures, Kyushu. Also recorded (3 JMA) on Kozu-shima, Nii-jima and O-shima; (2 JMA) on Hachijo-jima, Mikura-jima and Miyake-jima; (1 JMA) on Dogo and in the Dozen Islands.

SEP 05 14 57 18.6 33.184 N 137.071 E 10 G 7.4 0.9 594 NEAR THE SOUTH COAST OF HONSHU, JAPAN. MW 7.4 (GS), 7.4 (HRV). mb 6.2 (GS). MS 7.1 (GS). ME 7.4 (GS). Mo 1.5*10**20 Nm (HRV), 1.2*10**20 Nm (GS), 1.1*10**20 Nm (PPT). Es 2.8*10**15 Nm (GS). About forty people injured in the Kyoto area. Felt in much of southwestern Japan and as far north as Tokyo. Tsunamis were observed with wave heights of 86 cm at Kushimoto and 56 cm at Owase. Power outages occured at Wakayama and a fire occurred at Sakai. Recorded (5L JMA) in Wakayama and Mie; (4 JMA) in Aichi, Fukui, Gifu, Hyogo, Kyoto, Nara, Osaka, Shiga and Tottori; (3 JMA) in Chiba, Hiroshima, Ishikawa, Kanagawa, Nagano, Okayama, Shimane, Shizuoka, Tokyo and Yamanashi; (2 JMA) in Gumma, Ibaraki, Niigata, Saitama, Tochigi and Yamaguchi; (1 JMA) in Miyagi Prefectures. Recorded (3 JMA) in Kagawa, Kochi and Tokushima; (2 JMA) in Ehime Prefectures, Shikoku. Recorded (1 JMA) in Fukuoka, Kumamoto, Miyazaki, Oita and Saga Prefectures, Kyushu. Also recorded (3 JMA) on Hachijo-jima, Kozu-shima, Miyake-jima, Nii-jima and O-shima; (2 JMA) on Dogo, Mikura-jima and in the Dozen Islands; (1 JMA) on Sadago-shima.

SEP 06 12 42 59.3 55.372 S 28.976 W 10 G 6.9 1.1 233 SOUTH SANDWICH ISLANDS REGION. MW 6.9 (GS), 6.8 (HRV). mb 6.0 (GS). MS 6.5 (GS). Mo 2.5*10**19 Nm (GS), 2.1*10**19 Nm (HRV), 2.0*10**19 Nm (PPT).

SEP 06 23 29 35.0 33.205 N 137.227 E 10 G 6.7 0.8 478 NEAR THE SOUTH COAST OF HONSHU, JAPAN. MW 6.7 (HRV), 6.5 (GS). mb 6.4 (GS). MS 6.3 (GS). Mo 6.3*10**18 Nm (GS), 1.1*10**19 Nm (HRV), 6.4*10**18 Nm (PPT). Felt in southwestern Honshu from Kobe to Tokyo. Recorded (4 JMA) in Osaka, Mie, Shizuoka and Wakayama; (3 JMA) in Aichi, Fukui, Hyogo, Kanagawa, Kyoto, Nara, Shiga, Tottori and Yamanashi; (2 JMA) in Chiba, Hiroshima, Ishikawa, Nagano, Okayama, Saitama, Shimane, Tokyo and Toyama; (1 JMA) in Gumma, Miyagi, Niigata and Yamaguchi Prefectures. Recorded (3 JMA) in Tokushima and (2 JMA) in Ehime, Kagawa and Kochi Prefectures, Shikoku. Also recorded (3 JMA) on Kozu-shima, Nii-jima and O-shima; (2 JMA) on Aoga-shima, Hachijo-jima, Mikura-jima and Miyake-jima.

SEP 07 11 53 06.1 28.573 S 65.840 W 22 D 6.4 0.8 360 CATAMARCA, ARGENTINA. MW 6.4 (GS), 6.2 (HRV). mb 6.1 (GS). MS 6.1 (GS). Mo 4.2*10**18 Nm (GS), 2.0*10**18 Nm (HRV), 1.4*10**18 Nm (PPT). At least one person killed, several people injured and some buildings damaged (VI) at Catamarca. Felt (III) at San Juan. Also felt throughout Argentina as far as Buenos Aires and in parts of Chile.

SEP 07 12 15 49.7 34.682 N 103.781 E 10 A 5.2 0.8 108 GANSU, CHINA. mb 5.2 (GS). At least nineteen people injured, 600 houses destroyed and more than 3,800 houses damaged in Gansu Province.

SEP 15 08 35 10.8 8.773 S 115.357 E 98 5.2 1.1 157 BALI REGION, INDONESIA. mb 5.2 (GS). One person killed and two injured at Denpasar. Felt (V) at Mataram, Lombok and (II) at Banyuwangi, Java.

SEP 21 13 32 30.8 54.841 N 19.912 E 10 A 4.7 1.2 224 POLAND. MW 4.7 (HRV). mb 4.9 (GS). ML 4.8 (CLL), 4.7 (BRG). Mo 1.4*10**16 Nm (HRV). At least three people injured and seventeen houses damaged at Kaliningrad, Russia. Damage to railroad tracks near Svetlogorsk, Russia. Minor damage occured at Suwalki, Poland. Felt throughout Belarus, Estonia, Latvia, Lithuania and northern Poland. Also felt in the areas of Copenhagen, Denmark; Helsinki, Finland; Oslo, Norway; and in southern Sweden.

OCT 06 14 40 39.9 35.950 N 139.919 E 64 D 5.8 0.8 405 NEAR THE SOUTH COAST OF HONSHU, JAPAN. MW 5.8 (HRV), 5.7 (GS). mb 5.5 (GS). Mo 4.8*10**17 Nm (HRV), 4.5*10**17 Nm (GS). One person injured and two houses damaged at Temma. Felt in Chiba, Gumma, Ibaraki, Kanagawa, Nagano, Shizuoka and Tokyo Prefectures. Recorded (5L JMA) in Ibaraki, Saitama and Tochigi; (4 JMA) in Chiba, Gumma, Kanagawa and Tokyo; (3 JMA) in Fukui, Nagano, Shizuoka and Yamanashi; (2 JMA) in Miyagi; (1 JMA) in Aichi, Gifu, Iwate and Yamagata Prefectures. Also recorded (2 JMA) on O-shima and (1 JMA) on Hachijo-jima, Kozu-shima, Miyake-jima and Nii-jima.

OCT 07 21 46 20.3 37.125 N 54.477 E 35 D 5.6 0.8 526 NORTHERN IRAN. MW 5.6 (GS), 5.6 (HRV). mb 5.6 (GS). MS 5.4 (GS). ML 6.0 (THR). Mo 3.1*10**17 Nm (GS), 3.1*10**17 Nm (HRV). At least 60 people injured in Golestan. Felt as far west as Tehran.

OCT 08 08 27 53.5 10.951 S 162.161 E 36 G 6.8 0.9 545 SOLOMON ISLANDS. MW 6.8 (GS), 6.8 (HRV). mb 6.1 (GS). MS 6.9 (GS). ME 6.7 (GS). Mo 1.6*10**19 Nm (HRV), 1.5*10**19 Nm (GS). Es 2.9*10**14 Nm (GS).

OCT 08 14 36 06.1 13.925 N 120.534 E 105 G 6.5 0.9 526 MINDORO, PHILIPPINES. MW 6.5 (GS), 6.4 (HRV). mb 6.3 (GS). ME 6.3 (GS). Mo 6.6*10**18 Nm (GS), 5.3*10**18 Nm (HRV), 5.1*10**18 Nm (PPT). Es 7.1*10**13 Nm (GS). Power outages occurred in the Manila area, Luzon. Felt (V PIVS) at Puerto Galera. Also felt (V PIVS) at Los Banos, Malolos, San Fernando and Tagaytay; (IV PIVS) at Bataan, Buco, Infanta, Lucban, Manila, Pasay, Pasig, Taguig and Talisay; (III PIVS) at Clark Field and Quezon City, Luzon. Felt on Mindoro and throughout central and southern Luzon.

OCT 09 21 26 53.6 11.422 N 86.665 W 35 G 6.9 1.1 441 NEAR THE COAST OF NICARAGUA. MW 6.9 (HRV), 6.8 (GS). mb 6.0 (GS). MS 7.0 (GS). ME 6.5 (GS). ML 6.8 (SNET). Mo 2.9*10**19 Nm (HRV), 2.0*10**19 Nm (GS), 3.2*10**19 Nm (PPT). Es 1.4*10**14 Nm (GS). Felt at Managua and in much of Nicaragua. Felt (IV) at San Salvador, El Salvador. Felt as far north as Tegucigalpa, Honduras and as far south as San Jose, Costa Rica.

OCT 15 04 08 50.2 24.530 N 122.694 E 94 6.7 0.9 698 TAIWAN REGION. MW 6.7 (GS), 6.6 (HRV). mb 6.4 (GS). ME 6.2 (GS). Mo 7.8*10**18 Nm (HRV), 1.1*10**19 Nm (GS). Es 4.5*10**13 Nm (GS). Several people injured and buildings damaged in T'ao-yuan County. Felt throughout Taiwan. Also felt in much of the Ryukyu Islands, Japan. Recorded (5 TAP) in Hua-lien and I-lan; (4 TAP) in T'ai-chung, T'ai-pei, T'ai-tung, T'ao-yuan and Yun-lin; (3 TAP) in Chang-hua, Chia-i, Hsin-chu, Miao-li, Nan-t'ou and T'ai-nan; (2 TAP) in Kao-hsiung and P'ing-tung Counties. Also recorded (5L JMA) on Yonaguni-jima; (4 JMA) on Iriomote-jima and Ishigaki-jima; (3 JMA) on Miyako-jima; (2 JMA) on Tarama-shima; (1 JMA) on Amami-oshima and Kume-jima, Ryukyu Islands, Japan.

OCT 18 22 11 44.9 25.073 N 99.169 E 30 4.8 0.6 87 YUNNAN, CHINA. mb 4.8 (GS). MS 4.4 (GS). Twelve people injured and more than 20,000 houses damaged or destroyed in the Baoshan area. Felt strongly in Changning, Longling, Shidian and Tengchong Counties.

OCT 23 08 56 00.8 37.226 N 138.779 E 16 G 6.6 1.1 782 NEAR THE WEST COAST OF HONSHU, JAPAN. MW 6.6 (HRV), 6.4 (GS), 6.6 (NIED). mb 6.4 (GS). MS 6.3 (GS). ME 6.5 (GS). Mo 8.6*10**18 Nm (HRV), 3.8*10**18 Nm (GS), 7.5*10**18 Nm (NIED), 2.4*10**19 Nm (PPT). Es 1.2*10**14 Nm (GS). At least 40 people killed, 3,183 injured and 6,000 buildings destroyed or damaged in Niigata Prefecture. A high-speed train derailed; several roads, bridges and rail lines damaged; at least 1,300 landslides and 11 fires occurred; several gas, water and power lines damaged in Niigata

Prefecture. Felt in Chiba, Fukushima, Gumma, Kanagawa, Miyagi, Saitama and Tokyo Prefectures.

OCT 27 01 40 50.2 37.284 N 138.885 E 14 D 6.0 0.9 499 NEAR THE WEST COAST OF HONSHU, JAPAN. MW 6.0 (GS), 5.9 (HRV), 5.8 (NIED). mb 5.7 (GS). MS 5.4 (GS). Mo 8.0*10**17 Nm (HRV), 1.2*10**18 Nm (GS), 6.3*10**17 Nm (NIED). At least five people injured; one building destroyed and some others damaged; water and gas lines broke in Niigata Prefecture. Felt in Gumma, Kanagawa, Nagano, Saitama and Tokyo Prefectures. Recorded (6L JMA) in Niigata; (4 JMA) in Fukushima, Gumma and Saitama; (3 JMA) in Ibaraki, Ishikawa, Kanagawa, Miyagi, Nagano, Tochigi, Tokyo, Toyama, Yamagata and Yamanashi; (2 JMA) in Chiba, Gifu and Shizuoka; (1 JMA) in Aichi, Akita, Aomori, Osaka and Shiga Prefectures. Also recorded (4 JMA) on Sadoga-shima, (2 JMA) on Awa-shima and (1 JMA) on Hegura-jima and Tobi-shima.

NOV 02 10 02 12.8 49.277 N 128.772 W 10 G 6.7 1.2 459 VANCOUVER ISLAND, CANADA REGION. MW 6.7 (GS), 6.6 (HRV), 6.6 (PGC). mb 5.8 (GS). MS 6.4 (GS). ME 6.7 (GS). Mo 8.4*10**18 Nm (HRV), 1.1*10**19 Nm (GS), 1.1*10**19 Nm (PPT), 1.0*10**19 Nm (PGC). Es 2.8*10**14 Nm (GS). Felt at Alert Bay, Bamfield and Port Alice.

NOV 03 23 57 28.1 37.434 N 138.752 E 10 G 5.1 0.7 193 NEAR THE WEST COAST OF HONSHU, JAPAN. MW 5.1 (NIED). mb 5.4 (GS). MS 4.5 (GS). Mo 5.6*10**16 Nm (NIED). One person injured at Nagaoka. Felt in Niigata Prefecture. Recorded (5U JMA) in Niigata; (3 JMA) in Fukushima, Gumma, Ishikawa and Nagano; (2 JMA) in Ibaraki, Miyagi, Saitama, Tochigi, Toyama and Yamagata; (1 JMA) in Shizuoka and Tokyo Prefectures. Also recorded (3 JMA) on Sadoga-shima.

NOV 08 02 15 58.8 37.396 N 138.862 E 10 G 5.5 0.7 382 NEAR THE WEST COAST OF HONSHU, JAPAN. MW 5.5 (GS), 5.5 (HRV), 5.5 (NIED). mb 5.6 (GS). MS 5.0 (GS). Mo 2.3*10**17 Nm (HRV), 2.0*10**17 Nm (GS), 2.2*10**17 Nm (NIED). At least eight people injured and a landslide occurred in Niigata Prefecture. Recorded (5U JMA) in Niigata; (4 JMA) in Fukushima; (3 JMA) in Gumma, Ibaraki, Ishikawa, Nagano, Saitama and Yamagata; (2 JMA) in Kanagawa, Miyagi, Tochigi, Tokyo, Toyama and Yamanashi; (1 JMA) in Akita, Chiba and Shizuoka Prefectures. Also recorded (2 JMA) on Sadoga-shima and (1 JMA) on Hegura-jima.

NOV 09 18 43 08.4 37.368 N 138.825 E 10 5.1 0.8 211 NEAR THE WEST COAST OF HONSHU, JAPAN. MW 5.1 (NIED). mb 5.2 (GS). MS 4.6 (GS). Mo 4.4*10**16 Nm (NIED). One person injured at Mitsuke. Felt in northern Honshu. A minor landslide occurred near Tochio. Recorded (5L JMA) in Niigata; (3 JMA) in Fukushima; (2 JMA) in Gumma, Ibaraki, Ishikawa, Nagano, Saitama and Yamagata; (1 JMA) in Miyagi, Tokyo and Tochigi Prefectures. Also recorded (2 JMA) on Sadoga-shima.

NOV 09 23 58 23.6 11.150 S 163.706 E 13 G 6.9 1.0 405 SOLOMON ISLANDS. MW 6.9 (GS), 6.9 (HRV). mb 6.6 (GS). MS 6.7 (GS). ME 7.3 (GS). Mo 2.9*10**19 Nm (HRV), 2.2*10**19 Nm (GS), 5.4*10**19 Nm (PPT). Es 2.1*10**15 Nm (GS).

NOV 11 17 34 52.0 11.128 S 162.208 E 10 G 6.7 1.1 233 SOLOMON ISLANDS. MW 6.7 (GS), 6.6 (HRV). mb 5.8 (GS). MS 6.6 (GS). ME 6.5 (GS). Mo 1.2*10**19 Nm (GS), 1.0*10**19 Nm (HRV), 7.6*10**18 Nm (PPT). Es 1.2*10**14 Nm (GS).

NOV 11 21 26 41.1 8.152 S 124.868 E 10 G 7.5 1.1 301 KEPULAUAN ALOR, INDONESIA. MW 7.5 (HRV), 7.4 (GS). mb 6.5 (GS). MS 7.3 (GS). ME 7.4 (GS). Mo 2.3*10**20 Nm (HRV), 1.6*10**20 Nm (GS), 1.7*10**20 Nm (PPT). Es 2.9*10**15 Nm (GS). At least 34 people killed, 400 injured, 781 buildings destroyed and 16,712 damaged on Alor. Landslides blocked roads in some areas. Felt (VIII) at Kalabahi. Felt as far away as Dili, East Timor.

NOV 15 09 06 56.5 4.695 N 77.508 W 15 G 7.2 0.9 708 NEAR THE WEST COAST OF COLOMBIA. MW 7.2 (GS), 7.1 (HRV). mb 6.6 (GS). MS 7.1 (GS). ME 7.4 (GS). Mo 6.6*10**19 Nm (GS), 5.9*10**19 Nm (HRV), 4.6*10**19 Nm (PPT). Es 3.3*10**15 Nm (GS). Two people seriously injured, four others slightly injured, at least 154 buildings destroyed and 290 damaged in Bajo Baudo. Seven people injured and at least 67 houses destroyed or damaged at Buenaventura. One person injured and some buildings damaged at Cerrito. Buildings damaged at El Cairo, Jamundi and Restrepo. Some damage and power and telephone service interrupted at Cali. Power interrupted at Bogota. Felt at Armenia, Quibdo and in much of western and central Colombia. Earthquake lights observed in the area.

NOV 17 21 09 13.1 20.068 S 178.710 W 623 D 6.6 1.0 510 FIJI REGION. MW 6.6 (GS), 6.5 (HRV). mb 5.9 (GS). Mo 8.4*10**18 Nm (GS), 7.2*10**18 Nm (HRV), 5.5*10**18 Nm (PPT).

NOV 20 08 07 22.0 9.602 N 84.172 W 16 G 6.4 0.9 530 COSTA RICA. MW 6.4 (GS), 6.4 (HRV). mb 6.2 (GS). MS 6.3 (GS). ME 6.3 (GS). Mo 4.8*10**18 Nm (GS), 4.5*10**18 Nm (HRV), 5.5*10**18 Nm (PPT). Es 6.5*10**13 Nm (GS). Eight people killed and several injured; 526 buildings damaged or destroyed; many roads and bridges damaged; some landslides occurred in the San Jose area. Water lines broke at Parrita and power outages occurred at Quepos. Felt (VII) at Parrita and Quepos; (VI) at Damas, Failes and Jaco; (V) at Alajuela, Monterrey, Naranjo, Puntarenas, San Isidro, Turrialba and Zapote; (IV) at Batan, Bribri, Limon, Los Chiles, Nicoya, Palmar Sur and Upala. Felt in much of Costa Rica.

NOV 21 11 41 07.7 15.679 N 61.706 W 14 G 6.3 1.0 672 LEEWARD ISLANDS. MW 6.3 (GS), 6.3 (HRV). mb 6.3 (GS). MS 6.1 (GS). ME 6.2 (GS). Mo 3.4*10**18 Nm (HRV), 3.2*10**18 Nm (GS), 7.1*10**18 Nm (PPT). Es 3.9*10**13 Nm (GS). One person killed, at least two injured and several houses destroyed or damaged at Trois-Rivieres; one person injured at Capesterre-Belle-Eau; ten people slightly injured on Les Saintes; at least eight houses destroyed and twenty-five damaged on Terre-de-Bas, Guadeloupe. At least twenty houses damaged and power outages occurred in northern Dominica. Felt in Antigua and Barbuda, Saint Kitts and Nevis and as far as Saint Lucia.

NOV 22 04 01 30.4 33.297 N 47.977 E 36 D 5.0 1.1 268 WESTERN IRAN. mb 5.0 (GS). MS 4.0 (GS). Several people slightly injured and several vehicles damaged by rockslides on the road between Khorramabad and Pol-e Dokhtar. Some houses slightly damaged in the Pol-e Dokhtar area.

NOV 22 20 26 23.9 46.676 S 164.721 E 10 G 7.1 1.1 585 OFF WEST COAST OF THE SOUTH ISLAND, N.Z. MW 7.1 (HRV), 7.0 (GS). mb 6.4 (GS). MS 7.1 (GS). ME 6.8 (GS). Mo 5.5*10**19 Nm (HRV), 3.4*10**19 Nm (GS), 5.5*10**19 Nm (PPT). Es 4.0*10**14 Nm (GS). Minor damage at Invercargill and in the Southland-Otago area. Felt in much of the South Island and as far north as Hamilton on the North Island.

NOV 24 22 59 40.0 45.626 N 10.559 E 17 5.3 1.1 529 NORTHERN ITALY. mb 5.3 (GS). MS 4.6 (GS). ML 5.5 (FBB), 5.5 (LDG), 5.5 (GRF), 5.3 (STR), 5.1 (FUR), 5.0 (ZAMG). At least nine people injured and many buildings damaged in the Brescia area. Felt as far west as Torino, as far south as La Spezia and as far east as Venice. Also felt at Bern, Switzerland.

NOV 26 02 25 03.3 3.609 S 135.404 E 10 G 7.1 1.2 439 PAPUA, INDONESIA. MW 7.1 (HRV), 7.0 (GS). mb 6.2 (GS). MS 7.2 (GS). Mo 5.7*10**19 Nm (HRV), 3.1*10**19 Nm (GS), 4.4*10**19 Nm (PPT). At least 32 people killed, 130 injured, 328 buildings destroyed (VIII), airport and seaport damaged and power outages occurred at Nabire. Damage estimated at 55 million U.S. dollars. Felt (IV) at Serui, Yapen; (III) at Biak, Biak and Timika, Papua.

NOV 28 02 35 13.4 26.525 S 113.834 W 10 G 6.6 1.4 265 EASTER ISLAND REGION. MW 6.6 (HRV), 6.5 (GS). mb 5.6 (GS). MS 6.1 (GS). Mo 8.6*10**18 Nm (HRV), 5.7*10**18 Nm (GS), 1.1*10**19 Nm (PPT).

NOV 28 18 32 14.1 43.006 N 145.119 E 39 G 7.0 0.8 929 HOKKAIDO, JAPAN REGION. MW 7.0 (GS), 7.0 (HRV). mb 6.4 (GS). MS 6.7 (GS). ME 7.0 (GS). Mo 3.7*10**19 Nm (GS), 3.5*10**19 Nm (HRV), 4.0*10**19 Nm (PPT). Es 7.2*10**14 Nm (GS). At least 24 people injured; road damage occurred; power, natural gas and railway service interrupted in the Bekkai-Kushiro-Nemuro area. Minor damage to docks and buildings at Nemuro. A 10 cm tsunami was recorded at Nemuro. Felt at Misawa, Honshu. Recorded (5U JMA) in eastern Hokkaido, (4 JMA) in south-central Hokkaido, (3 JMA) in southwestern Hokkaido and (1 JMA) in northern Hokkaido. Also recorded (3 JMA) in Aomori, Iwate and Miyagi; (2 JMA) in Akita, Ibaraki and Yamagata; (1 JMA) in Fukushima, Kanagawa, Saitama, Shizuoka, Tochigi and Tokyo Prefectures, Honshu.

DEC 01 17 42 24.7 36.848 N 3.448 E 10 G 4.5 0.9 120 NORTHERN ALGERIA. mb 4.5 (GS). At least 15 people injured, minor damage to some buildings and power outages occurred in the Boumerdas area. Felt at Algiers.

DEC 01 23 17 21.5 3.665 S 135.528 E 10 G 5.5 1.0 96 PAPUA, INDONESIA. MW 5.5 (GS), 5.5 (HRV). mb 5.3 (GS). MS 5.3 (GS). Mo 2.3*10**17 Nm (HRV), 2.0*10**17 Nm (GS). One person killed in the Nabire area. Felt at Jayapura.

DEC 05 08 30 59.5 36.865 N 3.421 E 10 G 4.5 1.0 174 NORTHERN ALGERIA. mb 4.5 (GS). ML 4.7 (ALG). Forty-six people

injured in the Zemmouri area. Felt at Algiers.

DEC 06 14 15 11.8 42.900 N 145.228 E 35 G 6.8 0.8 759 HOKKAIDO, JAPAN REGION. MW 6.8 (GS), 6.8 (HRV), 6.8 (NIED). mb 6.5 (GS). MS 6.5 (GS). ME 6.7 (GS). Mo 1.5*10**19 Nm (GS), 1.5*10**19 Nm (HRV), 1.6*10**19 Nm (NIED), 1.0*10**19 Nm (PPT). Es 2.7*10**14 Nm (GS). At least 4 people injured and power outages occurred in the Kushiro area. Felt at Obihiro. Also felt at Misawa and Sendai, Honshu. Recorded (5U JMA) in the Kushiro area; (5L JMA) in the Obihiro area and in eastern Hokkaido; (4 JMA) in the Chitose-Tomakomai area and in south-central Hokkaido; (3 JMA) in southwestern and central Hokkaido; (2 JMA) in the Shibetsu area; (1 JMA) in northern Hokkaido. Also recorded (3 JMA) in Aomori and Miyagi; (2 JMA) in Akita, Iwate and Yamagata; (1 JMA) in Fukushima, Ibaraki, Niigata and Shizuoka Prefectures, Honshu.

DEC 09 08 49 00.2 24.757 N 92.539 E 35 D 5.4 0.7 236 INDIA-BANGLADESH BORDER REGION. MW 5.4 (GS), 5.3 (HRV). mb 5.5 (GS). MS 4.7 (GS). Mo 1.6*10**17 Nm (GS), 1.1*10**17 Nm (HRV). Several people slightly injured at Hailakandi, India. Minor damage in Cachar, India. Felt in much of central and southern Assam, India. Felt in eastern Meghalaya, India. Also felt at Chittagong and in parts of eastern Bangladesh.

DEC 14 05 56 10.0 44.119 N 141.793 E 10 G 5.8 0.9 494 HOKKAIDO, JAPAN REGION. MW 5.8 (GS), 5.8 (HRV). mb 5.8 (GS). MS 5.3 (GS). Mo 6.2*10**17 Nm (GS), 4.8*10**17 Nm (HRV). Two people injured at Obira and one at Haboro. Some buildings, roads and water lines damaged at Tomamae. Felt in northern and western Hokkaido. Recorded (5U JMA) in the Haboro area; (4 JMA) in the Shibetsu-Numata area; (3 JMA) in the Otararea; (2 JMA) in the Mombetsu area and much of western Hokkaido; (1 JMA) in the Obihiro, Shari-Yubetsu and Setana areas. Also recorded (2 JMA) on Rishiri-to.

DEC 14 23 20 13.3 18.958 N 81.409 W 10 G 6.8 1.0 639 CAYMAN ISLANDS REGION. MW 6.8 (GS), 6.8 (HRV). mb 6.2 (GS). MS 6.7 (GS). Mo 2.1*10**19 Nm (GS), 1.8*10**19 Nm (HRV), 1.2*10**19 Nm (PPT). Felt (VI) at Bodden Town and West Bay; (V) at George Town, Grand Cayman. Felt (III-V) in many parts of Cuba. Also felt at Cancun, Mexico and Half Way Tree and New Kingston, Jamaica.

DEC 20 23 02 12.4& 37.042 N 28.206 E 5 5.3 456 WESTERN TURKEY. <ISK>. MW 5.3 (HRV). mb 5.2 (GS). MS 4.7 (GS). Mo 1.1*10**17 Nm (HRV). Three people injured, some buildings damaged and rockslides blocked a highway at Marmaris. Felt at Bodrum, Datca and Izmir.

DEC 23 14 59 03.6 50.145 S 160.365 E 10 G 8.1 1.3 180 NORTH OF MACQUARIE ISLAND. MW 8.1 (HRV), 8.0 (GS), 8.1 (HRV). ME 8.2 (GS). Mo 1.6*10**21 Nm (HRV), 1.0*10**21 Nm (GS), 5.4*10**20 Nm (PPT). Es 5.2*10**16 Nm (GS). Felt throughout Tasmania, Australia and over much of the South Island, New Zealand.

DEC 26 00 58 53.4 3.300 N 95.963 E 30 G 9.0 1.2 488 OFF THE WEST COAST OF NORTHERN SUMATRA. MW 9.0 (HRV), 8.2 (GS). mb 7.0 (GS). MS 8.8 (GS). ME 8.5 (GS). Mo 4.0*10**22 Nm (HRV), 2.6*10**21 Nm (GS), 2.1*10**21 Nm (PPT). Es 1.1*10**17 Nm (GS). This is the fourth largest earthquake in the world since 1900 and is the largest since the 1964 Prince William Sound, Alaska earthquake. The tsunami caused more casualties than any other in recorded history. In total, more than 220,272 people were killed, 22,352 are still listed as missing and 1,076,350 were displaced in South Asia and East Africa. At least 173,981 people were killed by the earthquake and tsunami in Indonesia. Tsunamis killed at least 29,854 people in Sri Lanka, 10,749 in India, 5,313 in Thailand, 150 in Somalia, 82 in Maldives, 68 in Malaysia, 59 in Myanmar, 10 in Tanzania, 3 in Seychelles, 2 in Bangladesh and 1 in Kenya. Tsunamis caused damage in Madagascar and Mauritius and also occurred in Mozambique, South Africa, Australia and Antarctica. The tsunami crossed into the Pacific and Atlantic Oceans and was recorded in New Zealand and along the west and east coasts of South and North America. The earthquake was felt (VIII) at Banda Aceh and (V) at Medan, Sumatra and (II-IV) in parts of Bangladesh, India, Malaysia, Maldives, Myanmar, Singapore, Sri Lanka and Thailand. Subsidence

and landslides were observed in Sumatra. A mud volcano near Baratang, Andaman Islands began erupting on December 28.

DEC 26 04 21 29.6 6.880 N 92.945 E 39 7.1 0.9 219 NICOBAR ISLANDS, INDIA REGION. MW 7.1 (HRV). mb 6.1 (GS). MS 7.4 (GS). Mo 5.6*10**19 Nm (HRV).

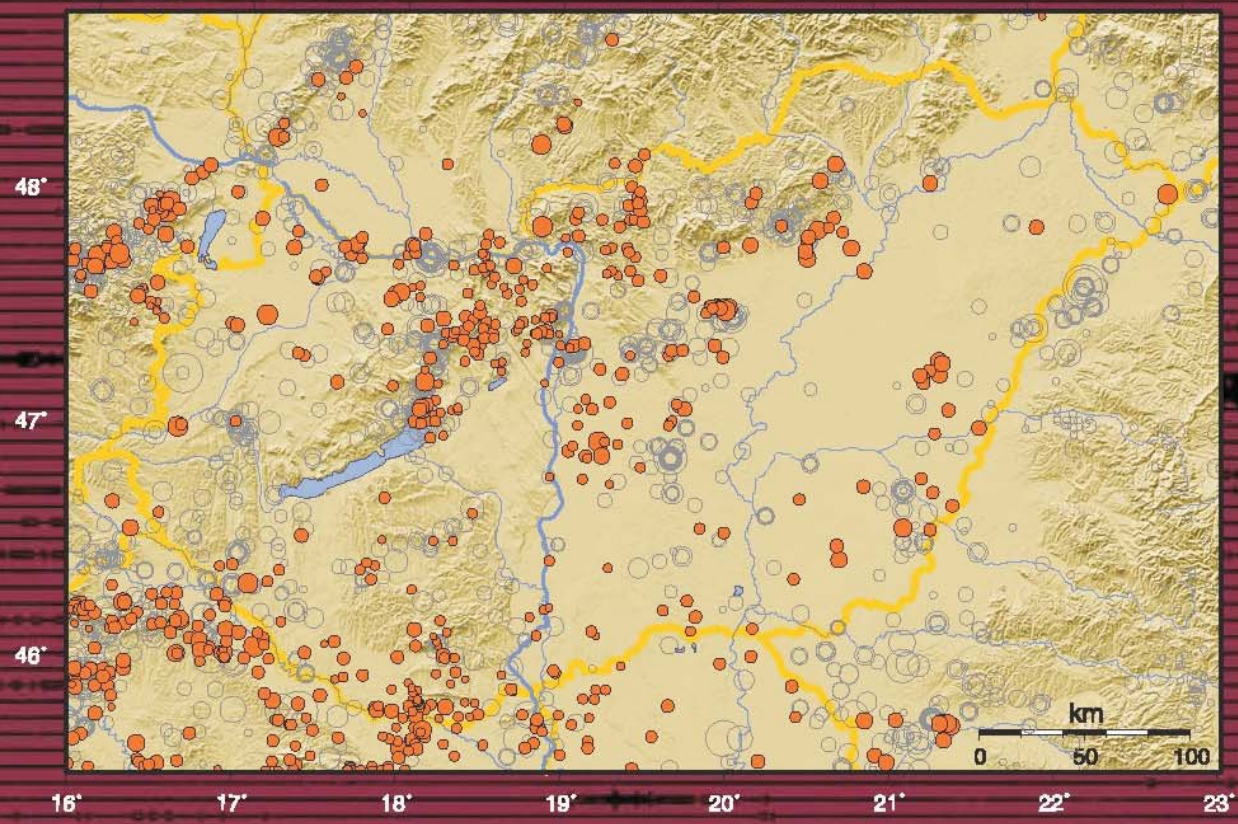
DEC 26 09 20 00.4 8.886 N 92.357 E 9 * 6.6 1.0 230 NICOBAR ISLANDS, INDIA REGION. MW 6.6 (HRV). mb 6.0 (GS). MS 6.6 (GS). Mo 1.0*10**19 Nm (HRV).

Compiled by Waverly J. Person and Pamela J. Benfield.
USGS NEIC

1995–2004

tíz év / ten years

Földrengések Magyarországon / Earthquakes in Hungary



A földrengések gyakorisága / Earthquakes Recurrence

Terület/Area: 45.5-49.0N - 16.0-23.0E 206.117 km^2