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Hungarian Earthquake Bulletin
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GeoRisk
Földrengéskutató Intézet ◆ Earthquake Research Institute

Magyar Tudományos Akadémia
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Szeizmológiai Főosztály

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Budapest

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GeoRisk • MTA GGKI

MAGYARORSZÁGI FÖLDRENGÉSEK ÉVKÖNYVE

HUNGARIAN EARTHQUAKE BULLETIN

2002

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Hivatkozás / Bibliographic reference

Tóth L., Mónus P., Zsíros T., Kiszely M., Czifra T.:
Magyarországi földrengések évkönyve 2002.
Hungarian Earthquake Bulletin, 2002.
GeoRisk - MTA GGKI, Budapest, 2003. p. 104
ISSN: 1219-963X

GEORISK
MTA GGKI

BUDAPEST 2003

Készült a *Paksi Atomerőmű Rt.* támogatásával.
This work was supported by *Paks Nuclear Power Plant Ltd.*

ISSN: 1219-963X

Felelős kiadó: *Dr. Tóth László*

TARTALOMJEGYZÉK

CONTENTS

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 talaj-folyósodást 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 a 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.

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 2002. év szeizmikus szempontból átlagos időszaknak tekinthető Magyarországon. Az év folyamán 112 szeizmikus eseményt regisztráltunk és lokalizáltunk a 45.5-49.0N szélességi és 16.0-23.0E hosszúsági koordináták által határolt területen, amelyek közül 101 volt természetes eredetű földrengés, a többi nagyrészt kőbányarobbantás. Az események mérete a $0.1 \leq ML \leq 3.7$ lokális magnitúdó-tartományba esett, s közülük 9 volt a lakosság által is érezhető.

A legnagyobb földrengés intenzitás, melyet az év folyamán Magyarország területéről jelentettek 5 EMS fokozat volt, mely kisebb vakolatrepedést okozott néhány hagyományos épületben. Jelentős épületkár ebben az évben nem történt.

Időrendben az első említésre méltó szeizmikus esemény a január 28-i, M_L 2.4 magnitúdójú földrengés, melyet Kutasó és Bokor településeken éreztek 4-5 EMS intenzitással.

Február 11-én a Bükk-hegységben pattant ki két rengés mintegy három óra különbséggel, melyek magnitúdója M_L 2.9 és M_L 3.0 volt. Az előbbit Mezőnyárád és Cserépfalu településeken érezték legjobban, kb. 5 EMS intenzitással. Az utóbbit Emődről és Ónodról jelentették 4-5 EMS intenzitással.

Február 22-én Környe – Oroszlány – Bokod területén volt érezhető egy M_L 2.9 méretű rengés, mely az epicentrum környékén 3-4 EMS intenzitással volt érezhető.

Február 25-én éjjel kisebb rengést (M_L 2.2; 3-4 EMS) jelentettek Hatvan – Heréd – Zagyvaszántó környékéről.

Május 8-án Aldebrő – Kerecsend – Tófalu körzetben mozdult meg a föld, egy M_L 2.9 rengés volt érezhető 4 EMS intenzitással.

Októberben a Jászságban kétszer is éreztek földrengést: 12-én este, majd 23-án hajnalban Jászapáti környékén M_L 3.3 és M_L 3.7 nagyságú földrengés volt, melyek intenzitása 4-5 EMS, illetve 5 EMS körül becsülhető. Az utóbbi volt az év legnagyobb méretű magyarországi rengése, melynek szeizmogramja a borító hátoldalán látható.

December 25-én este újra megmozdult a föld Jásztelek – Jászjákóhalma környékén, ahol 4-5 EMS intenzitású földrengés volt érezhető, melynek műszeresen mért magnitúdója M_L 2.6.

1.

SUMMARY

2002 was an average year for Hungarian seismicity. Out of the 112 seismic events ($0.1 \leq M_L \leq 3.7$) located within the area bounded by latitudes 45.5-49.0N and longitudes 16.0-23.0E 101 were identified as natural earthquakes, the rest were mostly quarry blasts. Nine earthquakes were reported as felt.

The highest magnitude assigned to a shock was 3.7 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, a shock of magnitude 2.4 M_L on the 28th of January produced reports of intensity 4-5 EMS at Kutasó and Bokor.

On February 11th, with less than three hours differences in origin time, two quakes (2.9 M_L and 3.0 M_L) shook the Bükk mountain region. The first was reported from Mezőnyárád and Cserépfalu (5 EMS), the second one from Emőd and Ónod (4-5 EMS).

A magnitude 2.9 M_L earthquake was felt at Környe – Oroszlány – Bokod area with intensity 3-4 EMS on February 22nd .

On February 25th, a small shock (2.2 M_L; 3-4 EMS) was reported from Hatvan – Heréd – Zagyvaszántó area.

On May 8th, an earthquake of magnitude 2.9 M_L produced reports of 4 EMS from Aldebrő – Kerecsend – Tófalu.

Two earthquakes were felt in the Jászság region in October: a shock of 3.3 M_L on 12th night and a further one of 3.7 M_L in the early morning of 23rd night produced reports of 4-5 EMS and 5 EMS from Jászapáti. The second one was the highest magnitude event during the year.

The last felt earthquake in the year was in the Jászság region again on 25th of December (2.6 M_L; 4-5 EMS).

2.

A MAGYARORSZÁGI FÖLDRENGÉSMEGFIGYELŐ HÁLÓZAT

A földrengés-megfigyelő hálózat az előző évhez viszonyítva 2002-ben nem változott jelentősen.

A *Paksi Atomerőmű Rt.* által 1995-ben létesített mikroszeizmikus megfigyelő hálózat az egész év folyamán működött. A Bátaapáti - Üveghuta térségében tervezett radioaktív hulladéktároló környezetének monitorozására 1999-ben létesített *„üveghutai hálózat”* 2001 decemberében megszűnt. A hálózat két mérőállomását (RHK1-Bakonya és RHK3-Tenkes) azonban az év folyamán megtartottuk.

Az egész hálózat gerincét továbbra is a paksi mikroszeizmikus megfigyelő hálózat egységes adatbázissal működő 11 mérőállomása jelentette, mely az események felismerését lehetővé tette. A helymeghatározás során fontos kiegészítő szerepe volt az *MTA GGKI Szeizmológiai Obszervatóriuma* által működtetett három állomásnak is. Különösen jelentős a német GEOFON hálózattal együttműködve üzemeltetett piszkéstetői szélessávú mérőállomás, mely 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 jelen hálózat észlelési küszöbe ML=1.5-2.0 magnitúdó körül van (2.4. 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 is jelenti, hogy a lakosság által érzékelt valamennyi rengést a hálózat nagy valószínűséggel detektálja.

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

2.

SEISMOGRAPH STATIONS IN HUNGARY

In 2002, there have been only some minor modifications with the Hungarian earthquake 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. The "*Üveghuta network"* set up in 1999 to monitor microseismic activity at a potential nuclear waste disposal site vicinity was closed in December 2001. However, two of those stations (RHK1-Bakonya and RHK3-Tenkes) had been revitalized and run throughout the year.

The core of the network was formed by the 11 station *Paks* microseismic monitoring network. This network had been operated and data collected in a uniform database what made possible to detect and identify local seismic events. In addition, data was contributed by three 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. 2.4) This means that in most parts of the country 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

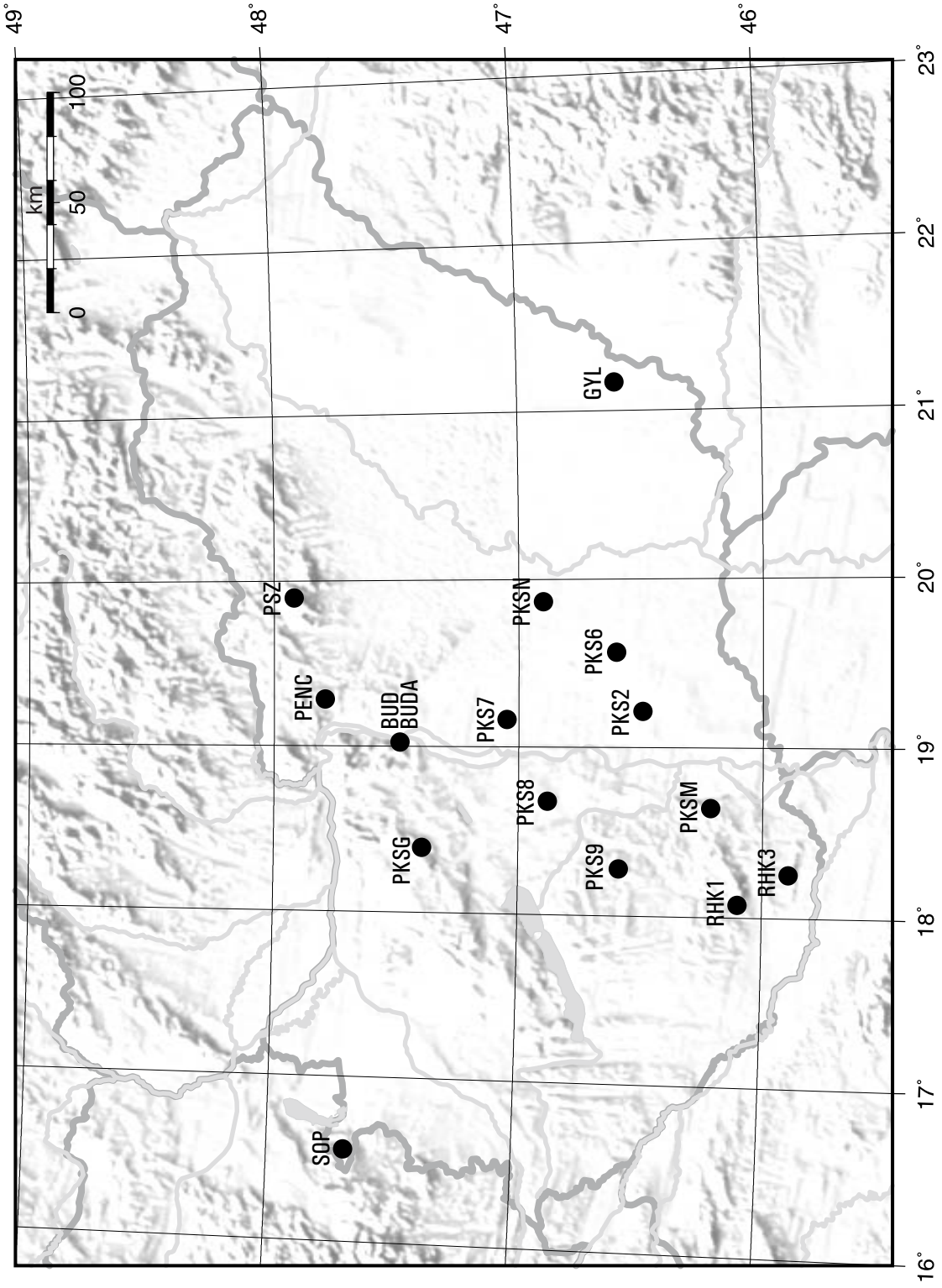
Jel Code	Szélesség Latitude (N)	Hosszúság Longitude (E)	Magasság Elevation (m)	Alapkőzet Foundation	Állomás típusa Station type (1)	Érzékelő típusa Sensor type (2)	Regisztrálás Recording (3)	Szervezet Org. (4)
BUD	47,4836	19,0239	196	dolomit dolomite	3C LP	Kirnos	A - C	GGKI
BUDA	47,4836	19,0239	196	dolomit dolomite	3C SP	LE-3D	D - E	GR
GYL	46,5981	21,1718	92	homok sand	3C SP	SS-1	D - E	GGKI
PENC	47,7905	19,2817	250	üledék alluvium	3C SP	LE-3D	D - E	GGKI
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 SP	LE-3D	D - E	GR
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-GR
RHK3	45,8885	18,2521	420	mészkő limestone	3C SP	LE-3D	D - E	GGKI-GR
SOP	47,6833	16,5583	260	gneisz gneiss	3C SP	SS-1	D - E	GGKI

(1) 1C – 1 komponenses vertikális szeizmométer / one component vertical seismometer
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; SM – gyorsulásmérő / strong motion accelerograph

(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 2002-ben (Részletek: 2.1. táblázat)

Figure 2.1. Seismograph station network in Hungary in 2002 (See Table 2.1. for details)

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

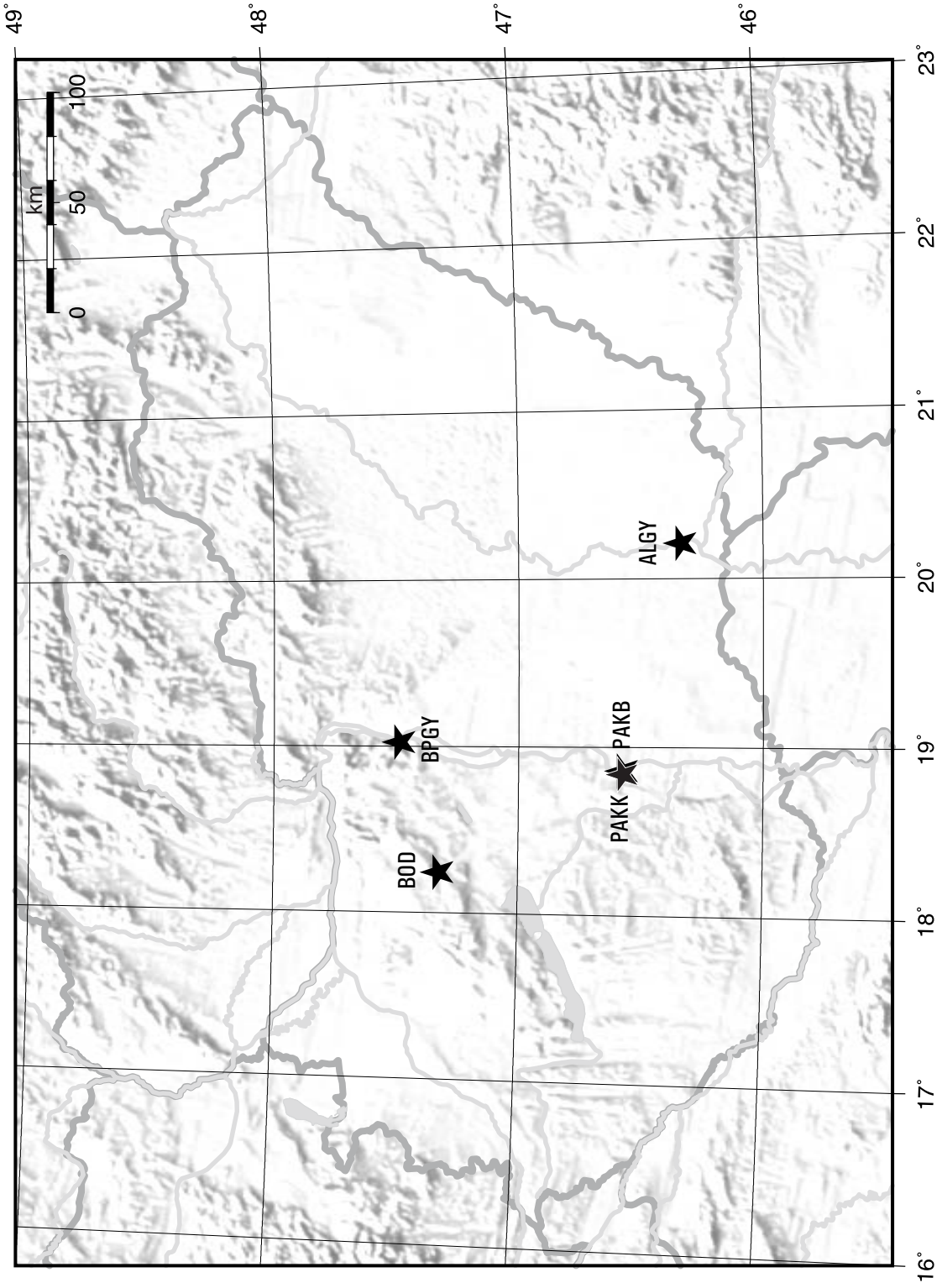
Jel Code	Szélesség Latitude (N)	Hosszúság Longitude (E)	Magasság Elevation (m)	Alapkőzet Foundation	Állomás típusa Station type (1)	Érzékelő típusa Sensor type (2)	Regisztrálás Recording (3)	Szervezet Org. (4)
ALGY	46.3332	20.2092	90	laza homok loose sand	3C SM	AC-23	D – E	MO-GR
BOD	47.322	18.241	250	mészkő limestone	3C SM	AC-23	D – E	GR
BPGY	47.4836	19.0239	196	olomite 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 2002-ben (Részletek: 2.2. táblázat)

Figure 2.2. Strong motion accelerograph stations in Hungary in 2002 (See Table 2.2. for details)

A PAKSI MIKROSZEIZMIKUS MEGFIGYELŐ HÁLÓZAT

A hálózat keretében 2002-ben 11 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 heti rendszerességgel cserélünk és juttatunk az adatközpontba. További 3 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 az XPITSA nevű program felhasználásával történik. A teljes adatmennyiséget archiváljuk.

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

AZ MTA GGKI ÁLLOMÁSAI

Az év folyamán az MTA GGKI három digitális és egy analóg 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 működik.

Gyula (*GYL*) és Sopron (*SOP*) állomások 1994 óta működnek. Itt 3 komponenses rövid periódusú adatok gyűjtése folyik KINEMETRICS gyártmányú 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. A regisztrált események adatai normál telefon összeköttetésen keresztül tölthetők le.

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).

2002. folyamán mindegyik állomás mérési adata rendelkezésünkre állt.

PAKS MICROSEISMIC MONITORING NETWORK

The system comprises of a network of 11 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 a weekly basis. Three 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 XPITSA for advanced seismogram analysis. All recorded data are archived.

The *Paks* Microseismic Monitoring Network is currently operated and its data processed and analyzed by *GeoRisk Earthquake Research Institute Ltd.*

STATIONS OPERATED BY GGKI

During 2002 GGKI operated three digital and one analogue 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.

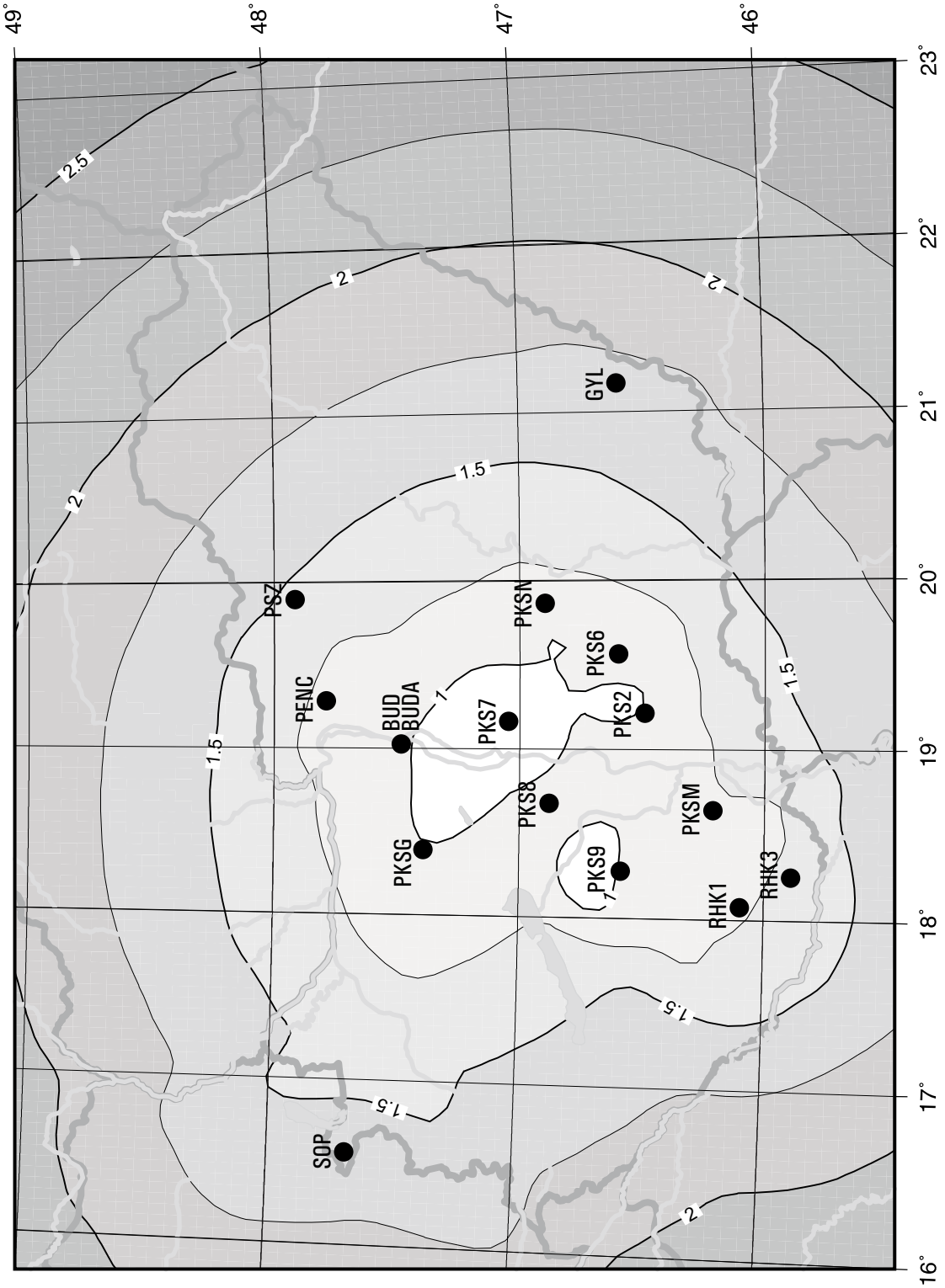
GYL and SOP are three component short period stations installed in 1994. Kinemetrics SSR-1 16bit digitizers and event recorders sample and record the output of three component SS-1 Ranger seismometers. Data of recorded events are collected via commercial telephone links.

A long period analogue recording seismograph has been operated at the *Seismological Observatory* in Budapest mostly for demonstration purposes.

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 2002, 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) 2002-re 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 2002, *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, 2002							
11	10:25:39.7	46.274N	18.284E	0	0.7	-	Kárász (expl.)
11	11:59:30.1	46.110N	18.240E	9	0.6	-	Pécs
21	13:11:51.3	47.325N	18.574E	19	0.1	-	Vértes mt. (expl.)
28	2:12:58.0	47.977N	19.418E	0	1.9	-	Cserhátsurány
28	2:32:07.4	48.056N	19.445E	1	1.9	-	Csitár
28	**3:18:02.0**	**47.956N**	**19.493E**	**1**	**2.4**	**4.5**	**Kutasó**
28	6:02:20.0	48.014N	19.473E	2	1.7	-	Nógrádsipek
28	6:22:25.4	48.002N	19.500E	2	1.6	-	Nógrádsipek
28	6:28:18.9	47.993N	19.481E	10	1.8	-	Herencsény
28	6:35:29.9	48.043N	19.485E	4	1.7	-	Varsány
30	1:10:15.4	46.382N	20.441E	10	1.8	-	Szikáncs
FEBRUÁR / FEBRUARY, 2002							
05	18:04:12.9	46.022N	19.979E	6	1.8	-	Serbia
06	10:02:07.3	45.667N	16.077E	7	2.0	-	Croatia
11	**16:41:33.1**	**47.689N**	**20.910E**	**0**	**2.9**	**5.0**	**Mezőnyárád**
11	**20:24:13.4**	**47.791N**	**20.831E**	**7**	**3.0**	**4.5**	**Emőd**
13	11:31:15.6	47.434N	18.345E	1	2.0	-	Vértes mt. (expl.)
13	11:39:35.2	47.727N	18.533E	10	1.1	-	Lábatlan (expl.)
13	15:59:07.1	45.528N	16.126E	4	1.7	-	Croatia
14	10:05:53.8	45.523N	17.709E	13	1.4	-	Croatia
18	14:59:11.2	46.215N	18.809E	10	0.9	-	Pörböly
22	**11:52:34.7**	**47.492N**	**18.248E**	**10**	**2.9**	**4.0**	**Környe**
23	0:19:26.5	46.252N	16.930E	25	2.3	-	Zákány
24	0:55:52.8	47.696N	19.435E	1	1.6	-	Iklad
25	18:05:01.8	45.743N	17.996E	0	0.8	-	Croatia
25	**23:10:19.6**	**47.681N**	**19.622E**	**10**	**2.2**	**3.5**	**Hatvan**
28	13:20:23.2	45.545N	17.721E	15	1.6	-	Croatia
MÁRCIUS / MARCH, 2002							
04	10:48:54.3	46.179N	18.300E	13	0.5	-	Zobákpuszta (expl.)
06	20:32:11.1	46.288N	16.876E	10	2.4	-	Őrtilos
10	8:31:32.5	45.940N	16.238E	0	1.8	-	Croatia

12	11:16:43.3	45.551N	17.385E	34	1.3	-	Croatia
16	12:13:22.5	46.120N	16.598E	17	2.2	-	Croatia
17	15:37:12.4	45.854N	18.483E	0	0.5	-	Magyarbóly
21	9:29:29.6	45.788N	18.446E	0	0.6	-	Beremend
21	11:36:16.9	45.522N	17.817E	0	1.5	-	Croatia
22	11:22:13.8	45.500N	17.868E	10	1.6	-	Croatia
22	15:18:16.4	45.736N	17.355E	12	1.5	-	Croatia
22	15:33:03.8	45.504N	17.986E	2	1.8	-	Croatia
26	16:45:02.3	45.878N	16.233E	0	2.1	-	Croatia
28	13:29:12.6	47.660N	18.752E	10	1.0	-	Dág
28	13:34:24.7	47.503N	18.890E	10	1.2	-	Budakeszi
ÁPRILIS / APRIL, 2002							
04	2:10:58.5	45.693N	16.739E	22	2.0	-	Croatia
08	12:15:27.0	45.613N	18.018E	15	1.5	-	Croatia
08	19:10:56.7	48.196N	19.521E	6	1.8	-	Nógrádszakál
15	10:23:30.6	45.544N	17.673E	20	1.5	-	Croatia
22	11:24:45.3	46.171N	18.294E	8	0.7	-	Zobákpuszta (expl.)
30	22:58:42.6	47.267N	18.138E	0	0.6	-	Isztimér
MÁJUS / MAY, 2002							
02	11:02:23.2	45.653N	17.393E	16	1.3	-	Croatia
03	5:27:38.3	47.95N	16.48E	10	2.3	-	Austria
03	11:11:54.8	46.084N	18.130E	6	1.1	-	Kővágószőlős (expl.)
04	9:54:40.6	46.239N	16.930E	20	1.9	-	Zákány
07	10:10:26.4	47.466N	18.493E	1	1.1	-	Vértes mt. (expl.)
07	12:02:36.1	47.306N	18.624E	10	0.7	-	Vereb
08	**14:57:04.9**	**47.811N**	**20.188E**	**15**	**2.9**	**4.0**	**Tófalu**
13	10:56:41.4	45.521N	17.715E	13	1.3	-	Croatia
13	11:35:28.9	46.148N	18.296E	10	1.0	-	Vasas
20	20:05:13.7	46.371N	17.830E	12	1.5	-	Kaposvár
21	9:38:57.8	45.554N	17.729E	16	1.5	-	Croatia
22	22:57:19.2	45.942N	17.625E	17	0.6	-	Kastélyosdombó
27	10:45:01.2	45.881N	16.006E	3		-	Croatia
27	11:35:50.8	47.686N	19.455E	10	2.1	-	Iklad (expl.)
JÚNIUS / JUNE, 2002							
08	11:24:15.1	46.150N	16.321E	1	2.4	-	Croatia
09	2:00:21.9	45.556N	16.552E	2	2.7	-	Croatia
09	17:22:38.0	45.794N	18.383E	1	1.2	-	Siklósnagyfalu
12	14:49:06.0	45.759N	17.278E	10	1.8	-	Croatia
18	10:13:37.0	47.440N	18.481E	2	1.5	-	Vértes mt. (expl.)
19	15:06:40.1	45.533N	17.833E	0	1.7	-	Croatia
22	5:42:34.3	46.603N	19.864E	10	1.7	-	Petőfiszállás

JÚLIUS / JULY, 2002

02	22:09:58.0	46.087N	17.552E	10		-	Homokszentgyörgy
03	22:10:00.9	46.67N	16.21E	10	2.7	-	Slovenia
04	2:40:03.2	45.79N	16.26E	10		-	Croatia
07	14:20:21.5	46.126N	17.021E	10	2.6	-	Croatia
23	10:28:44.9	45.507N	17.840E	0	1.9	-	Croatia
29	11:41:31.4	47.578N	16.331E	0		-	Austria

AUGUSZTUS / AUGUST, 2002

01	10:27:01.9	45.983N	18.357E	2	1.5	-	Peterd

SZEPTEMBER / SEPTEMBER, 2002

01	8:13:32.3	46.019N	17.209E	22	1.7	-	Heresznye
04	8:36:22.9	47.438N	18.377E	6	1.6	-	Vértes mt. (expl.)
06	4:32:32.7	47.347N	18.453E	13	1.1	-	Gánt
17	8:58:56.0	47.305N	18.576E	10	0.5	-	Lovasberény
20	13:45:25.8	45.551N	16.504E	4	1.8	-	Croatia
21	2:27:52.8	47.93N	16.56E	10	2.3	3.0	Austria
21	11:46:41.5	46.293N	16.633E	11	2.1	-	Croatia
23	2:08:06.9	45.93N	16.09E	10	2.2	-	Croatia
24	18:04:15.9	45.54N	16.00E	10	2.2	-	Croatia

OKTÓBER / OCTOBER, 2002

04	9:22:21.9	47.664N	19.479E	1	1.9	-	Aszód
10	2:16:26.5	45.65N	16.03E	10	2.3	-	Croatia
12	**18:49:11.1**	**47.543N**	**20.010E**	**15**	**3.3**	**4.5**	**Jászapáti**
14	15:33:33.0	45.959N	17.152E	10	2.1	-	Croatia
14	19:23:25.2	46.153N	16.491E	10	1.8	-	Croatia
16	22:32:37.4	46.044N	16.136E	10	2.0	-	Croatia
22	3:28:21.8	46.243N	16.618E	10	1.6	-	Croatia
23	**2:52:15.1**	**47.545N**	**20.043E**	**14**	**3.7**	**5.0**	**Jászapáti**
23	3:34:59.8	47.549N	19.940E	10	1.6	-	Jászdózsa
24	20:25:29.5	47.560N	19.979E	8	1.4	-	Jászdózsa
25	6:25:54.2	47.595N	19.827E	10	1.9	-	Jászágó
25	22:09:43.0	46.547N	17.389E	13	2.4	-	Kelevíz
26	10:44:25.6	46.20N	16.06E	5	1.8	-	Croatia
29	3:31:07.6	47.547N	19.988E	10	1.8	-	Jászdózsa

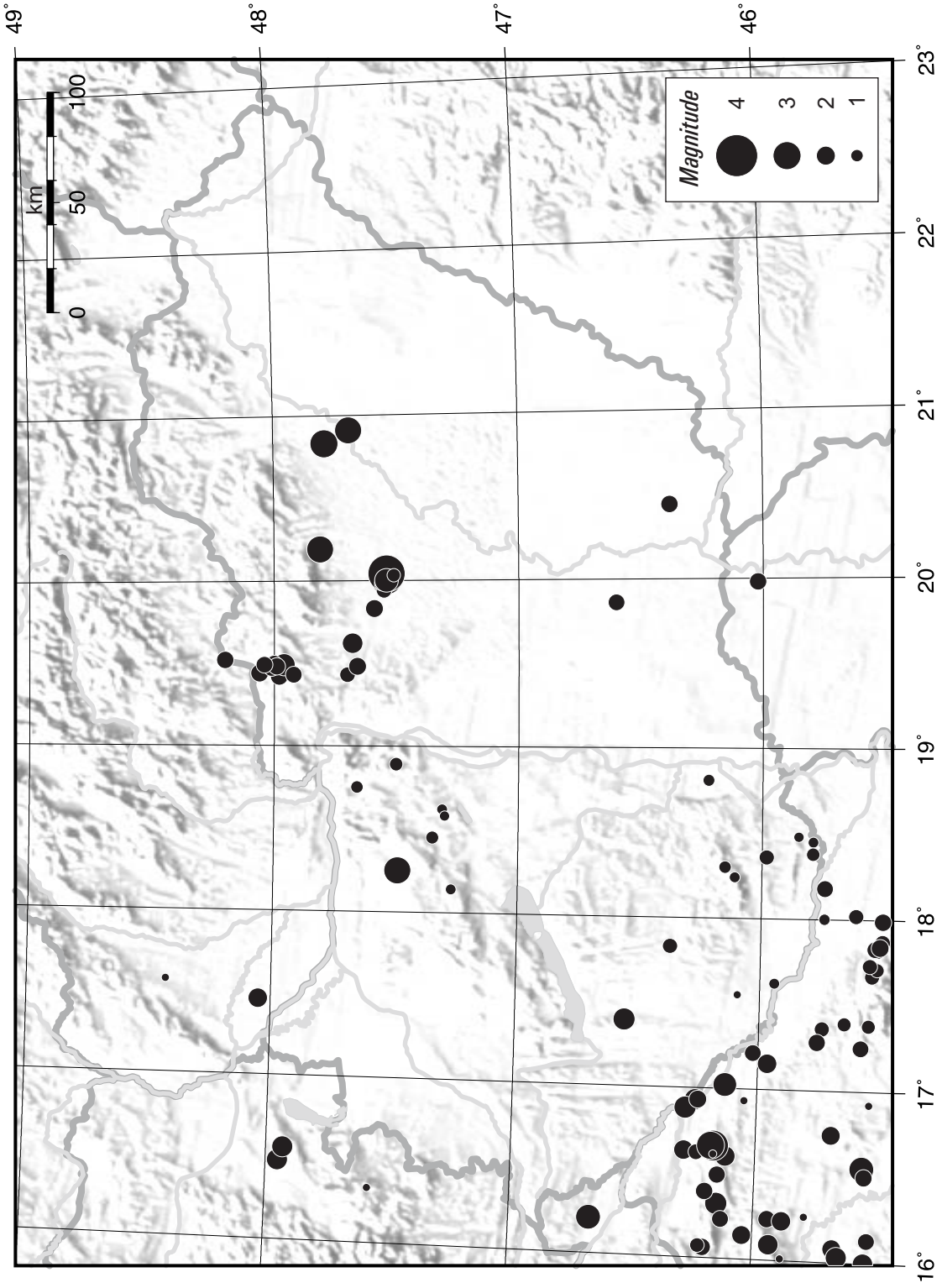
NOVEMBER / NOVEMBER, 2002

29	12:34:30.1	46.22N	16.07E	10	1.4	-	Croatia

DECEMBER / DECEMBER, 2002

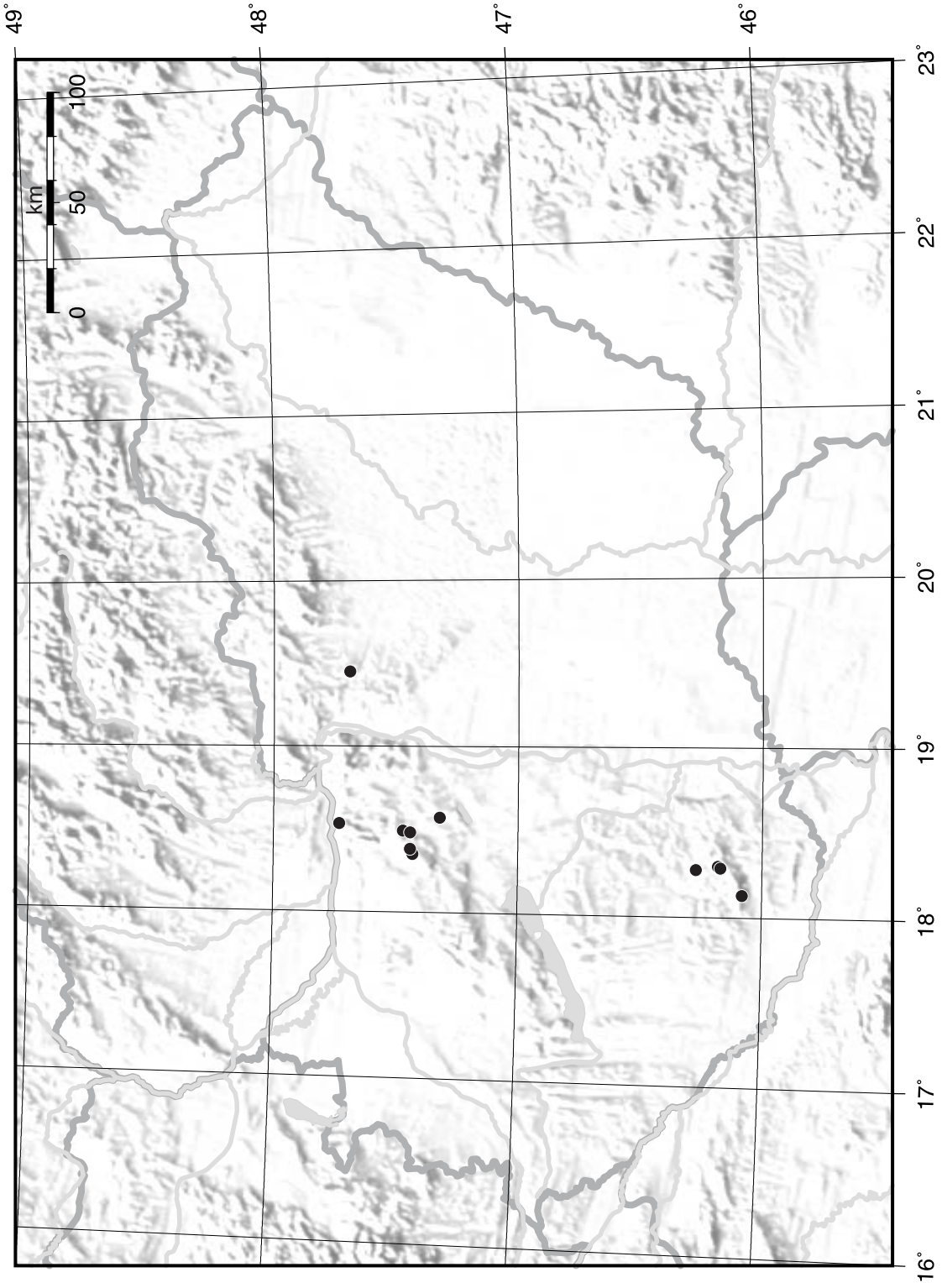
06	1:52:11.9	46.174N	16.660E	5	3.2	-	Croatia
06	2:47:10.0	46.20N	16.39E	10	1.8	-	Croatia
06	3:12:51.0	46.179N	16.657E	4	3.0	-	Croatia

10	23:57:19.3	45.541N	16.919E	15		-	Croatia
15	8:26:01.2	46.051N	16.935E	6		-	Croatia
15	11:04:48.7	48.433N	17.572E	1		-	Slovakia
17	17:29:16.2	46.169N	16.607E	10		-	Croatia
18	16:03:12.4	47.919N	19.428E	10	1.7	-	Szanda
19	14:42:16.2	45.579N	17.251E	9	1.7	-	Croatia
20	13:39:34.4	46.13N	16.23E	10	1.7	-	Croatia
25	**21:58:23.0**	**47.540N**	**20.002E**	**12**	**2.6**	**4.5**	**Jásztelek**
26	6:12:15.7	47.505N	20.034E	15	1.2	-	Jásztelek
26	15:26:11.9	45.742N	18.179E	13	1.7	-	Croatia
30	21:22:44.9	48.052N	17.461E	12	2.1	-	Slovakia



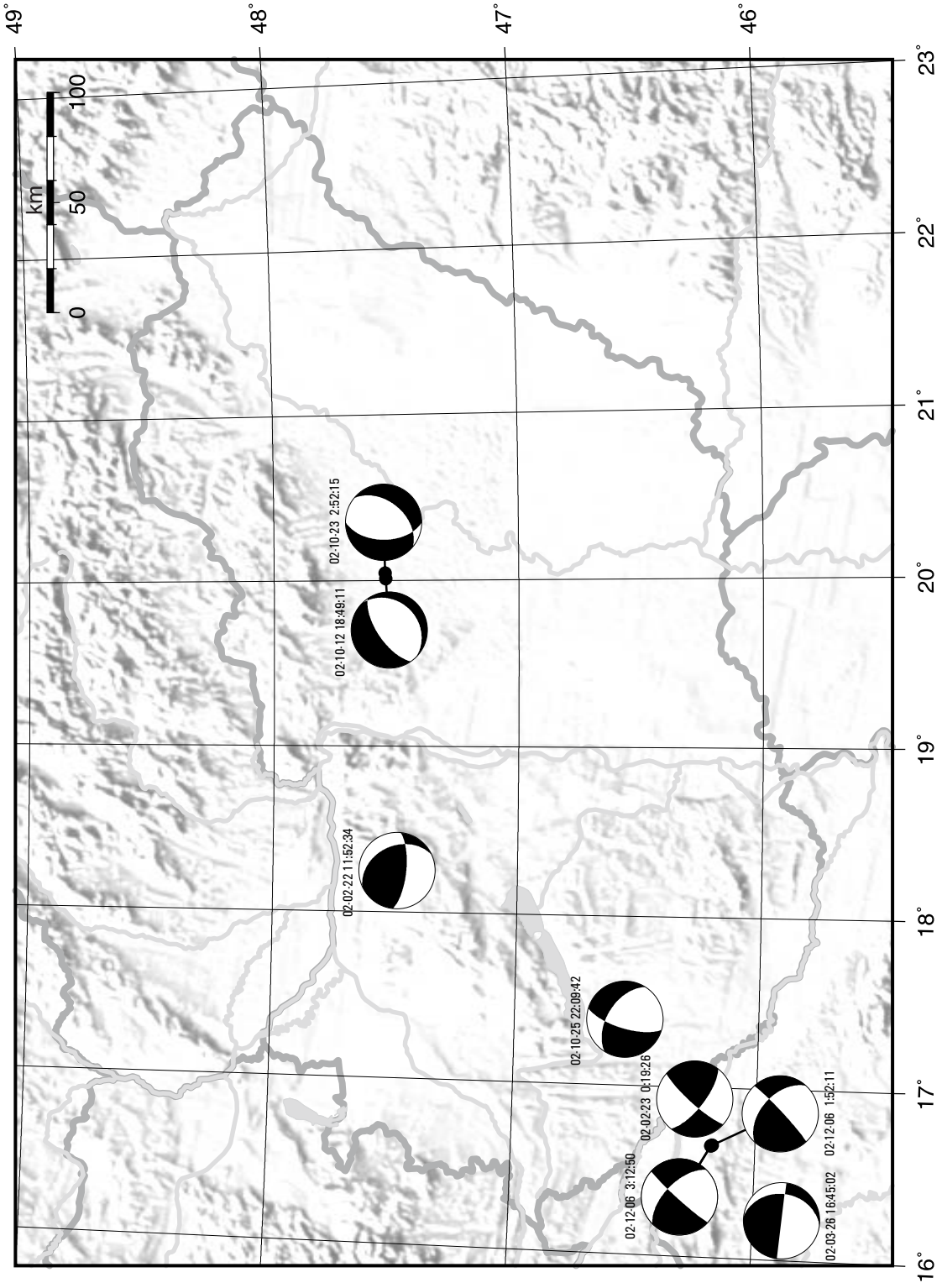
3.1. ábra A 2002-ben regisztrált földrengések epicentrumai

Figure 3.1. Epicenters of 2002 earthquakes



3.2. ábra A 2002-ben regisztrált robbantások epicentrumai

Figure 3.2. Epicenters of 2002 explosions



3.3. ábra A 2002-ben regisztrált földrengések fészekmechanizmusai

Figure 3.3. Fault plane solutions of 2002 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 by Fig. 3.3.

Hypocenter Parameters **Földrengés paraméterek**

1.

2002-01-11 time: 10:25:39.73 UTC ML= 0.7
lat: 46.274N lon: 18.284E h= 0.4 km
erh=12.8km erz= 512km
nr= 6 gap=245 rms=0.44
Locality: Kárász
Comments: explosion

sta	dist	azm	phase	hr	mn	sec	res
RHK1	25.3	219	iPgC	10	25	44.40	0.15
			eSg		25	47.50	-0.28
PKSM	28.4	104	ePgC	10	25	45.10	0.29
			eSg		25	47.70	-1.07
RHK2	42.1	112	ePgC	10	25	46.80	-0.44
			eSg		25	53.90	0.80

2.

2002-01-11 time: 11:59:30.11 UTC ML= 0.6
lat: 46.110N lon: 18.240E h= 9.0 km
erh= 0.3km erz= 0.7km
nr= 6 gap=166 rms=0.03
Locality: Pécs
Comments:

sta	dist	azm	phase	hr	mn	sec	res
RHK1	12.8	264	iPgC	11	59	32.90	-0.01
			iSg		59	35.10	0.01
RHK3	24.4	177	ePgC	11	59	34.80	0.05
			eSg		59	38.30	-0.06
PKSM	33.0	70	iPgD	11	59	36.20	-0.01
			eSg		59	41.00	0.02

3.

2002-01-21 time: 13:11:51.34 UTC ML= 0.1
lat: 47.325N lon: 18.574E h= 18.5 km
erh=14.5km erz= 3.3km
nr= 5 gap=233 rms=0.34
Locality: Vértes mt.
Comments: explosion

sta	dist	azm	phase	hr	mn	sec	res
PKSG	15.7	298	iPgC	13	11	55.60	-0.07
			eSg		11	59.00	-0.05
PKS8	50.2	171	ePgC	13	12	01.00	0.11
PKSM	123.8	178	ePnC	13	12	12.10	0.66
			Sn		12	26.60	-0.53

4.

2002-01-28 time: 2:12:57.95 UTC ML= 1.9
lat: 47.977N lon: 19.418E h= 0.5 km
erh= 6.7km erz= 6.0km
nr= 11 gap=230 rms=0.94
Locality: Cserhátsurány
Comments:

sta	dist	azm	phase	hr	mn	sec	res
PENC	23.1	206	ePgC	2	13	01.90	-0.17
			eSg		13	05.90	0.62
VYH	71.9	323	iPg	2	13	10.90	0.12
			eSg		13	20.70	-0.09
PKSG	100.9	230	ePgC	2	13	14.80	-1.16
			eSg		13	30.10	0.09
PKS9	176.9	209	ePn	2	13	32.40	5.43
			eSn		13	51.80	2.18
PKSM	204.9	197	ePn	2	13	33.90	3.44
			eSn		13	57.80	1.98
RHK2	210.7	193	eSn	2	13	53.30	-3.82
RHK1	232.4	206	eSn	2	14	06.20	4.26

5.

2002-01-28 time: 2:32:07.45 UTC ML= 1.9
lat: 48.056N lon: 19.445E h= 0.9 km
erh= 5.9km erz= 3.6km
nr= 5 gap=335 rms=0.28
Locality: Csitár
Comments:

sta	dist	azm	phase	hr	mn	sec	res
PENC	31.9	202	iPgC	2	32	13.40	0.24
			iSg		32	17.40	-0.21
PKSG	108.2	227	iPgC	2	32	26.50	-0.28
			eSg		32	42.00	0.15
PKS9	185.6	208	eSn	2	33	01.60	0.63

6.

2002-01-28 time: 3:18:02.04 UTC ML= 2.4
lat: 47.956N lon: 19.493E h= 1.0 km
erh= 3.3km erz= 2.6km
nr= 30 gap=238 rms=0.85
Locality: Kutasó
Comments: felt 4-5 EMS

sta	dist	azm	phase	hr	mn	sec	res
PENC	24.3	221	ePg	3	18	06.80	0.42
			eSg		18	10.80	1.04
BORY	60.7	295	Pg	3	18	13.10	0.21
			eSg		18	21.50	0.15
BUD	63.2	214	iPgC	3	18	12.80	-0.54
			eSg		18	21.40	-0.75
DEVI	71.9	305	Pg	3	18	15.00	0.13
			eSg		18	24.20	-0.69
VYH	77.1	321	ePg	3	18	15.60	-0.21
			eSg		18	24.20	-2.35
JEMO	83.6	294	eSg	3	18	29.20	0.60
TEHL	85.9	287	eSg	3	18	28.80	-0.56
MLYN	93.1	296	Pg	3	18	20.50	1.84
			eSg		18	33.20	1.58
HOST	95.7	305	Pg	3	18	19.00	-0.12
			eSg		18	30.80	-1.65
PKSG	103.9	233	ePgC	3	18	19.70	-0.89
			eSg		18	35.00	-0.06
STIT	108.6	294	Pg	3	18	22.20	0.77
			eSg		18	35.10	-1.46
PVES	157.2	299	Pn	3	18	28.20	-0.36
			eSn		18	49.50	0.26
DVOD	162.7	296	Pn	3	18	29.60	0.36
			eSn		18	51.20	0.74
HRAD	166.0	296	Pn	3	18	29.70	0.05
			eSn		18	52.20	1.02
PKS9	177.8	211	ePnC	3	18	33.10	1.98
PKSM	204.4	198	iPnC	3	18	32.90	-1.54
			eSn		18	55.80	-3.91
RHK1	233.0	208	ePn	3	18	37.30	-0.70
			eSn		19	06.50	0.45

7.

2002-01-28 time: 6:02:19.97 UTC ML= 1.7
lat: 48.014N lon: 19.473E h= 1.8 km
erh= ---km erz= ---km
nr= 4 gap=328 rms=0.00
Locality: Nógrádsipek
Comments:

sta	dist	azm	phase	hr	mn	sec	res
PENC	28.7	210	iPgC	6	02	25.10	0.00
			eSg		02	29.10	0.00
PKSG	106.7	230	eSg	6	02	53.90	0.00
PKSM	210.1	197	eSn	6	03	18.70	0.00

8.

2002-01-28 time: 6:22:25.41 UTC ML= 1.6
lat: 48.002N lon: 19.500E h= 1.7 km
erh= 4.0km erz=43.5km
nr= 5 gap=257 rms=0.22
Locality: Nógrádsipek
Comments:

sta	dist	azm	phase	hr mn	sec	res
PENC	28.6	215	iPgC	6:22:30.40		-0.13
			eSg	22:34.50		-0.02
VYH	73.6	318	eSg	6:22:48.90		0.09
PKSG	107.4	231	ePg	6:22:45.00		0.41
			eSg	22:59.30		-0.25

9.

2002-01-28 time: 6:28:18.85 UTC ML= 1.8
lat: 47.993N lon: 19.481E h= 10.0 km
erh= ---km erz= ---km
nr= 3 gap=254 rms=0.01
Locality: Herencsény
Comments:

sta	dist	azm	phase	hr mn	sec	res
PENC	27.0	213	iPgD	6:28:24.00		0.00
			eSg	28:28.00		-0.01
VYH	73.4	319	eSg	6:28:42.40		0.01

10.

2002-01-28 time: 6:35:29.91 UTC ML= 1.7
lat: 48.043N lon: 19.485E h= 3.7 km
erh= ---km erz= ---km
nr= 4 gap=340 rms=0.17
Locality: Varsány
Comments:

sta	dist	azm	phase	hr mn	sec	res
PENC	32.0	208	ePgC	6:35:35.80		0.14
			eSg	35:39.80		-0.34
PKSG	109.5	229	ePg	6:35:49.40		-0.08
			eSg	36:04.90		0.16

11.

2002-01-30 time: 1:10:15.43 UTC ML= 1.8
lat: 46.382N lon: 20.441E h= 10.0 km
erh=35.4km erz=26.2km
nr= 9 gap=295 rms=0.97
Locality: Szikáncs
Comments:

sta	dist	azm	phase	hr mn	sec	res
PKSN	72.2	323	ePg	1:10:29.00		0.55
			eSg	10:38.20		-0.40
RHK2	130.5	258	ePn	1:10:37.20		-0.25
			eSn	10:54.00		-0.63
PKSM	140.0	262	iPnC	1:10:38.00		-0.64
			eSn	10:55.70		-1.04
PKS9	167.6	278	ePn	1:10:43.50		1.42
			eSn	11:02.60		-0.28
RHK1	185.2	260	eSn	1:11:10.30		3.52

12.

2002-02-05 time: 18:04:12.93 UTC ML= 1.8
lat: 46.022N lon: 19.979E h= 5.7 km
erh=37.1km erz=18.1km
nr= 6 gap=266 rms=0.84
Locality: Serbia
Comments:

sta	dist	azm	phase	hr mn	sec	res
PKSM	105.5	282	ePgD	18:04:31.40		-0.39
			eSg	04:48.60		2.10
RHK3	134.5	264	ePn	18:04:35.50		-0.50
			eSn	04:57.20		3.20
PKS9	145.2	296	ePnC	18:04:37.10		-0.24
			eSn	04:56.60		0.22
RHK1	147.5	273	ePn	18:04:39.80		2.17
			eSn	05:00.10		3.21
PKSG	194.7	321	ePn	18:04:43.00		-0.51
			eSn	05:13.80		6.43
PSZ	210.9	358	ePn	18:04:45.70		0.17

13.

2002-02-06 time: 10:02:07.31 UTC ML= 2.0
lat: 45.667N lon: 16.077E h= 6.8 km
erh= 2.6km erz= 2.2km
nr= 15 gap=121 rms=0.67
Locality: Croatia
Comments:

sta	dist	azm	phase	hr mn	sec	res
SISC	31.7	133	iPg	10:02:13.30		0.21
			iSg	02:18.10		0.49
CESS	58.7	306	iPg	10:02:18.39		0.53
			iSg	02:26.27		0.19
VBY	66.5	254	iPg	10:02:19.39		0.13
			iSg	02:27.73		-0.84
DOBS	71.5	319	iPg	10:02:19.96		-0.17
CEY	128.8	274	ePn	10:02:27.79		-1.74
			eSn	02:46.98		0.12
BISS	131.5	326	ePn	10:02:29.74		-0.12
OBKA	150.8	308	iPnC	10:02:33.10		0.83
			iSn	02:52.50		0.75
RHK1	162.4	73	iPnC	10:02:32.00		-1.71
			eSn	02:49.90		-4.41
ARSA	181.1	346	iPnC	10:02:36.20		0.15
			iSn	02:58.10		-0.37

14.

2002-02-11 time: 16:41:33.09 UTC ML= 2.9
lat: 47.689N lon: 20.910E h= 0.4 km
erh= 8.3km erz= 8.9km
nr= 15 gap=180 rms=1.13
Locality: Mezőnyárád
Comments: felt 5 EMS

sta	dist	azm	phase	hr mn	sec	res
PSZ	80.3	289	ePg	16:41:46.50		-0.92
			eSg	41:56.80		-1.80
BUD	143.8	261	ePn	16:41:58.00		0.01
UZH	146.8	44	ePn	16:41:57.60		-0.77
			iSn	42:15.00		-3.08
VYH	178.5	300	ePn	16:42:01.10		-1.23
			eSn	42:21.60		-3.53
PKS2	185.3	224	ePn	16:42:03.60		0.43
			eSn	42:25.90		-0.73
PKS8	191.5	242	ePn	16:42:03.40		-0.55
			eSn	42:24.90		-3.12
PKSG	192.6	260	ePnD	16:42:04.30		0.22
			eSn	42:25.80		-2.45
PKSM	238.4	226	iPnD	16:42:09.70		-0.09
KWP	253.3	32	ePn	16:42:11.60		-0.05
			eSn	42:49.20		7.47
RHK1	279.2	231	ePn	16:42:14.70		-0.18
MOD	281.4	286	ePn	16:42:17.80		2.64
			eSn	42:51.90		3.93
RHK3	284.8	225	ePnC	16:42:16.50		0.93
			eSn	42:45.80		-2.91
ZST	290.0	281	ePn	16:42:20.50		4.27
			eSn	42:52.90		3.02
OJC	292.9	344	iPn	16:42:20.60		4.01
OKC	313.6	320	ePn	16:42:21.10		1.93

		eSn	42:59.50	4.39
ARSA	409.1	263	iPnD	16:42:30.90	-0.17
			iSn	43:14.50	-1.80
DPC	447.4	311	ePn	16:42:38.60	2.74
			eSn	43:37.70	12.88
KSP	485.7	316	ePn	16:42:42.60	1.97
			eSn	43:46.70	13.38
MOA	498.4	272	iPnC	16:42:41.60	-0.61
			iSn	43:32.20	-3.92
OBKA	500.5	255	iPnC	16:42:42.80	0.33
			iSn	43:36.40	-0.19
KHC	566.0	286	ePn	16:42:50.00	-0.64
			eSn	43:46.50	-4.64
KBA	575.3	263	iPnC	16:42:52.20	0.40
			iSn	43:52.80	-0.40

15.

2002-02-11 time: 20:24:13.42 UTC ML= 3.0
lat: 47.791N lon: 20.831E h= 7.4 km
erh= 6.5km erz= 5.5km
nr= 11 gap=174 rms=0.60
Locality: Emőd
Comments: felt 4-5 EMS

sta	dist	azm	phase	hr mn	sec	res
PSZ	71.5	281	ePg	20:24:25.90		-0.36
			eSg	24:34.70		-1.57
BUD	140.0	256	iPn	20:24:38.00		1.03
UZH	143.3	49	iPn	20:24:37.30		-0.08
			iSn	24:54.50		-1.57
VYH	167.8	298	ePn	20:24:40.50		0.07
			eSn	25:00.40		-1.10
SRO	188.6	271	iPn	20:24:43.20		0.17
			eSn	25:05.20		-0.93
PKSG	188.8	256	ePnD	20:24:42.80		-0.26
			eSn	25:04.70		-1.48
PKS8	191.8	238	ePn	20:24:42.50		-0.93
PKS9	235.2	235	eSn	20:25:23.00		6.53
PKSM	242.0	223	iPnD	20:24:48.90		-0.78
			iSn	25:14.60		-3.37
MOD	272.6	284	ePn	20:24:58.20		4.70
			eSn	25:31.50		6.74
OJC	280.5	344	ePn	20:25:00.00		5.52
			iSn	25:33.50		6.99
RHK1	281.8	228	ePnC	20:24:53.90		-0.75
ZST	281.9	279	iPn	20:24:53.70		-0.96
			eSn	25:24.50		-2.33
RHK3	288.5	223	ePn	20:24:55.10		-0.39
			eSn	25:25.10		-3.20
OKC	301.1	319	ePn	20:24:58.00		0.94
SOP	320.7	268	iPnD	20:24:59.10		-0.40
			eSn	25:33.30		-2.14
VRAC	355.5	298	Pn	20:25:03.30		-0.54
			Sn	25:39.66		-3.50
ARSA	404.3	261	iPnD	20:25:10.20		0.28
			iSn	25:50.80		-3.19
DPC	435.4	311	ePn	20:25:14.00		0.20
			eSn	26:19.30		18.40
MLR	467.7	123	Pn	20:25:22.02		4.19
KSP	473.4	316	ePn	20:25:19.70		1.16
			eSn	26:02.00		-7.33
MOA	491.7	271	iPnD	20:25:20.80		-0.02
			iSn	26:10.00		-3.39
OBKA	497.3	253	iPnD	20:25:21.00		-0.52
			iSn	26:09.50		-5.14
PRU	522.0	298	Pn	20:25:24.00		-0.60
			eSn	26:15.50		-4.62
GERE	541.6	283	Pn	20:25:27.00		-0.05
			Sn	26:21.35		-3.13
GEC2	541.6	283	ePn	20:25:27.10		0.05
			eSn	26:21.20		-3.28
KHC	556.8	286	ePn	20:25:28.00		-0.93
KBA	570.3	262	iPnC	20:25:31.60		0.98
			iSn	26:28.40		-2.44
FINE	557.2	13	Pn	20:27:26.90		-6.77

16.

2002-02-13 time: 11:31:15.56 UTC ML= 2.0
lat: 47.434N lon: 18.345E h= 0.8 km
erh= ---km erz= ---km
nr= 4 gap=321 rms=0.02
Locality: Vértes mt.
Comments: explosion

sta	dist	azm	phase	hr mn	sec	res
PKSG	5.8	144	iPgC	11:31:16.60		-0.01
			eSg	31:17.40		-0.03
PKS8	66.7	158	ePg	11:31:27.50		0.03
PKS9	94.3	183	ePg	11:31:32.40		0.00

17.

2002-02-13 time: 11:39:35.20 UTC ML= 1.1
lat: 47.727N lon: 18.533E h= 10.0 km
erh= 2.9km erz= 2.4km
nr= 10 gap=131 rms=0.61
Locality: Lábatlan
Comments: explosion

sta	dist	azm	phase	hr mn	sec	res
SRO	19.1	300	iPg	11:39:39.20		0.15
			eSg	39:42.40		0.36
PKSG	38.7	196	iPgC	11:39:41.70		-0.65
			eSg	39:47.60		-0.32
PKS8	94.9	173	iPgD	11:39:53.30		1.06
			eSg	40:04.40		-1.14
PSZ	104.2	78	eS*	11:40:08.40		-0.01
MOD	118.0	308	eSn	11:40:11.00		-0.63
PKSM	168.6	177	iPnD	11:40:02.20		0.22
			eSn	40:22.40		-0.47

18.

2002-02-13 time: 15:59:07.11 UTC ML= 1.7
lat: 45.528N lon: 16.126E h= 3.9 km
erh= 3.8km erz= 2.8km
nr= 16 gap=160 rms=0.95
Locality: Croatia
Comments:

sta	dist	azm	phase	hr mn	sec	res
SISC	20.3	108	iPg	15:59:10.95		0.16
			iSg	59:14.00		0.33
VBY	68.0	268	iPgC	15:59:19.30		0.04
			iSg	59:27.70		-1.04
CESS	71.5	314	ePg	15:59:20.60		0.71
			iSg	59:29.80		-0.05
DOBS	85.9	324	iPgC	15:59:22.10		-0.35
			iSg	59:33.50		-0.92
CEY	134.5	280	iPn	15:59:31.30		0.88
			iSn	59:48.00		-0.61
LJU	136.4	295	ePn	15:59:31.60		0.94
OBKA	163.7	312	iPnC	15:59:34.90		0.84
			iSn	59:56.40		1.32
RHK1	164.3	67	iPnC	15:59:32.80		-1.33
RHK3	170.6	76	eSn	15:59:52.40		-4.20
PKSM	209.6	69	ePn	15:59:32.80		-6.98
			eSn	16:00:06.90		1.64

19.

2002-02-14 time: 10:05:53.78 UTC ML= 1.4
lat: 45.523N lon: 17.709E h= 13.2 km
erh= 2.0km erz= 0.6km
nr= 6 gap=338 rms=0.06
Locality: Croatia
Comments:

sta	dist	azm	phase	hr mn	sec	res
RHK3	58.9	46	iPgD	10:06:04.60		0.04
			eSg	06:12.90		-0.07

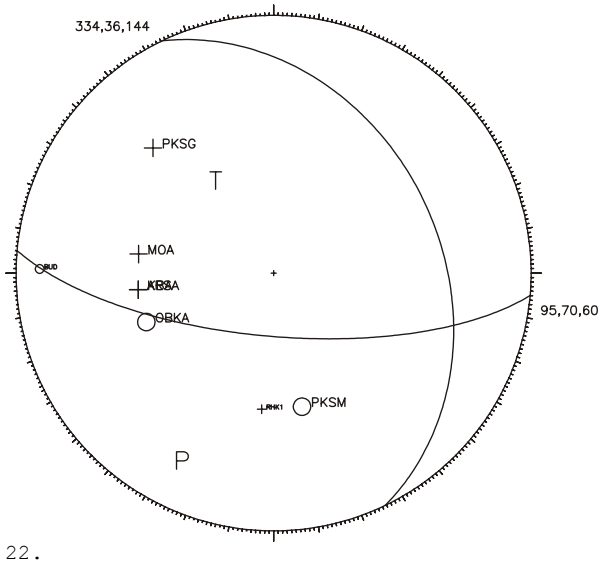
```
RHK1  70.0  24   iPgD  10:06:06.50    0.01
                 eSg      06:15.70   -0.71
PKSM 105.3  43   iPnD  10:06:12.20   -0.06
                 eSn      06:26.80    0.13
```

20.

```
 2002-02-18  time: 14:59:11.21 UTC  ML= 0.9
   lat: 46.215N  lon: 18.809E  h= 10.0 km
                 erh= 3.7km    erz= 2.6km
   nr=  8        gap=265       rms=0.28
   Locality: Pörböly
   Comments:

sta   dist azm  phase  hr mn  sec     res
PKSM  12.9 268   ePgC  14:59:14.10   -0.03
                 iSg      59:16.40    0.00
PKS9  58.1 315   ePg   14:59:21.80    0.07
                 eSg      59:32.10    2.16
RHK1  58.1 257   ePg   14:59:21.80    0.06
                 eSg      59:29.80   -0.15
PKS8  74.5 352   iPgC  14:59:24.80    0.17
                 eSg      59:34.10   -1.00
```

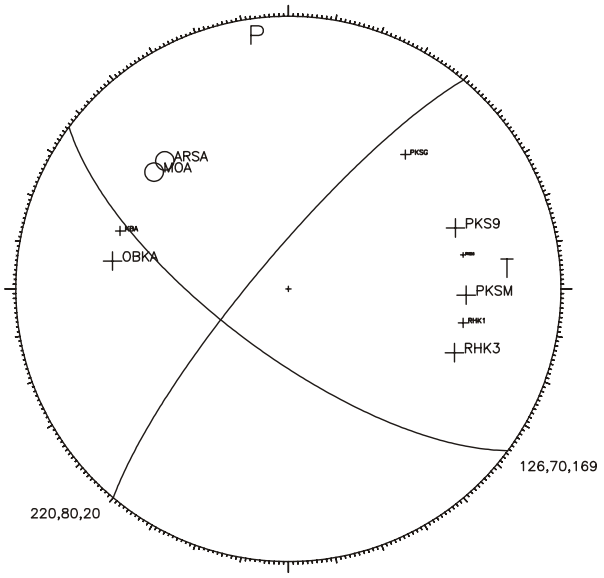
21.

```
 2002-02-22  time: 11:52:34.73 UTC  ML= 2.9
   lat: 47.492N  lon: 18.248E  h= 10.0 km
                 erh= 2.6km    erz= 1.9km
   nr= 20        gap= 78       rms=0.76
   Locality: Környe
   Comments: felt 4 EMS

sta   dist azm  phase  hr mn  sec     res
PKSG  15.5 136   iPgC  11:52:37.30   -0.71
                 eSg      52:39.20   -1.38
SRO   36.1   8   iPg   11:52:42.10    0.68
                 eSg      52:47.10    0.46
BUD   58.5  91   ePgD  11:52:45.40    0.07
                 eSg      52:51.30   -2.29
PKS9 100.6 179   ePg   11:52:53.30    0.53
ZST  116.1 312   iPn   11:52:55.30    0.34
                 iSn      53:09.80   -0.95
MOD  121.9 324   ePn   11:52:55.80    0.12
                 iSn      53:11.20   -0.83
PSZ  132.4  69   ePn   11:52:57.70    0.71
                 eSn      53:13.60   -0.76
PKS2 133.2 147   eSn   11:53:15.60    1.07
PKSM 145.4 168   iPnD  11:52:58.70    0.09
                 eSn      53:15.20   -2.04
RHK1 155.4 185   ePnC  11:53:00.10    0.24
                 eSn      53:18.20   -1.27
ARSA 207.5 263   iPnC  11:53:07.50    1.14
                 iSn      53:31.60    0.57
MOA  301.7 278   iPnC  11:53:20.50    2.40
                 iSn      53:53.50    1.57
OBKA 301.8 249   iPnD  11:53:19.10    0.99
                 iSn      53:51.40   -0.55
KBA  373.8 263   iPnC  11:53:28.70    1.61
                 iSn      54:07.00   -0.93
```



22.

```
 2002-02-23  time:  0:19:26.50 UTC  ML= 2.3
   lat: 46.252N  lon: 16.930E  h= 24.6 km
                 erh= 2.8km    erz= 5.2km
   nr= 26        gap=126       rms=0.74
   Locality: Zákány
   Comments:

sta   dist azm  phase  hr mn  sec     res
RHK1  90.1 101   ePnC   0:19:41.70   -0.11
                 eSn      19:52.80   -0.96
RHK3 110.0 111   iPnC   0:19:44.20   -0.10
                 eSn      19:57.70   -0.48
PKS9 110.2  70   iPnC   0:19:45.40    1.08
                 eSn      19:59.70    1.48
DOBS 113.3 264   iPn    0:19:43.80   -0.90
                 iSn      19:59.00    0.10
CESS 117.5 255   iPn    0:19:44.90   -0.33
                 eSn      20:00.00    0.16
PKSM 132.1  92   iPnC   0:19:46.60   -0.45
                 eSn      20:02.80   -0.28
BISS 145.3 288   iPn    0:19:48.30   -0.39
                 iSn      20:05.00   -1.00
VBY  154.2 237   iPn    0:19:51.50    1.70
ARSA 154.5 316   iPnD   0:19:49.90    0.06
                 iSn      20:08.00   -0.04
PKSG 168.8  41   ePnC   0:19:51.60   -0.02
                  Sn      20:10.50   -0.71
OBKA 185.4 279   iPnC   0:19:53.60   -0.09
                 iSn      20:15.10    0.20
PKS6 206.2  79   iPnC   0:19:47.60   -8.69
                 eSn      20:19.40   -0.12
VOY  235.9 264   ePn    0:20:02.70    2.71
                 eSn      20:34.40    8.29
MOA  269.2 311   iPnD   0:20:05.20    1.05
                 iSn      20:34.90    1.39
KBA  289.3 289   iPnC   0:20:13.60    6.95
                 iSn      20:49.00   11.03
PSZ  291.6  51   ePn    0:20:11.40    4.47
```



23.

2002-02-24 time: 0:55:52.84 UTC ML= 1.6
lat: 47.696N lon: 19.435E h= 0.6 km
erh= ---km erz= ---km
nr= 4 gap=258 rms=0.07
Locality: Iklad
Comments:

sta	dist	azm	phase	hr mn	sec	res
PENC	15.6	313	iPgC	0:55:55.60		-0.03
			eSg	55:57.90		0.09
PSZ	42.4	54	ePg	0:56:00.50		0.08
			eSg	56:06.20		-0.12

24.

2002-02-25 time: 18:05:01.84 UTC ML= 0.8
lat: 45.743N lon: 17.996E h= 0.4 km
erh= 2.5km erz= 158km
nr= 5 gap=325 rms=0.21
Locality: Croatia
Comments:

sta	dist	azm	phase	hr mn	sec	res
RHK1	39.9	9	iPgD	18:05:08.90		-0.07
			eSg	05:14.10		-0.43
PKSM	72.2	44	iPgC	18:05:14.70		-0.03
			eSg	05:24.80		0.01
PKS9	96.3	13	ePg	18:05:19.50		0.47

25.

2002-02-25 time: 23:10:19.62 UTC ML= 2.2
lat: 47.681N lon: 19.622E h= 10.0 km
erh= 4.0km erz= 3.9km
nr= 15 gap=130 rms=1.10
Locality: Hatvan
Comments: felt 3-4 EMS

sta	dist	azm	phase	hr mn	sec	res
PENC	28.2	295	ePg	23:10:25.50		0.53
			eSg	10:30.10		0.96
PSZ	33.4	38	ePg	23:10:25.00		-0.84
			eSg	10:29.80		-0.89
PKSN	89.2	168	ePgD	23:10:36.10		0.46
			eSg	10:48.90		0.76
PKSG	98.1	251	ePgC	23:10:36.90		-0.33
			eSg	10:50.90		-0.07
PKS6	120.3	182	iPn	23:10:42.20		1.82
PKS9	158.7	220	ePnD	23:10:44.30		-0.86
			eSn	11:05.50		0.42
PKSM	179.6	205	iPnD	23:10:46.60		-1.17
			eSn	11:07.10		-2.63
RHK1	211.8	214	ePn	23:10:50.80		-0.98
			eSn	11:14.00		-2.87

26.

2002-02-28 time: 13:20:23.21 UTC ML= 1.6
lat: 45.545N lon: 17.721E h= 14.7 km
erh= 1.6km erz= 0.5km
nr= 6 gap=337 rms=0.07
Locality: Croatia
Comments:

sta	dist	azm	phase	hr mn	sec	res
RHK3	56.6	47	iPgD	13:20:33.60		-0.06
			eSg	20:41.90		0.09
RHK1	67.4	24	iPgD	13:20:35.60		0.07
			eSg	20:45.00		-0.15
PKSM	103.0	44	iPnD	13:20:41.20		0.00
			eSn	20:55.30		0.06

27.

2002-03-04 time: 10:48:54.25 UTC ML= 0.5
lat: 46.179N lon: 18.300E h= 13.1 km
erh= 1.7km erz= 3.4km
nr= 6 gap=199 rms=0.16
Locality: Zobákpuszta
Comments: explosion

sta	dist	azm	phase	hr mn	sec	res
RHK1	19.5	243	iPgC	10:48:58.50		0.06
			eSg	49:01.60		-0.12
PKSM	26.6	82	ePgC	10:48:59.30		-0.24
			Sg	49:03.80		0.14
RHK3	32.2	186	ePg	10:49:00.60		0.16
			eSg	49:05.00		-0.28

28.

2002-03-06 time: 20:32:11.10 UTC ML= 2.4
lat: 46.288N lon: 16.876E h= 10.0 km
erh= 9.0km erz=12.3km
nr= 12 gap=149 rms=1.08
Locality: Őrtilos
Comments:

sta	dist	azm	phase	hr mn	sec	res
RHK1	95.0	103	iPgD	20:32:28.00		-0.15
			eSg	32:40.10		-1.35
DOBS	109.6	262	iPn	20:32:30.10		-0.42
			iSn	32:45.30		-0.37
CESS	114.6	252	iPn	20:32:31.30		0.15
			iSn	32:47.00		0.21
BISS	140.1	287	iPn	20:32:34.80		0.47
			iSn	32:51.80		-0.65
ARSA	148.7	316	iPnC	20:32:37.60		2.20
			iSn	32:52.40		-1.95
OBKA	180.6	278	iPnC	20:32:40.70		1.32
			iSn	32:56.60		-4.84

29.

2002-03-10 time: 8:31:32.46 UTC ML= 1.8
lat: 45.940N lon: 16.238E h= 0.2 km
erh= 6.7km erz= 8.1km
nr= 10 gap=101 rms=0.79
Locality: Croatia
Comments:

sta	dist	azm	phase	hr mn	sec	res
SISC	53.2	169	iPg	8:31:	42.10	0.13
			iSg	31:	48.90	-0.48
CESS	60.2	273	iPgC	8:31:	43.20	-0.01
			iSg	31:	50.30	-1.29
DOBS	63.9	291	iPg	8:31:	43.70	-0.17
			eSg	31:	51.10	-1.67
VBY	90.5	238	ePg	8:31:	48.10	-0.52
			iSg	31:	58.80	-2.42
BISS	116.2	313	ePg	8:31:	52.30	-0.92
RHK1	143.4	83	ePnD	8:31:	58.90	1.55
			eSn	32:	13.00	-3.76
OBKA	144.8	296	iPnC	8:31:	57.60	0.07
			iSn	32:	15.80	-1.29
ARSA	155.6	339	iPnC	8:32:	00.40	1.53
			iSn	32:	19.40	-0.07
RHK3	156.5	92	ePnC	8:31:	57.60	-1.39
			Sn	32:	15.40	-4.28
PKS9	173.0	65	eSn	8:32:	00.10	-23.24
PKSM	188.4	81	ePn	8:32:	01.50	-1.46
			Sn	32:	29.50	2.75

30.

2002-03-12 time: 11:16:43.35 UTC ML= 1.3
lat: 45.551N lon: 17.385E h= 34.1 km
erh=15.0km erz= 114km
nr= 6 gap=341 rms=0.57
Locality: Croatia
Comments:

sta	dist	azm	phase	hr mn	sec	res
RHK3	77.6	61	iPgD	11:16:	56.60	0.04
			eSg	17:	06.40	-0.45
RHK1	81.2	41	iPgD	11:16:	56.40	-0.60
			eSg	17:	07.80	0.15
PKSM	122.1	53	ePgC	11:17:	03.40	1.29
			Sg	17:	17.20	0.46

31.

2002-03-16 time: 12:13:22.52 UTC ML= 2.2
lat: 46.120N lon: 16.598E h= 17.1 km
erh= 5.4km erz= 7.4km
nr= 9 gap=168 rms=0.64
Locality: Croatia
Comments:

sta	dist	azm	phase	hr mn	sec	res
DOBS	87.3	272	iP*C	12:13:	37.30	-0.64
			eS*	13:	49.60	-0.37
CESS	89.3	259	eP*	12:13:	38.70	0.45
			eS*	13:	51.60	1.07
RHK1	114.3	91	ePn	12:13:	41.60	-0.02
			eSn	13:	55.90	-0.62
BISS	127.4	297	ePn	12:13:	43.30	0.04
ARSA	150.1	327	iPnC	12:13:	47.10	1.01
			iSn	14:	03.90	-0.57

32.

2002-03-17 time: 15:37:12.42 UTC ML= 0.5
lat: 45.854N lon: 18.483E h= 0.4 km
erh= 2.9km erz= 107km
nr= 6 gap=266 rms=0.19
Locality: Magyarbóly
Comments:

sta	dist	azm	phase	hr mn	sec	res
RHK3	18.2	283	iPgC	15:37:	15.50	-0.18
			eSg	37:	18.40	0.18
PKSM	41.6	17	ePgC	15:37:	20.10	0.25
			eSg	37:	25.10	-0.55
RHK1	41.6	311	iPgC	15:37:	19.90	0.05
			eSg	37:	25.80	0.14

33.

2002-03-21 time: 9:29:29.65 UTC ML= 0.6
lat: 45.788N lon: 18.446E h= 0.2 km
erh= 0.8km erz=60.0km
nr= 5 gap=290 rms=0.60
Locality: Beremend
Comments:

sta	dist	azm	phase	hr mn	sec	res
RHK3	18.8	308	ePgC	9:29:	32.90	-0.11
			eSg	29:	34.50	-1.13
PKSM	49.4	18	ePgC	9:29:	38.60	0.12
			eSg	29:	44.50	-0.86
PKS9	89.7	352	ePg	9:29:	46.60	0.93

34.

2002-03-21 time: 11:36:16.93 UTC ML= 1.5
lat: 45.522N lon: 17.817E h= 0.4 km
erh= 6.5km erz= 4.8km
nr= 7 gap=338 rms=0.62
Locality: Croatia
Comments:

sta	dist	azm	phase	hr mn	sec	res
RHK3	53.3	40	ePgC	11:36:	26.50	0.05
			eSg	36:	34.90	1.03
RHK1	67.1	17	iPgD	11:36:	28.50	-0.41
			eSg	36:	38.00	-0.26
PKSM	99.9	40	ePgC	11:36:	34.10	-0.66
			eSg	36:	48.20	-0.47
PKS8	164.7	24	iPnC	11:36:	45.50	1.05

35.

2002-03-22 time: 11:22:13.83 UTC ML= 1.6
lat: 45.500N lon: 17.868E h= 10.0 km
erh= 3.1km erz=11.6km
nr= 6 gap=336 rms=0.49
Locality: Croatia
Comments:

sta	dist	azm	phase	hr mn	sec	res
RHK3	52.9	35	iPgD	11:22:	24.00	0.56
			eSg	22:	32.20	1.26
RHK1	68.4	14	iPgD	11:22:	25.90	-0.28
			eSg	22:	35.40	-0.41
PKSM	99.4	37	iPgD	11:22:	31.50	-0.16
			eSg	22:	44.70	-0.87

36.

2002-03-22 time: 15:18:16.39 UTC ML= 1.5
lat: 45.736N lon: 17.355E h= 11.6 km
erh= 7.3km erz= 2.3km
nr= 6 gap=338 rms=0.28
Locality: Croatia
Comments:

sta	dist	azm	phase	hr mn	sec	res
RHK1	68.9	54	ePgD	15:18:	28.60	-0.26
			eSg	18:	38.90	0.31
RHK3	72.0	76	iPgD	15:18:	29.60	0.20
			eSg	18:	38.60	-0.96
PKSM	112.8	62	ePnC	15:18:	35.90	-0.12
			eSn	18:	51.40	0.07

37.

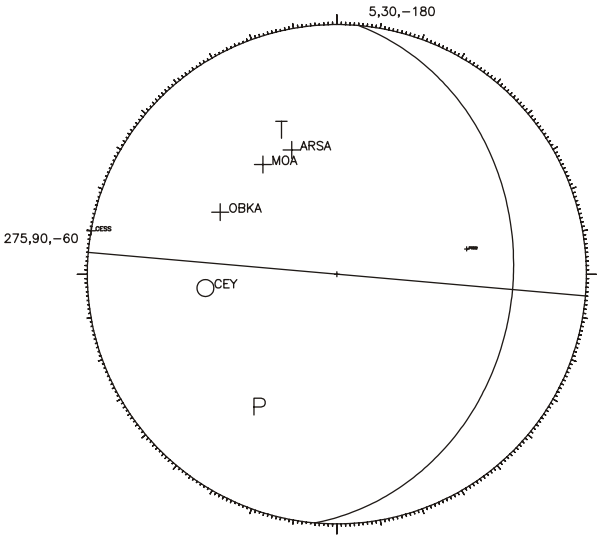
2002-03-22 time: 15:33:03.75 UTC ML= 1.8
lat: 45.504N lon: 17.986E h= 2.2 km
erh= 7.5km erz= 116km
nr= 5 gap=333 rms=0.20
Locality: Croatia
Comments:

sta	dist	azm	phase	hr mn	sec	res
RHK3	47.9	26	ePg	15:33:12.50		0.19
RHK1	66.4	6	iPgD	15:33:15.60		-0.02
			eSg		33:24.50	-0.38
PKSM	93.7	33	ePgC	15:33:20.20		-0.29
PKS9	122.5	11	eSg	15:33:42.90		0.21

38.

2002-03-26 time: 16:45:02.31 UTC ML= 2.1
lat: 45.878N lon: 16.233E h= 0.2 km
erh= 4.0km erz= 3.4km
nr= 10 gap=161 rms=0.42
Locality: Croatia
Comments:

sta	dist	azm	phase	hr mn	sec	res
CESS	60.7	280	ePgC	16:45:13.40		0.26
			iSg		45:19.80	-1.79
DOBS	66.4	297	iPg	16:45:13.90		-0.27
VBY	86.7	241	iPg	16:45:17.90		0.11
			iSg		45:27.30	-2.56
LJU	133.1	278	ePn	16:45:24.80		-1.11
			iSn		45:41.20	-3.11
CEY	141.3	264	iPnD	16:45:27.00		0.07
			eSn		45:44.30	-1.84
RHK1	144.8	80	ePn	16:45:27.30		-0.07
			eSn		45:46.80	-0.12
OBKA	147.7	298	iPnC	16:45:28.00		0.26
			iSn		45:43.30	-4.27
ARSA	162.0	340	iPnC	16:45:29.40		-0.11
			iSn		45:45.70	-5.03
VOY	182.2	275	ePn	16:45:32.30		0.26
			eSn		45:55.20	-0.02
PKSM	190.0	79	ePnC	16:45:37.70		4.69
			eSn		45:59.90	2.94
MOA	265.6	326	iPnC	16:45:44.00		1.57
			iSn		46:10.90	-2.82



39.

2002-03-28 time: 13:29:12.61 UTC ML= 1.0
lat: 47.660N lon: 18.752E h= 10.0 km
erh=15.2km erz=48.2km
nr= 6 gap=209 rms=0.49
Locality: Dág
Comments:

sta	dist	azm	phase	hr mn	sec	res
BUD	28.3	134	ePg	13:29:17.20		-0.78
			eSg		29:22.70	0.54
PKSG	40.4	222	ePgC	13:29:20.00		-0.04
			eSg		29:26.00	0.17
PSZ	90.3	71	ePg	13:29:29.40		0.56
			eSg		29:41.20	-0.29

40.

2002-03-28 time: 13:34:24.72 UTC ML= 1.2
lat: 47.503N lon: 18.890E h= 10.0 km
erh= 9.3km erz= 8.8km
nr= 6 gap=167 rms=0.22
Locality: Budakeszi
Comments:

sta	dist	azm	phase	hr mn	sec	res
BUD	10.3	102	iPgC	13:34:27.10		-0.18
			eSg		34:29.60	0.32
PKSG	39.7	252	iPgC	13:34:32.00		-0.02
			eSg		34:37.80	0.08
PSZ	88.4	59	ePg	13:34:41.00		0.40
			eSg		34:52.70	-0.29

41.

2002-04-04 time: 2:10:58.52 UTC ML= 2.0
lat: 45.693N lon: 16.739E h= 21.9 km
erh=12.0km erz=15.5km
nr= 13 gap=180 rms=1.30
Locality: Croatia
Comments:

sta	dist	azm	phase	hr mn	sec	res
CESS	103.9	287	ePn	2:11:16.50		0.71
			eSn		11:28.80	-0.47
DOBS	110.8	297	iPn	2:11:15.90		-0.75
VBY	117.6	260	iPn	2:11:18.60		1.11
			eSn		11:31.30	-0.99
RHK3	119.8	79	ePn	2:11:17.40		-0.37
			eSn		11:30.30	-2.49
PKS9	155.0	50	ePn	2:11:23.80		1.64
			eSn		11:41.40	0.80
PKSM	158.3	69	iPnD	2:11:20.90		-1.68
			eSn		11:41.30	-0.04
PKS8	199.1	49	ePn	2:11:30.90		3.23
			eSn		11:52.90	2.50

42.

2002-04-08 time: 12:15:27.00 UTC ML= 1.5
lat: 45.613N lon: 18.018E h= 15.0 km
erh= 6.9km erz= 3.0km
nr= 7 gap=277 rms=0.43
Locality: Croatia
Comments:

sta	dist	azm	phase	hr mn	sec	res
RHK3	36.0	31	iPgD	12:15:34.00		0.04
RHK1	54.1	5	iPgD	12:15:36.70		-0.33
			Sg		15:45.20	0.35
PKSM	82.3	36	iP*C	12:15:41.60		-0.26
			eS*		15:53.80	0.35
PKS9	110.1	11	ePn	12:15:46.90		1.05
ARSA	264.4	314	iPnD	12:16:03.70		-1.38
MOA	379.5	311	iPnD	12:16:18.80		-0.64

43.

2002-04-08 time: 19:10:56.71 UTC ML= 1.8
lat: 48.196N lon: 19.521E h= 6.1 km
erh=11.9km erz= 4.5km
nr= 5 gap=275 rms=0.40
Locality: Nógrádszakál
Comments:

sta	dist	azm	phase	hr mn	sec	res
PSZ	41.6	138	ePgC	19:11:04.30		0.09
			eSg	11:07.70		-2.37
PENC	48.5	202	ePgD	19:11:05.30		-0.14
			eSg	11:10.00		-2.26
PKSG	123.2	223	ePn	19:11:17.80		-0.52
PKS7	130.6	192	ePnC	19:11:20.00		0.76
			eSn	11:33.40		-3.42
PKSN	146.8	170	Sn	19:11:36.90		-3.51
PKS8	159.7	203	ePn	19:11:22.80		-0.07
PKS6	177.5	179	eSn	19:11:48.00		0.76

44.

2002-04-15 time: 10:23:30.57 UTC ML= 1.5
lat: 45.544N lon: 17.673E h= 19.9 km
erh= 6.1km erz= 5.8km
nr= 6 gap=337 rms=0.60
Locality: Croatia
Comments:

sta	dist	azm	phase	hr mn	sec	res
RHK3	59.5	50	eP*C	10:23:41.00		-0.50
			eS*	23:49.40		-0.63
RHK1	69.1	27	eP*D	10:23:43.00		0.04
			eS*	23:52.50		-0.13
PKSM	105.7	45	ePnD	10:23:48.60		0.36
			eSn	24:04.00		1.98

45.

2002-04-22 time: 11:24:45.33 UTC ML= 0.7
lat: 46.171N lon: 18.294E h= 8.1 km
erh= 1.0km erz= 4.5km
nr= 5 gap=196 rms=0.09
Locality: Zobákpuszta
Comments: explosion

sta	dist	azm	phase	hr mn	sec	res
RHK1	18.7	245	iPgC	11:24:48.90		-0.06
			eSg	24:51.90		0.10
PKSM	27.2	80	ePgC	11:24:50.50		0.10
			eSg	24:54.20		-0.15
RHK3	31.2	186	eSg	11:24:55.60		0.04

46.

2002-04-30 time: 22:58:42.59 UTC ML= 0.6
lat: 47.267N lon: 18.138E h= 0.2 km
erh= ***km erz= ***km
nr= 5 gap=252 rms=0.20
Locality: Isztimér
Comments:

sta	dist	azm	phase	hr mn	sec	res
PKSG	23.6	54	iPgD	22:58:46.80		-0.01
			eSg	58:50.00		-0.10
PKS7	81.3	107	eSg	22:59:08.50		0.05
PKSM	123.5	162	iPgD	22:59:04.70		0.05
			eSg	59:19.10		-2.75

47.

2002-05-02 time: 11:02:23.22 UTC ML= 1.3
lat: 45.653N lon: 17.393E h= 16.4 km
erh= 2.3km erz= 1.8km
nr= 6 gap=339 rms=0.07
Locality: Croatia
Comments:

sta	dist	azm	phase	hr mn	sec	res
RHK3	72.0	68	iP*C	11:02:36.40		0.02
			eS*	02:46.60		-0.04
RHK1	72.4	47	iP*D	11:02:36.50		0.05
			eS*	02:46.70		-0.07
PKSM	115.0	57	iPnC	11:02:42.40		-0.09
			eSn	02:57.70		0.17

48.

2002-05-03 time: 5:27:38.26 UTC ML=2.3
lat: 47.948N lon: 16.477E h= 10.0 km
erh=11.8km
Locality: Austria
Comments:
Reported by NEIC

49.

2002-05-03 time: 11:11:54.81 UTC ML= 1.1
lat: 46.084N lon: 18.130E h= 5.7 km
erh= 0.3km erz= 0.6km
nr= 6 gap=140 rms=0.03
Locality: Kővágószőlős
Comments: explosion

sta	dist	azm	phase	hr mn	sec	res
RHK1	4.5	291	ePgC	11:11:56.10		0.00
			eSg	11:57.10		-0.01
RHK3	23.4	156	iPgC	11:11:59.10		-0.01
			eSg	12:02.50		0.03
PKSM	42.0	70	iPgD	11:12:02.40		0.03
			eSg	12:08.20		-0.07

50.

2002-05-04 time: 9:54:40.63 UTC ML= 1.9
lat: 46.239N lon: 16.930E h= 20.5 km
erh= 5.7km erz= 5.7km
nr= 12 gap=157 rms=0.62
Locality: Zákány
Comments:

sta	dist	azm	phase	hr mn	sec	res
RHK1	89.9	100	ePgD	9:54:56.40		0.22
			eSg	55:07.90		-0.40
RHK3	109.5	111	iPnD	9:54:59.00		0.28
			eSn	55:12.40		-0.43
PKS9	110.7	70	ePn	9:54:59.90		1.03
			eSn	55:14.70		1.60
DOBS	113.2	265	iPn	9:54:58.70		-0.48
CESS	117.2	255	iPn	9:55:00.10		0.43
PKSM	132.1	91	ePnC	9:55:01.60		0.06
			eSn	55:17.30		-0.54
PKS8	151.7	62	ePnC	9:55:02.90		-1.08
			eSn	55:21.00		-1.18

51.

2002-05-07 time: 10:10:26.35 UTC ML= 1.1
lat: 47.466N lon: 18.493E h= 1.4 km
erh= 9.1km erz= 7.0km
nr= 6 gap=305 rms=0.45
Locality: Vértes mt.
Comments: explosion

```
sta   dist azm  phase  hr mn  sec     res
PKSG  11.3 223   iPgC  10:10:28.30   -0.09
                 eSg      10:29.10   -0.88
PKS8  66.8 168   iPgC  10:10:38.10   -0.17
                 eSg      10:47.00   -0.57
PKS9  99.1 189   iPgC  10:10:44.80    0.76
PKSM 139.9 175   iPnC  10:10:50.50   -0.14
                 eSn      11:05.40   -4.19
```

52.

```
 2002-05-07  time: 12:02:36.08 UTC  ML= 0.7
   lat: 47.306N  lon: 18.624E  h= 10.0 km
                 erh=20.8km    erz=28.4km
   nr=  6        gap=237       rms=0.98
   Locality: Vereb
   Comments:

sta   dist azm  phase  hr mn  sec     res
PKSG  20.1 299   iPgD  12:02:39.90   -0.19
                 eSg      02:43.60    0.38
PKS8  47.6 175   ePgD  12:02:45.10    0.33
                 eSg      02:52.40    0.85
PKS9  84.1 198   ePg   12:02:51.20    0.00
                 eSg      02:55.40   -7.60
```

53.

```
 2002-05-08  time: 14:57:04.92 UTC  ML= 2.9
   lat: 47.811N  lon: 20.188E  h= 14.8 km
                 erh= 4.9km    erz= 3.3km
   nr=  7        gap=282       rms=0.20
   Locality: Tófalu
   Comments: felt 4 EMS

sta   dist azm  phase  hr mn  sec     res
PSZ   25.0 298   iPgC  14:57:10.00   -0.11
                 eSg      57:13.90   -0.26
PENC  68.0 268   iPgD  14:57:17.60    0.26
                 eSg      57:27.00   -0.03
BUD   94.8 247   eP*   14:57:21.70    0.00
                 eS*      57:34.90    0.11
RHK1 249.3 220   iPnC  14:57:40.70   -0.45
                 eSn      58:08.50   -0.90
```

54.

```
 2002-05-13  time: 10:56:41.41 UTC  ML= 1.3
   lat: 45.521N  lon: 17.715E  h= 12.6 km
                 erh= 2.6km    erz= 1.0km
   nr=  6        gap=338       rms=0.10
   Locality: Croatia
   Comments:

sta   dist azm  phase  hr mn  sec     res
RHK3  58.8  46   ePgD  10:56:52.10   -0.05
                 eSg      57:00.50   -0.02
RHK1  70.0  24   iPgD  10:56:54.20    0.09
                 eSg      57:03.80   -0.22
PKSM 105.2  43   iPnD  10:56:59.90   -0.05
                 eSn      57:14.70    0.29
```

55.

```
 2002-05-13  time: 11:35:28.94 UTC  ML= 1.0
   lat: 46.148N  lon: 18.296E  h= 10.0 km
                 erh= 2.1km    erz= 6.4km
   nr=  8        gap=128       rms=0.36
   Locality: Vasas
   Comments:

sta   dist azm  phase  hr mn  sec     res
RHK1  17.9 252   iPgC  11:35:32.50   -0.10
                 eSg      35:35.60    0.15
PKSM  27.6  75   ePgC  11:35:33.70   -0.48
                 eSg      35:38.50    0.22
RHK3  28.7 187   ePgC  11:35:34.30   -0.06
                 eSg      35:38.90    0.32
PKS8  86.4  20   ePg   11:35:45.20    0.74
                 eSg      35:56.10   -0.47
```

56.

```
 2002-05-20  time: 20:05:13.67 UTC  ML= 1.5
   lat: 46.371N  lon: 17.830E  h= 12.0 km
                 erh= 3.3km    erz= 2.3km
   nr= 15        gap=232       rms=0.51
   Locality: Kaposvár
   Comments:

sta   dist azm  phase  hr mn  sec     res
RHK1  35.8 148   iPgD  20:05:20.70    0.30
                 eSg      05:25.50   -0.15
PKS9  41.9  55   iPgC  20:05:21.70    0.25
                 eSg      05:27.80    0.27
RHK3  62.6 148   iPgD  20:05:25.10    0.05
                 eSg      05:33.00   -0.92
PKSM  64.9 106   ePg   20:05:25.10   -0.36
                 eSg      05:35.50    0.84
PKS8  85.9  49   ePgC  20:05:28.40   -0.75
                 eSg      05:40.20   -1.03
PKSG 121.2  21   iPnD  20:05:34.30    0.02
                 eSn      05:49.50   -0.86
PKS7 126.5  54   ePn   20:05:35.70    0.76
                 eSn      05:51.10   -0.43
PKS6 135.5  79   ePn   20:05:38.80    2.73
```

57.

```
 2002-05-21  time:  9:38:57.78 UTC  ML= 1.5
   lat: 45.554N  lon: 17.729E  h= 16.0 km
                 erh= 3.8km    erz= 1.3km
   nr=  6        gap=337       rms=0.15
   Locality: Croatia
   Comments:

sta   dist azm  phase  hr mn  sec     res
RHK3  55.4  47   iPgD   9:39:08.00   -0.08
                 eSg      39:16.30    0.18
RHK1  66.2  24   ePgC   9:39:09.80   -0.14
                 eSg      39:19.50    0.08
PKSM 101.8  44   iPnD   9:39:15.60    0.14
                 eSn      39:28.80   -0.45
```

58.

```
 2002-05-22  time: 22:57:19.23 UTC  ML= 0.6
   lat: 45.942N  lon: 17.625E  h= 16.7 km
                 erh= 0.3km    erz= 0.1km
   nr=  5        gap=327       rms=0.01
   Locality: Kastélyosdombó
   Comments:

sta   dist azm  phase  hr mn  sec     res
RHK1  39.0  64   ePg   22:57:26.80    0.00
RHK3  49.1  97   iPgD  22:57:28.50    0.01
                 eSg      57:35.70   -0.02
PKSM  84.1  69   eP*C  22:57:34.20   -0.01
                 eS*      57:45.90    0.01
```

59.

```
 2002-05-27  time: 10:45:01.20 UTC  ML=
   lat: 45.881N  lon: 16.006E  h=  3.2 km
                 erh= 4.9km    erz= 4.9km
   nr= 18        gap= 95       rms=1.37
   Locality: Croatia
   Comments:

sta   dist azm  phase  hr mn  sec     res
CRES  43.1 262   iPg   10:45:08.80   -0.12
                 iSg      45:14.90   -0.03
```

```
CESS  43.3 284   iPg   10:45:09.20    0.24
                 eSg      45:14.40   -0.62
DOBS  51.2 306   ePg   10:45:10.10   -0.26
                  Sg      45:17.00   -0.51
SISC  53.7 148   iPg   10:45:11.35    0.54
                 iSg      45:16.65   -1.66
VBY   71.8 234   ePg   10:45:13.70   -0.34
                 eSg      45:23.10   -0.95
BISS 108.9 322   ePg   10:45:19.50   -1.16
CEY  123.8 263   ePn   10:45:23.30    0.04
                 eSn      45:39.70   -0.77
OBKA 132.4 302   iPnC  10:45:27.20    2.86
                 iSn      45:41.70   -0.69
ARSA 156.7 346   iPnC  10:45:28.70    1.33
                 iSn      45:44.10   -3.68
RHK1 162.1  81   ePn   10:45:30.50    2.45
```

60.

```
 2002-05-27  time: 11:35:50.81 UTC  ML= 2.1
   lat: 47.686N  lon: 19.455E  h= 10.0 km
                 erh= ---km    erz= ---km
   nr=  3        gap=260       rms=0.00
   Locality: Iklad
   Comments: explosion

sta   dist azm  phase  hr mn  sec     res
PENC  17.4 312   ePgC  11:35:54.40    0.00
                 eSg      35:57.20    0.00
PSZ   41.9  52   ePgD  11:35:58.50    0.00
```

61.

```
 2002-06-08  time: 11:24:15.09 UTC  ML= 2.4
   lat: 46.150N  lon: 16.321E  h=  1.2 km
                 erh= 1.9km    erz= 2.0km
   nr= 15        gap=133       rms=0.35
   Locality: Croatia
   Comments:

sta   dist azm  phase  hr mn  sec     res
PTJ   39.5 225   iPgD  11:24:21.90   -0.25
                  Sg      24:27.70    0.05
DOBS  65.8 270   ePg   11:24:26.40   -0.44
                 eSg      24:35.70   -0.31
CESS  69.2 254   iPg   11:24:27.30   -0.15
                 iSg      24:37.50    0.41
CRES  75.9 242   ePg   11:24:28.10   -0.55
                 eSg      24:40.40    1.17
VBY  109.5 229   iPg   11:24:34.50   -0.14
                 iSg      24:49.60   -0.29
RHK1 135.7  92   ePn   11:24:39.60    0.71
                 eSn      24:54.60   -2.86
ARSA 136.8 333   iPnD  11:24:39.00   -0.02
                 iSn      24:57.50   -0.19
OBKA 142.2 286   iPnC  11:24:40.10    0.40
                 iSn      24:59.20    0.30
```

62.

```
 2002-06-09  time:  2:00:21.87 UTC  ML= 2.7
   lat: 45.556N  lon: 16.552E  h=  1.6 km
                 erh= 3.4km    erz= 3.2km
   nr= 21        gap=156       rms=0.69
   Locality: Croatia
   Comments:

sta   dist azm  phase  hr mn  sec     res
SISC  17.0 236   iPgD   2:00:25.49    0.57
                 iSg      00:27.81    0.52
PTJ   60.0 310   iPgC   2:00:32.90    0.31
                  Sg      00:40.50   -0.44
CRES  90.3 289   ePg    2:00:37.40   -0.61
CESS  96.6 299   iPg    2:00:38.90   -0.22
VBY  101.4 267   iPgC   2:00:38.80   -1.18
                 eSg      00:50.80   -3.30
DOBS 106.9 308   ePg    2:00:40.50   -0.46
                 eSg      00:55.60   -0.24
RHK1 132.8  63   ePnD   2:00:45.00   -0.26
                 eSn      01:01.20   -2.30
RHK3 137.6  74   ePnD   2:00:45.60   -0.26
                 eSn      01:01.90   -2.66
LJU  166.0 289   iPn    2:00:50.20    0.80
                 eSn      01:09.20   -1.67
CEY  166.9 277   iPn    2:00:48.30   -1.21
                 eSn      01:09.30   -1.77
NVLJ 172.4 230   iPn    2:00:50.42    0.23
                 iSn      01:10.59   -1.69
PKS9 176.0  49   iPnC   2:00:50.50   -0.14
                 eSn      01:14.20    1.12
PKSM 177.8  66   ePnC   2:00:50.50   -0.37
                 eSn      01:14.80    1.32
OBKA 187.8 304   iPnC   2:00:51.70   -0.41
                 iSn      01:15.50   -0.20
ARSA 204.3 337   iPnC   2:00:54.30    0.13
                 iSn      01:16.30   -3.06
VOY  213.4 284   ePn    2:00:56.60    1.30
                 eSn      01:22.90    1.53
TRI  218.1 274   ePn    2:00:57.56    1.67
PKSG 248.1  35   ePn    2:01:00.20    0.56
PKS6 260.3  64   ePnC   2:01:00.80   -0.35
                 eSn      01:42.30   10.51
PKS7 260.5  50   ePn    2:01:09.00    7.82
                 eSn      01:37.30    5.46
PTCC 265.2 291   ePn    2:01:02.46    0.69
PKSN 296.0  60   eSn    2:01:52.90   13.18
MOA  309.1 326   iPnD   2:01:08.00    0.76
                 iSn      01:40.30   -2.33
KHC  456.6 331   ePn    2:01:26.40    0.77
                 eSn      02:12.00   -3.35
```

63.

```
 2002-06-09  time: 17:22:38.02 UTC  ML= 1.2
   lat: 45.794N  lon: 18.383E  h=  0.8 km
                 erh= 5.6km    erz=79.3km
   nr=  8        gap=294       rms=0.49
   Locality: Siklósnagyfalu
   Comments:

sta   dist azm  phase  hr mn  sec     res
RHK3  14.8 317   iPgD  17:22:40.60   -0.06
                 eSg      22:42.60   -0.12
RHK1  41.4 325   iPgD  17:22:45.10   -0.31
                 eSg      22:50.30   -0.88
PKSM  50.6  23   iPgD  17:22:46.90   -0.15
                 eSg      22:53.40   -0.70
PKS9  88.5 355   iPgC  17:22:54.70    0.87
                 eSg      23:06.70    0.55
```

64.

```
 2002-06-12  time: 14:49:05.98 UTC  ML= 1.8
   lat: 45.759N  lon: 17.278E  h= 10.0 km
                 erh=11.0km    erz=11.6km
   nr= 10        gap=181       rms=0.76
   Locality: Croatia
   Comments:

sta   dist azm  phase  hr mn  sec     res
RHK1  72.4  59   iPgD  14:49:18.80   -0.23
                 eSg      49:28.90   -0.32
RHK3  77.3  79   iPgD  14:49:19.80   -0.09
                 eSg      49:30.50   -0.24
CRES 141.7 273   iPn   14:49:29.40    0.00
                 iSn      49:46.40   -1.27
CESS 142.9 280   ePn   14:49:30.80    1.25
                 iSn      49:47.80   -0.13
DOBS 146.8 287   iPn   14:49:31.70    1.67
VBY  160.1 260   iSn   14:49:51.10   -0.66
```

65.

2002-06-18 time: 10:13:36.96 UTC ML= 1.5
lat: 47.440N lon: 18.481E h= 2.4 km
erh= 0.7km erz= 1.8km
nr= 5 gap=295 rms=0.21
Locality: Vértes mt.
Comments: explosion

sta	dist	azm	phase	hr mn	sec	res
PKSG	8.7	232	iPgC	10:13:38.50		-0.06
			eSg	13:39.30		-0.51
PKS8	64.1	167	iPgC	10:13:48.50		0.09
			eSg	13:57.00		-0.34
PKS9	96.0	189	ePgC	10:13:54.40		0.29

66.

2002-06-19 time: 15:06:40.14 UTC ML= 1.7
lat: 45.533N lon: 17.833E h= 0.1 km
erh=11.3km erz= 7.0km
nr= 10 gap=240 rms=0.95
Locality: Croatia
Comments:

sta	dist	azm	phase	hr mn	sec	res
RHK3	51.6	39	ePgC	15:06:49.40		0.05
RHK1	65.6	17	iPgD	15:06:52.20		0.35
			eSg	07:00.40		-0.58
PKSM	98.1	40	iPgC	15:06:57.10		-0.56
			eSg	07:09.30		-2.03
PKS9	122.1	16	ePg	15:07:02.40		0.46
PKS8	163.1	24	iPnC	15:07:09.10		1.60
			eSn	07:28.90		0.05
CRES	187.9	280	ePn	15:07:11.60		1.01
DOBS	196.0	290	iPn	15:07:10.00		-1.60

67.

2002-06-22 time: 5:42:34.29 UTC ML= 1.7
lat: 46.603N lon: 19.864E h= 10.0 km
erh=18.2km erz= 9.5km
nr= 7 gap=244 rms=0.97
Locality: Petőfiszállás
Comments:

sta	dist	azm	phase	hr mn	sec	res
PKSN	32.8	0	iPgD	5:42:40.20		-0.20
			eSg	42:42.40		-2.77
PKS8	95.8	289	iPgC	5:42:51.30		-0.19
			eSg	43:06.10		1.19
PKSM	103.6	245	iP*C	5:42:51.50		-1.35
			eS*	43:05.90		-1.43
PKS9	121.5	269	ePn	5:42:55.90		0.71
			eSn	43:14.50		3.00
PKSG	142.4	308	ePn	5:43:00.10		2.31
			eSn	43:19.30		3.18
PSZ	146.3	1	ePn	5:42:57.90		-0.39
			eSn	43:12.90		-4.11
RHK1	148.7	248	ePnC	5:43:00.00		1.42
			eSn	43:22.20		4.67

68.

2002-07-02 time: 22:09:58.01 UTC ML=
lat: 46.087N lon: 17.552E h= 10.0 km
erh= 2.4km erz= 1.9km
nr= 10 gap=179 rms=0.23
Locality: Homokszentgyörgy
Comments:

sta	dist	azm	phase	hr mn	sec	res
PKS9	78.9	45	iPgD	22:10:12.30		0.09
PKSM	85.3	81	iPgC	22:10:13.40		0.05
PKS8	123.3	44	iPnC	22:10:18.60		-0.54
PKSG	158.6	24	iPnD	22:10:23.60		0.06
DOBS	161.1	272	iPn	22:10:23.70		-0.15
CESS	162.2	266	ePn	22:10:24.20		0.22
CRES	164.9	260	iPn	22:10:24.40		0.08
PKS6	165.1	70	ePn	22:10:24.50		0.15
BISS	196.7	288	iPn	22:10:28.10		-0.19
ARSA	202.1	310	iPnC	22:10:29.40		0.44

69.

2002-07-03 time: 22:10: 0.85 UTC ML=2.7
lat: 46.672N lon: 16.209E h= 10.0 km
erh=24.4km
Locality: Slovenia
Comments:
Reported by NEIC

70.

2002-07-04 time: 2:40: 3.18 UTC ML=
lat: 45.787N lon: 16.257E h= 10.0 km
erh=28.7km erz= km
Locality: Croatia
Comments:
Reported by NEIC

71.

2002-07-07 time: 14:20:21.55 UTC ML= 2.6
lat: 46.126N lon: 17.021E h= 10.0 km
erh= 5.3km erz= 7.2km
nr= 16 gap=151 rms=0.90
Locality: Croatia
Comments:

sta	dist	azm	phase	hr mn	sec	res
RHK1	81.6	92	ePg	14:20:36.00		-0.23
			eSg	20:45.10		-2.58
DOBS	119.9	271	ePn	14:20:42.60		0.34
			eSn	20:58.20		-0.21
CESS	121.7	262	ePn	14:20:42.50		0.02
			eSn	20:58.40		-0.41
CRES	125.6	255	iPn	14:20:43.30		0.33
			iSn	20:58.50		-1.17
VBY	153.5	243	ePn	14:20:49.40		2.95
			eSn	21:06.00		0.13
BISS	156.8	292	ePn	14:20:47.30		0.45
			eSn	21:06.20		-0.39
ARSA	169.5	317	iPnC	14:20:49.30		0.86
			iSn	21:08.20		-1.22
MOA	283.9	312	iPnC	14:21:04.90		2.20
			iSn	21:35.20		0.39

72.

2002-07-23 time: 10:28:44.92 UTC ML= 1.9
lat: 45.507N lon: 17.840E h= 0.3 km
erh= ---km erz= ---km
nr= 4 gap=337 rms=0.14
Locality: Croatia
Comments:

sta	dist	azm	phase	hr mn	sec	res
RHK1	68.2	16	iPgD	10:28:57.00		-0.10
			eSg	29:06.50		-0.10
PKSM	100.1	38	ePg	10:29:02.70		-0.09
PKS9	124.7	16	iPgC	10:29:07.40		0.20

73.

2002-07-29 time: 11:41:31.41 UTC ML=
lat: 47.578N lon: 16.331E h= 0.1 km
erh=77.4km erz=49.2km
nr= 6 gap=184 rms=0.36
Locality: Austria
Comments:

```
sta   dist azm  phase  hr mn  sec     res
SOP   20.7  56   ePg   11:41:34.80   -0.31
                 eSg      41:37.90   -0.09
ARSA  71.0 239   iPgD  11:41:44.20    0.11
                 iSg      41:53.60   -0.38
MOA  157.9 281   iPnD  11:41:58.80    0.69
                 iSn      42:18.80   -0.14
```

74.

```
 2002-08-01  time: 10:27:01.89 UTC  ML= 1.5
   lat: 45.983N  lon: 18.357E  h=  1.6 km
                 erh= 0.1km    erz= 0.8km
   nr=  5        gap=260       rms=0.07
   Locality: Peterd
   Comments:

sta   dist azm  phase  hr mn  sec     res
RHK1  25.3 300   ePgC  10:27:06.40   -0.02
                 eSg      27:09.80   -0.15
PKSM  33.6  41   ePgC  10:27:07.90    0.00
                 eSg      27:12.50   -0.09
PKS9  67.4 355   iPgC  10:27:14.00    0.07
```

75.

```
 2002-09-01  time:  8:13:32.30 UTC  ML= 1.7
   lat: 46.019N  lon: 17.209E  h= 22.1 km
                 erh=10.4km    erz= 7.4km
   nr= 11        gap=179       rms=0.80
   Locality: Heresznye
   Comments:

sta   dist azm  phase  hr mn  sec     res
RHK1  67.6  83   ePgD   8:13:43.90   -0.57
                 eSg      13:55.20    1.24
PKS9 103.8  53   iPnC   8:13:50.30    0.77
                 eSn      14:03.90    0.93
PKSM 112.8  79   ePnC   8:13:50.50   -0.15
                 eSn      14:04.30   -0.66
DOBS 135.4 276   ePn    8:13:53.50    0.03
CRES 137.5 261   ePn    8:13:54.30    0.56
                 eSn      14:09.00   -1.46
PKS8 147.8  50   ePnD   8:13:54.20   -0.82
                 eSn      14:10.90   -1.83
```

76.

```
 2002-09-04  time:  8:36:22.86 UTC  ML= 1.6
   lat: 47.438N  lon: 18.377E  h=  6.3 km
                 erh= 7.0km    erz= 1.0km
   nr=  6        gap=344       rms=0.60
   Locality: Vértes mt.
   Comments: explosion

sta   dist azm  phase  hr mn  sec     res
PKSG   5.2 169   ePgC   8:36:23.90   -0.42
                 eSg      36:24.60   -0.85
PKS9  94.9 185   iPgC   8:36:40.40    0.56
                 eSg      36:53.40    0.32
PKSM 137.8 172   ePnC   8:36:46.20   -0.07
                 eSn      37:02.90   -1.63
```

77.

```
 2002-09-06  time:  4:32:32.68 UTC  ML= 1.1
   lat: 47.347N  lon: 18.453E  h= 13.1 km
                 erh= 5.0km    erz= 2.3km
   nr=  6        gap=205       rms=0.26
   Locality: Gánt
   Comments:

sta   dist azm  phase  hr mn  sec     res
PKSG   6.9 317   iPgC   4:32:35.50    0.18
                 eSg      32:37.00   -0.37
PKS8  54.7 162   ePgC   4:32:42.70   -0.03
PKS9  85.5 189   eSg    4:33:00.00   -0.17
PKSM 127.0 173   ePn    4:32:54.00    0.12
                 eSn      33:07.90   -2.52
```

78.

```
 2002-09-17  time:  8:58:55.97 UTC  ML= 0.5
   lat: 47.305N  lon: 18.576E  h= 10.0 km
                 erh=11.0km    erz= 3.1km
   nr=  6        gap=226       rms=0.27
   Locality: Lovasberény
   Comments:

sta   dist azm  phase  hr mn  sec     res
PKSG  17.0 305   iPgD   8:58:59.30   -0.19
                 eSg      59:02.60    0.36
PKS8  48.0 171   iPgD   8:59:04.80    0.08
                 eSg      59:11.20   -0.34
PKSM 121.6 178   ePn    8:59:17.20    0.32
                 eSn      59:31.00   -2.20
```

79.

```
 2002-09-20  time: 13:45:25.79 UTC  ML= 1.8
   lat: 45.551N  lon: 16.504E  h=  4.1 km
                 erh=12.4km    erz= 9.8km
   nr=  9        gap=166       rms=0.96
   Locality: Croatia
   Comments:

sta   dist azm  phase  hr mn  sec     res
CRES  87.0 291   iPg   13:45:41.60    0.25
VBY   97.6 267   iPg   13:45:42.60   -0.63
                 iSg      45:55.60   -1.23
DOBS 104.4 310   ePg   13:45:45.00    0.56
RHK1 136.4  64   iPnD  13:45:49.00   -0.30
                 eSn      46:04.90   -2.75
CEY  163.3 277   iPn   13:45:54.30    1.65
NVLJ 169.1 230   iPn   13:45:54.32    0.95
                 iSn      46:14.06   -0.83
```

80.

```
 2002-09-21  time:  2:27:52.76 UTC  ML=2.3
   lat: 47.933N  lon: 16.561E  h= 10.0 km
                 erh=11.5km
   Locality: Austria
   Comments: Felt (III) at Ebreichs
     Reported by NEIC
```

81.

```
 2002-09-21  time: 11:46:41.48 UTC  ML= 2.1
   lat: 46.293N  lon: 16.633E  h= 11.3 km
                 erh= 2.1km    erz= 1.2km
   nr=  6        gap=172       rms=0.15
   Locality: Croatia
   Comments:

sta   dist azm  phase  hr mn  sec     res
DOBS  91.2 260   iPg   11:46:57.70   -0.19
                 iSg      47:10.80    0.12
CRES 104.7 240   iP*   11:47:00.30    0.21
                 iS*      47:14.50   -0.11
RHK1 113.4 101   ePn   11:47:01.20   -0.01
                 eSn      47:14.10   -2.51
BISS 122.2 289   eSn   11:47:18.50   -0.05
```

82.

2002-09-23 time: 2:08: 6.93 UTC ML=2.2
lat: 45.930N lon: 16.087E h= 10.0 km
erh=13.8km
Locality: Croatia
Comments:
Reported by NEIC

83.

2002-09-24 time: 18:04:15.92 UTC ML=2.2
lat: 45.544N lon: 16.000E h= 10.0 km
erh=14.2km
Locality: Croatia
Comments:
Reported by NEIC

84.

2002-10-04 time: 9:22:21.90 UTC ML= 1.9
lat: 47.664N lon: 19.479E h= 0.6 km
erh= ---km erz= ---km
nr= 4 gap=266 rms=0.10
Locality: Aszód
Comments:

sta	dist	azm	phase	hr mn	sec	res
PENC	20.4	314	iPgD	9:22:25.50		-0.05
			eSg	22:28.40		0.00
PSZ	42.1	48	ePg	9:22:29.60		0.18
			eSg	22:35.20		-0.09

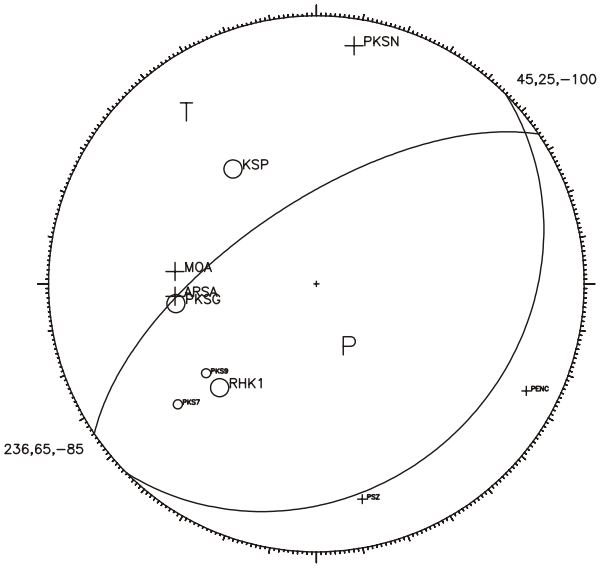
85.

2002-10-10 time: 2:16:26.54 UTC ML=2.3
lat: 45.652N lon: 16.033E h= 10.0 km
erh=26.8km
Locality: Croatia
Comments:
Reported by NEIC

86.

2002-10-12 time: 18:49:11.06 UTC ML= 3.3
lat: 47.543N lon: 20.010E h= 14.6 km
erh= 1.9km erz= 1.3km
nr= 24 gap=200 rms=0.52
Locality: Jászapáti
Comments: felt 4-5 EMS

sta	dist	azm	phase	hr mn	sec	res
PSZ	42.6	348	ePgC	18:49:19.00		-0.11
			iSg	49:25.10		-0.28
PENC	61.2	297	ePgC	18:49:22.60		0.30
			eSg	49:31.70		0.64
PKSN	72.6	189	iPgC	18:49:24.60		0.31
			eSg	49:34.40		-0.21
BUD	74.5	265	ePg	18:49:24.80		0.17
			eSg	49:34.00		-1.21
PKS7	84.6	229	eP*D	18:49:26.30		-0.02
			eS*	49:38.70		0.49
PKSG	123.2	262	iPnD	18:49:32.00		0.40
			eSn	49:47.60		-0.01
PKS9	169.1	231	ePnD	18:49:36.80		-0.52
			eSn	50:00.30		2.51
PKSM	181.1	215	ePn	18:49:37.90		-0.91
			eSn	49:58.50		-1.95
RHK1	218.1	223	iPnD	18:49:42.70		-0.73
			eSn	50:07.00		-1.68
MODS	224.0	294	ePn	18:49:44.60		0.44
			eSn	50:09.20		-0.78
ZST	229.3	288	iPn	18:49:45.60		0.78
			eSn	50:10.60		-0.56
OKC	289.7	332	ePn	18:49:54.00		1.65
			eSn	50:25.40		0.84
OJC	298.0	357	ePn	18:49:54.80		1.40
			eSn	50:26.10		-0.32
ARSA	340.3	265	iPnC	18:49:59.90		1.24
			iSn	50:35.50		-0.29
DOBS	379.4	246	eSn	18:50:42.20		-2.27
DPC	412.8	319	ePn	18:50:09.00		1.29
			eSn	50:51.20		-0.69
MOA	432.5	275	iPnC	18:50:12.30		2.14
			iSn	50:57.50		1.24
KSP	456.1	324	iPnD	18:50:14.90		1.79
			eSn	51:00.50		-1.00
PRU	485.3	304	ePn	18:50:17.10		0.35
			eSn	51:05.90		-2.08
KHC	508.5	290	ePn	18:50:20.90		1.26
			eSn	51:11.50		-1.62
BRG	576.6	310	Pn	18:50:28.80		0.67
			eSn	58:29.50		421.26
CLL	658.7	309	iPn	18:50:38.80		0.43



87.

2002-10-14 time: 15:33:32.99 UTC ML= 2.1
lat: 45.959N lon: 17.152E h= 10.0 km
erh=31.2km erz=21.5km
nr= 5 gap=174 rms=0.61
Locality: Croatia
Comments:

sta	dist	azm	phase	hr mn	sec	res
RHK1	73.2	78	iPgD	15:33:46.10		-0.08
			eSg	33:56.30		-0.16
CRES	132.3	264	ePn	15:33:56.70		1.46
			iSn	34:12.00		-0.60
VBY	155.9	251	eSn	15:34:17.90		0.05

88.

2002-10-14 time: 19:23:25.16 UTC ML= 1.8
lat: 46.153N lon: 16.491E h= 10.0 km
erh= 6.3km erz= 4.9km
nr= 13 gap=143 rms=1.11
Locality: Croatia
Comments:

sta	dist	azm	phase	hr mn	sec	res
PTJ	49.9	236	ePg	19:23:34.80		0.55
			eSg	23:40.50		-0.85
DOBS	78.9	270	iPg	19:23:39.10		-0.26
			iSg	23:49.10		-1.34
CRES	87.9	246	iPg	19:23:41.30		0.35

			iSg	23:52.60	-0.68
RHK1	122.6	93	ePn	19:23:46.30	0.09
			eSn	24:00.60	-2.02
ARSA	142.7	329	iPnD	19:23:49.10	0.40
			iSn	24:05.50	-1.57
OBKA	154.7	285	iPnC	19:23:52.10	1.90
			iSn	24:09.80	0.07
CEY	166.5	254	iSn	19:24:15.30	2.93

89.

2002-10-16 time: 22:32:37.40 UTC ML= 2.0
lat: 46.044N lon: 16.136E h= 10.0 km
erh= 3.7km erz= 3.3km
nr= 16 gap=133 rms=0.80
Locality: Croatia
Comments:

sta	dist	azm	phase	hr mn	sec	res
PTJ	21.1	221	iPgD	22:32:41.90		0.33
			Sg	32:44.10		-0.73
CESS	52.7	261	iPgC	22:32:47.60		0.62
			iSg	32:54.00		-0.46
DOBS	52.9	283	iPg	22:32:47.60		0.58
			iSg	32:54.90		0.38
CRES	57.9	245	iPg	22:32:47.90		0.01
			iSg	32:55.10		-0.98
BISS	102.7	311	iPg	22:32:55.50		-0.33
			iSg	33:07.80		-2.40
OBKA	132.9	293	iPnC	22:33:00.90		1.18
			iSn	33:17.00		-0.13
ARSA	142.1	341	iPnC	22:33:02.10		1.22
			iSn	33:18.90		-0.29
RHK1	150.1	88	iPnC	22:33:01.20		-0.67
			eSn	33:18.40		-2.56

90.

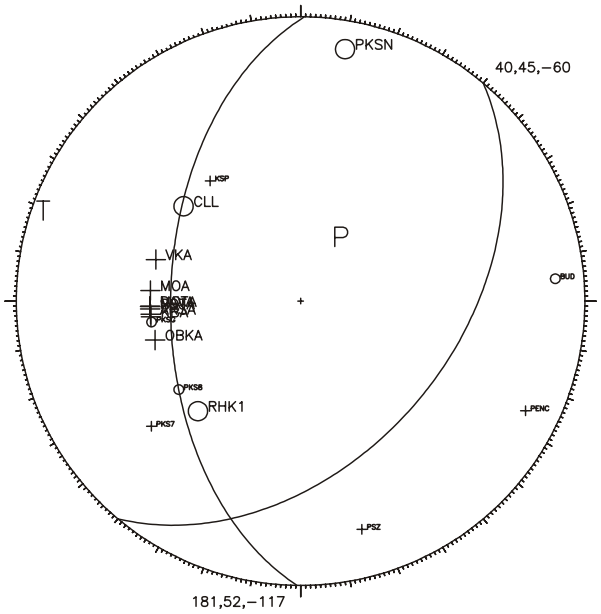
2002-10-22 time: 3:28:21.77 UTC ML= 1.6
lat: 46.243N lon: 16.618E h= 10.0 km
erh= 7.0km erz= 6.7km
nr= 19 gap=134 rms=1.33
Locality: Croatia
Comments:

sta	dist	azm	phase	hr mn	sec	res
DOBS	89.2	263	iPg	3:28:37.30		-0.50
CESS	94.1	251	iPg	3:28:39.20		0.53
			iSg	28:51.90		0.04
CRES	101.0	243	iPg	3:28:39.90		0.01
			iSg	28:53.20		-0.83
RHK1	113.7	98	iPnD	3:28:40.30		-1.40
			eSn	28:54.90		-2.35
BISS	123.1	291	iPn	3:28:42.70		-0.17
			iSn	28:58.50		-0.83
PKS9	133.4	73	ePn	3:28:46.20		2.05
			eSn	29:02.80		1.19
VBY	133.8	232	iPn	3:28:45.30		1.10
ARSA	139.8	323	iPnC	3:28:46.30		1.34
			iSn	28:59.80		-3.24
PKSM	156.2	91	ePn	3:28:45.30		-1.70
			eSn	29:02.90		-3.78
PKS8	173.0	66	eSn	3:29:12.80		2.39
MOA	252.7	315	iPnC	3:29:00.80		1.77
			iSn	29:28.10		0.01

91.

2002-10-23 time: 2:52:15.08 UTC ML= 3.7
lat: 47.545N lon: 20.043E h= 14.3 km
erh= 2.3km erz= 1.5km
nr= 27 gap=194 rms=0.65
Locality: Jászapáti
Comments: felt 5.0

sta	dist	azm	phase	hr mn	sec	res
PSZ	43.0	345	ePgC	2:52:23.40		0.23
			iSg	52:29.30		-0.18
PENC	63.3	296	ePgC	2:52:26.80		0.13
			eSg	52:36.20		0.48
PKSN	73.2	190	iPgD	2:52:28.70		0.30
			eSg	52:38.60		-0.20
BUD	77.1	265	ePgD	2:52:29.20		0.13
			eSg	52:38.40		-1.59
PKS7	86.7	230	eP*C	2:52:30.40		-0.27
			iS*	52:43.30		0.47
PKSG	125.7	262	ePnD	2:52:36.20		0.24
			eSn	52:52.00		-0.25
PKS8	127.3	234	ePnD	2:52:35.50		-0.65
			eSn	52:52.70		0.10
PKS9	171.2	232	ePn	2:52:41.70		0.07
			eSn	53:05.40		3.06
PKSM	182.7	216	iPn	2:52:42.00		-1.06
			eSn	53:07.20		2.31
RHK1	220.0	223	iPnD	2:52:46.90		-0.82
			eSn	53:16.90		3.72
MODS	226.2	294	ePn	2:52:48.70		0.22
			eSn	53:20.60		6.06
ZST	231.6	288	iPn	2:52:49.80		0.64
			eSn	53:14.90		-0.84
VKA	289.7	286	iPnC	2:52:57.20		0.79
			iSn	53:30.70		2.05
OKC	290.6	331	ePn	2:52:58.30		1.78
OJC	298.0	357	ePn	2:52:58.70		1.26
KWP	304.1	40	ePn	2:53:04.20		6.00
ARSA	342.8	265	iPnC	2:53:04.00		0.98
			iSn	53:40.60		0.18
PTJ	361.9	240	ePn	2:53:15.30		9.89
			eSn	54:02.00		17.34
CRES	399.4	241	iPn	2:53:12.40		2.31
DPC	414.2	319	ePn	2:53:13.20		1.27
			eSn	53:56.80		0.52
DPC	414.2	319	ePn	2:53:13.20		1.27
			eSn	53:56.80		0.52
OBKA	433.2	255	iPnC	2:53:16.30		2.00
			iSn	54:02.30		1.80
MOA	434.9	274	iPnC	2:53:16.30		1.78
			iSn	54:01.60		0.72
LJU	452.6	248	ePn	2:53:32.20		15.49
KSP	457.4	323	ePnC	2:53:19.10		1.78
PRU	487.2	304	ePn	2:53:21.40		0.37
			eSn	54:15.40		2.92
GEC2	493.1	287	ePn	2:53:22.60		0.83
VOY	498.8	250	ePn	2:53:30.70		8.22
KBA	509.1	264	iPnC	2:53:25.60		1.83
			iSn	54:17.80		0.46
KHC	510.7	290	ePn	2:53:25.30		1.34
			eSn	54:25.00		7.31
NVLJ	519.6	230	iPn	2:53:25.78		0.70
BRG	578.3	310	ePn	2:53:32.70		0.31
VTS	604.3	156	Pn	2:53:35.00		-0.63
CLL	660.4	309	iPnD	2:53:42.90		0.27
			eSn	55:43.00		52.08
SZH	662.4	136	Pn	2:53:57.00		14.12
SQTA	668.1	267	iPnC	2:53:45.10		1.52
			iSn	54:53.50		0.88
MOTA	674.6	268	iPnC	2:53:45.70		1.30
			iSn	54:55.20		1.13
MOX	705.5	299	ePn	2:53:49.40		1.15
MMB	723.7	156	Pn	2:53:55.00		4.48
RZN	749.1	150	Pn	2:53:53.00		-0.69
DAVA	767.5	268	iPnC	2:53:56.80		0.82
			iSn	55:13.70		-0.98
BSD	914.8	337	iPn	2:54:14.90		0.55
			iSn	55:44.90		-2.48



92.

2002-10-23 time: 3:34:59.84 UTC ML= 1.6
lat: 47.549N lon: 19.940E h= 10.0 km
erh= 5.4km erz= 3.4km
nr= 12 gap=189 rms=0.84
Locality: Jászdózsa
Comments:

sta	dist	azm	phase	hr mn	sec	res
PSZ	41.2	355	ePg	3:35:07.10		-0.32
			eSg	35:13.20		-0.13
PKSN	72.7	184	ePg	3:35:13.40		0.46
			eSg	35:22.40		-0.76
PKS7	81.2	227	ePg	3:35:14.70		0.26
			eSg	35:26.50		0.67
PKSG	118.1	262	ePn	3:35:20.90		0.57
			eSn	35:35.70		-0.61
PKS8	121.3	232	ePnD	3:35:19.40		-1.33
			eSn	35:36.60		-0.41
PKSM	178.6	214	ePn	3:35:29.90		2.03
			eSn	35:46.40		-3.33

93.

2002-10-24 time: 20:25:29.50 UTC ML= 1.4
lat: 47.560N lon: 19.979E h= 8.2 km
erh= 4.6km erz= 2.9km
nr= 14 gap=223 rms=0.74
Locality: Jászdózsa
Comments:

sta	dist	azm	phase	hr mn	sec	res
PSZ	40.3	351	ePg	20:25:36.50		-0.35
			eSg	25:42.50		-0.08
PENC	58.3	296	ePg	20:25:40.00		-0.01
			eSg	25:49.70		1.49
PKS7	84.2	227	ePg	20:25:43.90		-0.70
			eSg	25:56.00		-0.38
PKSG	121.2	261	iPnC	20:25:50.70		0.10
			eSn	26:05.60		-1.46
PKS8	124.4	232	ePn	20:25:50.90		-0.10
			eSn	26:06.40		-1.38
PKS9	168.5	230	ePn	20:25:58.20		1.70
			eSn	26:18.20		0.64
PKSM	181.3	214	ePn	20:25:58.50		0.40
			eSn	26:21.70		1.30

94.

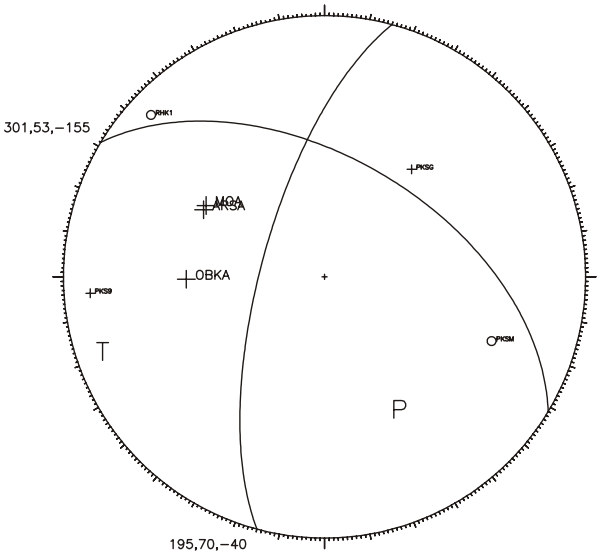
2002-10-25 time: 6:25:54.18 UTC ML= 1.9
lat: 47.595N lon: 19.827E h= 10.0 km
erh=10.9km erz= 4.4km
nr= 9 gap=202 rms=0.84
Locality: Jászágó
Comments:

sta	dist	azm	phase	hr mn	sec	res
PSZ	36.3	8	ePg	6:26:00.70		-0.21
			eSg	26:06.70		0.54
PKS7	79.0	220	ePg	6:26:08.20		-0.21
			eSg	26:20.10		0.60
PKSG	110.6	258	ePnD	6:26:13.90		0.17
			eSn	26:29.20		0.23
PKS8	118.0	228	ePn	6:26:12.90		-1.76
			eSn	26:30.70		0.07
PKSM	178.3	210	ePn	6:26:24.00		1.82

95.

2002-10-25 time: 22:09:42.99 UTC ML= 2.4
lat: 46.547N lon: 17.389E h= 12.9 km
erh= 3.4km erz= 3.6km
nr= 23 gap=108 rms=0.92
Locality: Kelevíz
Comments:

sta	dist	azm	phase	hr mn	sec	res
PKS9	68.4	86	ePgC	22:09:56.00		0.59
			eSg	10:05.70		0.59
RHK1	72.7	133	ePgD	22:09:56.40		0.24
			eSg	10:06.00		-0.44
PKSM	103.3	111	eP*D	22:10:00.80		-0.44
			eS*	10:14.40		-1.08
PKSG	121.0	39	ePnC	22:10:02.00		-1.47
			eSn	10:17.70		-1.74
PKS7	146.3	68	ePn	22:10:08.40		1.78
			eSn	10:25.80		0.75
DOBS	154.2	253	iPn	22:10:07.40		-0.20
CESS	161.6	247	ePn	22:10:08.60		0.08
BUD	162.2	50	eSn	22:10:30.00		1.42
ARSA	162.3	299	iPnC	22:10:08.60		-0.01
CRES	169.2	242	iPn	22:10:09.40		-0.07
BISS	173.7	274	ePn	22:10:10.20		0.17
ZST	184.7	353	ePn	22:10:09.20		-2.20
			eSn	10:34.90		1.33
OBKA	217.9	269	iPnC	22:10:16.40		0.85
PSZ	243.5	51	ePn	22:10:17.20		-1.53
			eSn	10:43.60		-3.02
MOA	277.5	301	iPnC	22:10:24.80		1.83
			iSn	10:53.10		-1.06



96.

2002-10-26 time: 10:44:25.61 UTC ML=1.8
lat: 46.199N lon: 16.058E h= 5.0 km
erh= 8.8km
Locality: Croatia
Comments:
Reported by NEIC

97.

2002-10-29 time: 3:31:07.59 UTC ML= 1.8
lat: 47.547N lon: 19.988E h= 10.0 km
erh= 3.6km erz= 3.0km
nr= 13 gap=197 rms=0.76
Locality: Jászdózsa
Comments:

sta	dist	azm	phase	hr mn	sec	res
PSZ	41.9	350	ePg	3:31:15.10		-0.18
			iSg	31:21.20		-0.07
PKSN	72.8	187	ePg	3:31:20.50		-0.22
			eSg	31:30.50		-0.46
BUD	73.0	264	ePg	3:31:20.80		0.06
			eSg	31:30.30		-0.70
PKS7	83.7	228	ePgC	3:31:22.70		0.06
			eSg	31:34.80		0.42
PKSG	121.7	262	ePn	3:31:29.40		0.89
			eSn	31:43.60		-1.24
PKS9	168.1	231	ePn	3:31:36.00		1.70
			eSn	31:57.20		2.06
PKSM	180.5	215	ePn	3:31:34.00		-1.85

98.

2002-11-29 time: 12:34:30.06 UTC ML=1.4
lat: 46.215N lon: 16.071E h= 10.0 km
erh=38.0km
Locality: Croatia
Comments:
Reported by NEIC

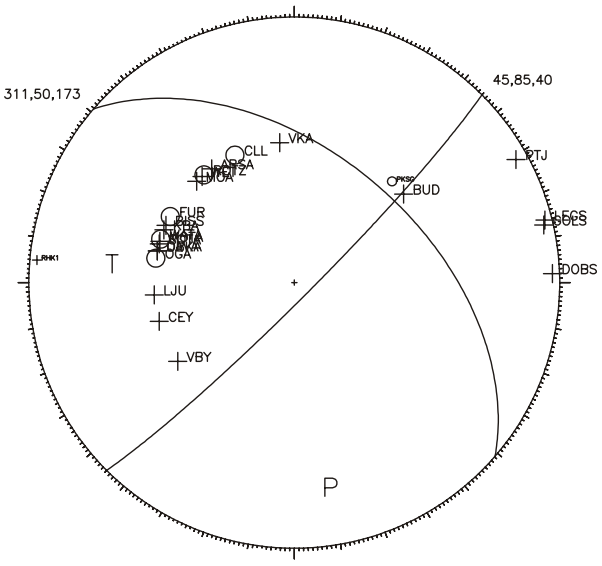
99.

2002-12-06 time: 1:52:11.87 UTC ML= 3.2
lat: 46.174N lon: 16.660E h= 5.5 km
erh= 2.0km erz= 1.5km
nr= 23 gap=141 rms=0.36
Locality: Croatia
Comments:

sta	dist	azm	phase	hr mn	sec	res
PTJ	62.3	241	iPgC	1:52:23.50		0.47
			eSg	52:32.00		0.26
GOLS	82.1	257	iPgC	1:52:26.70		0.14
			eSg	52:38.70		0.68
DOBS	92.0	268	iPgC	1:52:28.10		-0.23
			iSg	52:40.40		-0.77
CRES	100.9	247	iPg	1:52:29.70		-0.21
			iSg	52:44.00		0.01
LEGS	106.8	256	iPgC	1:52:30.60		-0.37
			iSg	52:45.00		-0.87
RHK1	109.5	95	ePgC	1:52:31.80		0.36
			eSg	52:47.80		1.09
BISS	129.1	294	iPnC	1:52:33.70		-0.59
			eSn	52:48.50		-3.29
VBY	132.0	236	iPnC	1:52:34.70		0.04
			iSn	52:51.30		-1.13
ARSA	147.9	324	iPnC	1:52:36.80		0.16
			iSn	52:47.30		-8.66
PKSM	153.0	88	ePn	1:52:36.90		-0.38
			eSn	52:58.20		1.10
LJU	165.5	265	iPnC	1:52:38.80		-0.04
OBKA	166.8	283	iPnC	1:52:38.90		-0.09
			iSn	52:52.70		-7.45
CEY	179.8	254	iPnC	1:52:40.60		-0.01
PKSG	189.2	44	ePnD	1:52:41.60		-0.19
			eSn	53:10.40		5.27
PKS7	214.8	63	ePn	1:52:49.20		4.22
			eSn	53:16.20		5.39
ZST	227.3	8	ePn	1:52:46.60		0.06
			eSn	53:09.80		-3.79
TRI	230.4	257	ePn	1:52:47.94		1.01
BUD	231.8	51	iPnC	1:52:47.00		-0.10
			eSn	53:22.50		7.92
VKA	233.9	354	iPnC	1:52:48.20		0.84
			iSn	53:21.90		6.85
MODS	249.0	11	iPn	1:52:49.10		-0.14
			eSn	53:14.40		-4.00
PTCC	256.1	276	ePn	1:52:50.20		0.07
			eSn	53:29.58		9.60
PKSN	258.9	72	eSn	1:53:30.00		9.41
MOA	260.5	316	iPnC	1:52:51.70		1.03
			iSn	53:19.20		-1.74
GMNA	264.3	272	ePn	1:52:52.18		1.02
			eSn	53:32.09		10.29
KBA	273.1	292	iPnC	1:52:52.50		0.25
			iSn	53:23.90		0.15
PSZ	313.1	52	ePn	1:52:55.90		-1.34
GEC2	371.3	323	ePn	1:53:05.70		1.20
CTI	387.6	268	ePn	1:53:06.61		0.08
			eSn	54:04.76		15.60
SCE	391.2	284	ePn	1:53:08.20		1.22
KHC	402.1	325	ePn	1:53:09.60		1.26
			eSn	53:51.60		-0.78
WATA	409.3	288	iPnD	1:53:10.90		1.66
OKC	422.2	15	ePn	1:53:11.60		0.76
			eSn	53:54.10		-2.74
SQTA	432.9	286	iPnC	1:53:12.60		0.43
WET	435.6	319	iPnC	1:53:13.50		0.99
OGA	439.2	280	iPnD	1:53:15.20		2.24
MOTA	444.0	287	iPnC	1:53:14.00		0.44
PRU	452.5	340	Pn	1:53:15.30		0.68
			eSn	53:58.30		-5.28
FUR	464.4	298	iPnD	1:53:16.90		0.80
DPC	465.1	357	ePn	1:53:16.20		0.02
			eSn	54:25.70		19.35
ASS	469.8	223	ePn	1:53:18.57		1.79

Hypocenter Parameters **Földrengés paraméterek**

SAL	480.2	262	ePn	1:53:18.17	0.09
BRMO	485.3	274	ePn	1:53:20.00	1.29
KSP	519.9	357	ePn	1:53:23.80	0.78
			eSn	54:12.00	-6.52
ROTZ	520.6	320	iPnD	1:53:23.30	0.19
DAVA	532.8	283	iPnC	1:53:24.30	-0.33
			iSn	54:16.20	-5.19
NKC	549.3	325	ePn	1:53:27.00	0.31
			eSn	54:19.90	-5.16
BRG	559.8	339	ePn	1:53:28.10	0.11
			iSn	54:50.60	23.23
GRA1	564.0	314	ePn	1:53:28.10	-0.43
GRF	564.0	314	ePn	1:53:28.10	-0.43
CODM	569.9	250	Pn	1:53:20.74	-8.52
MOX	621.9	323	ePn	1:53:36.10	0.36
			eSn	54:37.40	-3.76
CLL	631.1	335	iPnD	1:53:37.00	0.11
PGF	731.6	237	ePn	1:53:48.70	-0.72
			eSn	54:58.20	-7.32
HINF	768.0	284	ePn	1:53:52.40	-1.56
			eSn	55:06.00	-7.59
SBF	771.2	251	ePn	1:53:53.00	-1.35
LPG	773.5	264	ePn	1:53:54.60	-0.04
LPL	774.7	265	ePn	1:53:54.40	-0.39
MBDF	790.1	258	ePn	1:53:54.70	-2.02
HAU	809.1	285	ePn	1:53:56.70	-2.38
			eSn	55:15.00	-7.70
CABF	814.7	273	ePn	1:53:57.80	-1.98
FRF	843.0	250	ePn	1:54:02.20	-1.11
			eSn	55:20.60	-9.63
ORIF	853.4	261	ePn	1:54:05.00	0.40
LMR	863.6	249	ePn	1:54:04.20	-1.67
			eSn	55:26.00	-8.80
VIVF	948.1	261	ePn	1:54:14.70	-1.71



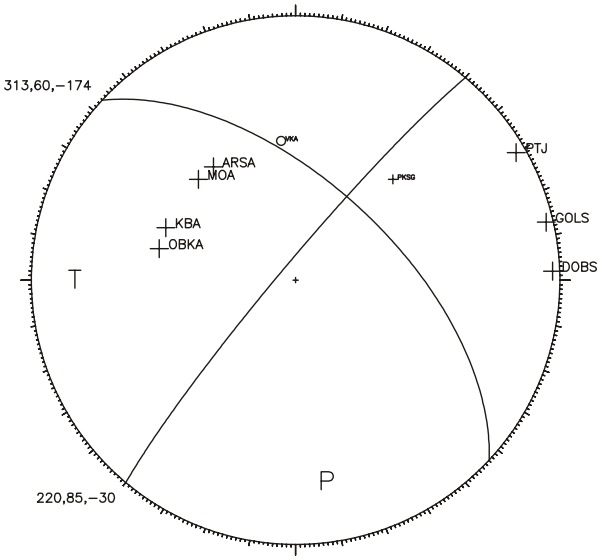
100.

2002-12-06 time: 2:47: 9.98 UTC ML=1.8
lat: 46.196N lon: 16.388E h= 10.0 km
erh=41.4km
Locality: Croatia
Comments:
Reported by NEIC

101.

2002-12-06 time: 3:12:50.99 UTC ML= 3.0
lat: 46.179N lon: 16.657E h= 4.1 km
erh= 2.1km erz= 1.6km
nr= 20 gap=141 rms=0.35
Locality: Croatia
Comments:

sta	dist	azm	phase	hr mn	sec	res
PTJ	62.4	240	iPgC	3:13:02.50		0.35
			eSg	13:10.70		-0.15
GOLS	82.0	257	iPgC	3:13:05.90		0.25
			iSg	13:17.90		0.81
DOBS	91.8	268	iPgC	3:13:07.30		-0.10
CRES	100.9	247	iPg	3:13:08.80		-0.22
			iSg	13:23.20		0.11
LEGS	106.8	256	iPg	3:13:09.80		-0.27
			iSg	13:24.20		-0.75
RHK1	109.7	95	ePg	3:13:10.50		-0.09
			eSg	13:25.90		0.01
BISS	128.7	294	iPn	3:13:12.90		-0.65
VBY	132.1	235	iPn	3:13:14.20		0.23
			iSn	13:31.20		-0.70
ARSA	147.4	324	iPnC	3:13:15.90		0.02
			iSn	13:27.60		-7.69
PKSM	153.2	89	ePn	3:13:16.40		-0.20
			eSn	13:38.50		1.92
LJU	165.4	265	ePn	3:13:17.90		-0.22
			iSn	13:37.40		-1.88
OBKA	166.4	283	iPnC	3:13:18.20		-0.05
			iSn	13:31.90		-7.62
CEY	179.7	254	ePn	3:13:20.10		0.19
PKSG	189.0	44	ePnC	3:13:21.00		-0.07
			eSn	13:48.80		4.28
PKS7	214.7	63	ePn	3:13:27.90		3.62
			eSn	13:55.00		4.76
ZST	226.8	9	iPn	3:13:25.80		0.01
			eSn	13:50.20		-2.73
TRI	230.3	257	ePn	3:13:27.17		0.95
			eSn	13:58.52		4.81
BUD	231.6	51	eSn	3:14:00.80		6.81
VKA	233.4	354	iPnD	3:13:32.50		5.90
			iSn	14:01.20		6.82
MODS	248.5	11	ePn	3:13:28.20		-0.29
			eSn	13:53.30		-4.44
PTCC	255.9	276	ePn	3:13:29.62		0.22
			eSn	14:06.35		6.98
PKSN	258.9	72	eSn	3:14:11.20		11.16
MOA	260.0	316	iPnC	3:13:31.00		1.08
			iSn	13:58.10		-2.18
KBA	272.7	292	iPnC	3:13:32.70		1.19
			iSn	14:03.00		-0.11
PSZ	312.9	52	ePn	3:13:37.20		0.68
GEC2	370.8	323	ePn	3:13:45.40		1.66
			eSn	14:23.10		-1.78
KHC	401.6	325	ePn	3:13:48.90		1.32
			eSn	14:29.50		-2.21
NKC	548.8	325	ePn	3:14:06.60		0.67
			eSn	15:01.00		-3.39
MOX	621.4	323	ePn	3:14:15.70		0.72
			eSn	15:50.60		30.11



102.

2002-12-10 time: 23:57:19.31 UTC ML=
lat: 45.541N lon: 16.919E h= 14.6 km
erh= 9.8km erz= 6.7km
nr= 13 gap=213 rms=0.66
Locality: Croatia
Comments:

sta	dist	azm	phase	hr mn	sec	res
RHK1	108.8	56	ePn	23:57:38.40		0.37
			eSn	57:52.00		-0.63
GOLS	113.4	297	iPn	23:57:38.20		-0.41
			iSn	57:53.30		-0.36
CRES	118.2	286	iPn	23:57:38.40		-0.81
			iSn	57:53.70		-1.03
CESS	123.0	293	iSn	23:57:55.80		0.00
VBY	129.9	268	ePn	23:57:41.70		1.04
			eSn	57:57.00		-0.33
DOBS	131.4	301	iPn	23:57:41.50		0.65
			iSn	57:58.90		1.25
LEGS	132.6	290	iPn	23:57:41.20		0.20
			iSn	57:58.30		0.38

103.

2002-12-15 time: 8:26:01.19 UTC ML=
lat: 46.051N lon: 16.935E h= 6.0 km
erh=27.2km erz= 2.8km
nr= 6 gap=179 rms=0.27
Locality: Croatia
Comments:

sta	dist	azm	phase	hr mn	sec	res
RHK1	88.1	87	ePg	8:26:17.50		0.54
			eSg	26:29.10		-0.16
GOLS	101.6	267	iPg	8:26:19.20		-0.16
CRES	117.3	258	iPn	8:26:22.20		0.12
LEGS	125.8	265	iPn	8:26:22.80		-0.34
			iSn	26:40.50		0.24

104.

2002-12-15 time: 11:04:48.70 UTC ML=
lat: 48.433N lon: 17.572E h= 0.7 km
erh= 6.3km erz= 3.3km
nr= 12 gap=191 rms=0.91
Locality: Slovakia
Comments:

sta	dist	azm	phase	hr mn	sec	res
MODS	22.8	253	iPg	11:04:52.70		-0.08
			iSg	04:55.70		-0.25
ZST	43.7	233	iPg	11:04:56.50		0.00
			iSg	05:01.40		-1.19
VYHS	93.7	86	ePg	11:05:05.70		0.26
			eSg	05:17.50		-0.99
PSZ	182.0	108	ePn	11:05:19.50		1.17
			eSn	05:43.40		1.95
ARSA	202.0	229	iPnC	11:05:22.20		1.37
			iSn	05:47.90		2.00
MOA	254.5	255	iPnC	11:05:26.70		-0.67
			iSn	05:54.50		-3.04

105.

2002-12-17 time: 17:29:16.16 UTC ML=
lat: 46.169N lon: 16.607E h= 10.0 km
erh= 6.5km erz=13.8km
nr= 11 gap=186 rms=0.68
Locality: Croatia
Comments:

sta	dist	azm	phase	hr mn	sec	res
GOLS	78.0	257	ePg	17:29:30.10		-0.10
			eSg	29:41.50		0.36
SISC	79.7	193	iPg	17:29:31.70		1.20
			iSg	29:40.82		-0.87
DOBS	87.9	269	iPg	17:29:31.40		-0.56
			iSg	29:44.70		0.42
CRES	96.9	247	iPg	17:29:34.20		0.65
			eSg	29:47.20		0.08
LEGS	102.7	256	iPg	17:29:34.40		-0.19
			eSg	29:47.90		-1.06
RHK1	113.5	94	ePn	17:29:35.50		-0.57

106.

2002-12-18 time: 16:03:12.43 UTC ML= 1.7
lat: 47.919N lon: 19.428E h= 10.0 km
erh= ---km erz= ---km
nr= 3 gap=233 rms=0.01
Locality: Szanda
Comments:

sta	dist	azm	phase	hr mn	sec	res
PENC	18.0	218	ePgC	16:03:16.10		-0.01
			eSg	03:19.00		0.02
PSZ	34.8	90	ePg	16:03:18.90		0.00

107.

2002-12-19 time: 14:42:16.22 UTC ML= 1.7
lat: 45.579N lon: 17.251E h= 8.6 km
erh= ---km erz= ---km
nr= 4 gap=342 rms=0.00
Locality: Croatia
Comments:

sta	dist	azm	phase	hr mn	sec	res
RHK3	85.1	66	iPgC	14:42:31.50		0.00
RHK1	85.7	48	ePg	14:42:31.60		0.00
			eSg	42:43.60		0.00
PKSM	128.8	57	iPnD	14:42:38.20		0.00

108.

2002-12-20 time: 13:39:34.36 UTC ML=1.7
lat: 46.133N lon: 16.234E h= 10.0 km
erh=23.0km
Locality: Croatia
Comments:
Reported by NEIC

Hypocenter Parameters **Földrengés paraméterek**

109.

2002-12-25 time: 21:58:22.95 UTC ML= 2.6
lat: 47.540N lon: 20.002E h= 12.1 km
erh= 2.7km erz= 1.5km
nr= 11 gap=226 rms=0.35
Locality: Jásztelek
Comments: felt 4-5 EMS

sta	dist	azm	phase	hr mn sec	res
PSZ	42.8	349	ePgD	21:58:30.90	0.01
			iSg	58:36.60	-0.48
PENC	60.9	297	ePgC	21:58:34.30	0.28
			eSg	58:42.90	0.23
BUD	74.0	265	ePg	21:58:36.70	0.37
			eSg	58:46.20	-0.57
PKSG	122.6	262	ePnC	21:58:43.70	-0.03
			eSn	58:59.20	-0.73
VYHS	137.2	321	ePn	21:58:46.10	0.56
			eSn	59:03.40	0.24
PKSM	180.5	215	iPnD	21:58:49.40	-1.54
			eSn	59:10.30	-2.48
RHK1	218.0	223	iPnD	21:58:54.40	-1.22
			eSn	59:17.10	-4.00
RHK3	227.2	216	ePn	21:59:01.20	4.43
			eSn	59:28.40	5.25

110.

2002-12-26 time: 6:12:15.67 UTC ML= 1.2
lat: 47.505N lon: 20.034E h= 15.0 km
erh= ***km erz= ***km
nr= 6 gap=229 rms=0.64
Locality: Jásztelek
Comments:

sta	dist	azm	phase	hr mn sec	res
PSZ	47.1	347	ePgD	6:12:24.90	0.40
			eSg	12:30.80	-0.59
PKSG	124.5	264	ePn	6:12:35.50	-0.82
			eSn	12:53.40	0.98
PKSM	178.7	216	ePnC	6:12:43.60	0.53
			eSn	13:04.00	-0.45

111.

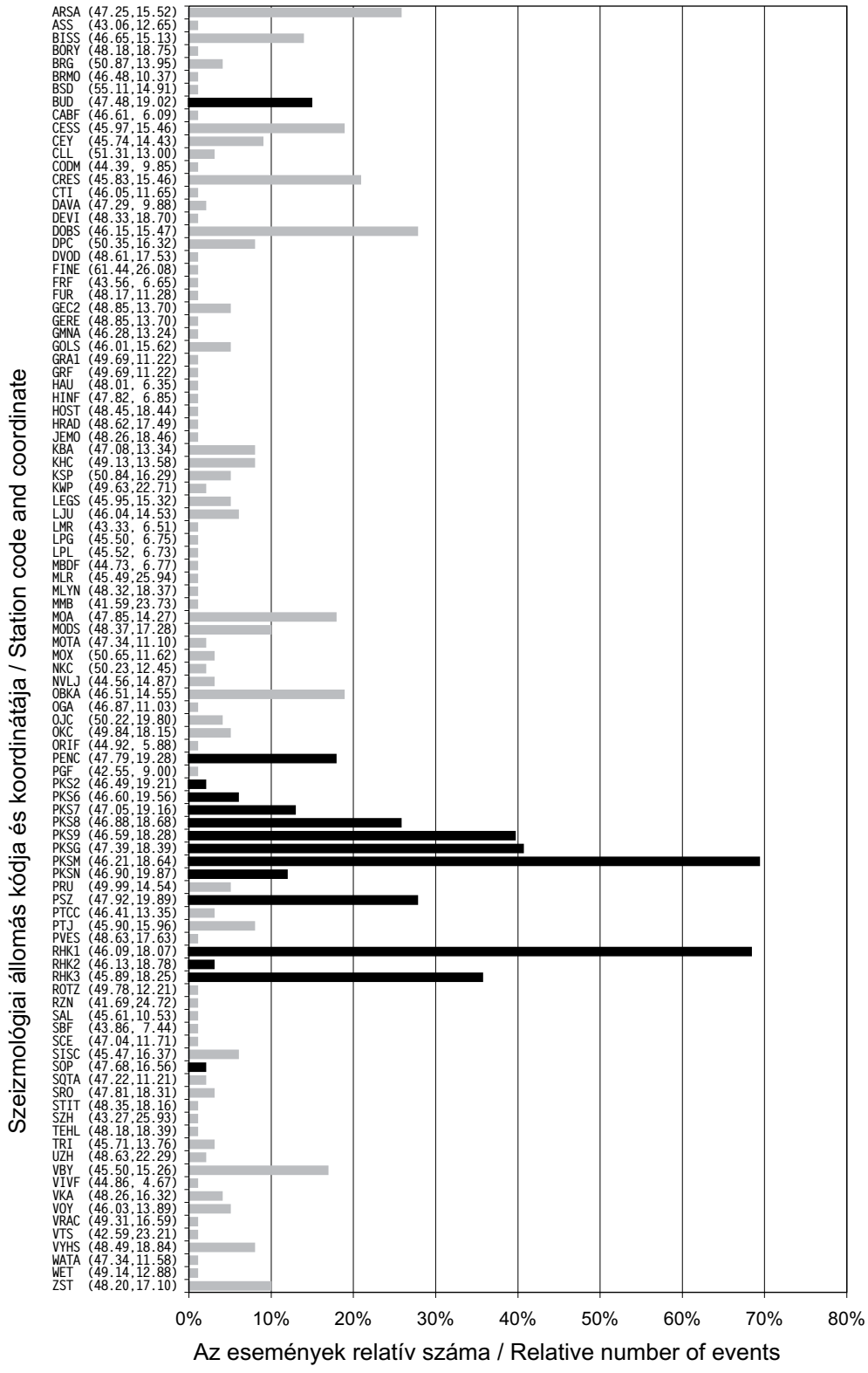
2002-12-26 time: 15:26:11.91 UTC ML= 1.7
lat: 45.742N lon: 18.179E h= 12.8 km
erh= 1.9km erz= 1.1km
nr= 6 gap=314 rms=0.11
Locality: Croatia
Comments:

sta	dist	azm	phase	hr mn sec	res
RHK3	17.2	19	iPgC	15:26:15.80	0.06
RHK1	40.1	348	iPgC	15:26:19.50	0.07
			eSg	26:25.10	-0.19
PKSM	63.3	34	iPgC	15:26:23.30	-0.15
			eSg	26:32.50	0.05
PKS9	94.2	5	eP*	15:26:28.90	0.10
			eS*	26:43.20	1.23

112.

2002-12-30 time: 21:22:44.90 UTC ML= 2.1
lat: 48.052N lon: 17.461E h= 12.5 km
erh= 2.6km erz= 2.7km
nr= 11 gap=154 rms=0.28
Locality: Slovakia
Comments:

sta	dist	azm	phase	hr mn sec	res
ZST	31.1	301	iPg	21:22:50.60	-0.29
			iSg	22:54.50	-1.07
MODS	38.3	339	iPg	21:22:52.10	0.01
			eSg	22:56.60	-1.10
VKA	88.3	286	iPgC	21:23:01.10	0.28
			iSg	23:12.80	-0.43
PKSG	101.2	136	eP*	21:23:03.10	0.22
			eS*	23:15.30	-1.61
BUD	133.1	118	eSn	21:23:22.50	-1.63
ARSA	170.7	239	iPnD	21:23:11.50	-0.13
			iSn	23:30.60	-1.87
RHK1	222.5	168	ePn	21:23:18.00	-0.08
PKSM	223.3	156	ePn	21:23:17.60	-0.59
MOA	239.7	265	iPnC	21:23:23.80	3.57
			iSn	23:49.10	1.31
DPC	268.7	342	ePn	21:23:24.60	0.75
			eSn	23:53.30	-0.93
OBKA	279.2	232	iPnC	21:23:25.30	0.14
			iSn	23:54.20	-2.36
GEC2	291.8	288	ePn	21:23:27.70	0.98
			eSn	24:06.50	7.15
PRU	303.3	315	ePn	21:23:28.00	-0.16
			eSn	24:13.20	11.30
KHC	310.6	293	ePn	21:23:30.10	1.03
			eSn	24:13.40	9.89
KBA	328.1	251	iPnC	21:23:38.00	6.74
			iSn	24:16.50	9.09
VOY	352.1	230	ePn	21:23:34.20	-0.04
			eSn	24:11.00	-1.73
BRG	404.3	321	ePn	21:23:42.40	1.65



3.4. ábra Az egyes állomások részvétele a hipocentrum meghatározásban

Figure 3.4. Contribution of individual stations to the hypocenter determination

4.

JELENTŐS FÖLDRENGÉSEK 2002-BEN
(Magyarországon érezhető földrengések)

2002. január 28. - Kutasó
2002. február 11. - Mezőnyárád
2002. február 11. - Emőd
2002. február 22. - Környe
2002. február 25. - Hatvan
2002. május 8. - Tófalu
2002. október 12. - Jászapáti
2002. október 23. - Jászapáti
2002. december 25. - Jásztelek

A MAKROSZEIZMIKUS INTENZITÁS MEGHATÁROZÁSA

A földrengés érezhető és épített környezetben okozott hatásainak összegyűjtése kérdőívek segítségével történik. Az összegyűjtött válaszok alapján kerül 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 2002

(Earthquakes that was felt in Hungary)

28 January 2002 - Kutasó
11 February 2002 - Mezőnyárád
11 February 2002 - Emőd
22 February 2002 - Környe
25 February 2002 - Hatvan
8 May 2002 - Tófalu
12 October 2002 - Jászapáti
23 October 2002 - Jászapáti
25 December 2002 - Jásztelek

METHOD USED FOR ESTIMATION OF INTENSITY

The earthquake effects (macroseismic observations) are usually gathered on 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)

2002. január 28. - Kutasó / 28 January 2002 - Kutasó

FÉSZEKPARAMÉTEREK / HYPOCENTER PARAMETERS

Dátum / Date:	2002/01/28
Kipattanási idő / Origin Time:	03:18:02.0 UTC
Szélesség és hosszúság / Latitude and Longitude:	47.956N 19.493E (S.D. 3.3 km)
Mélység / Depth:	1.0 km (S.D. 3 km)
Magnitúdó / Magnitude:	2.4 ML
Maximális intenzitás / Maximum Intensity:	4-5 EMS

LEÍRÁS

Január 28-án kisebb (2.4 M_L) földrengést éreztek és jelentettek Kutasóról. A makroszeizmikus adatgyűjtés során kiderült, hogy az esemény nagyon kis területen, Kutasó és Bokor településeken volt érezhető, a legnagyobb intenzitás 4-5 EMS volt.

Az esemény szeizmogramja a 4.1. ábrán látható.

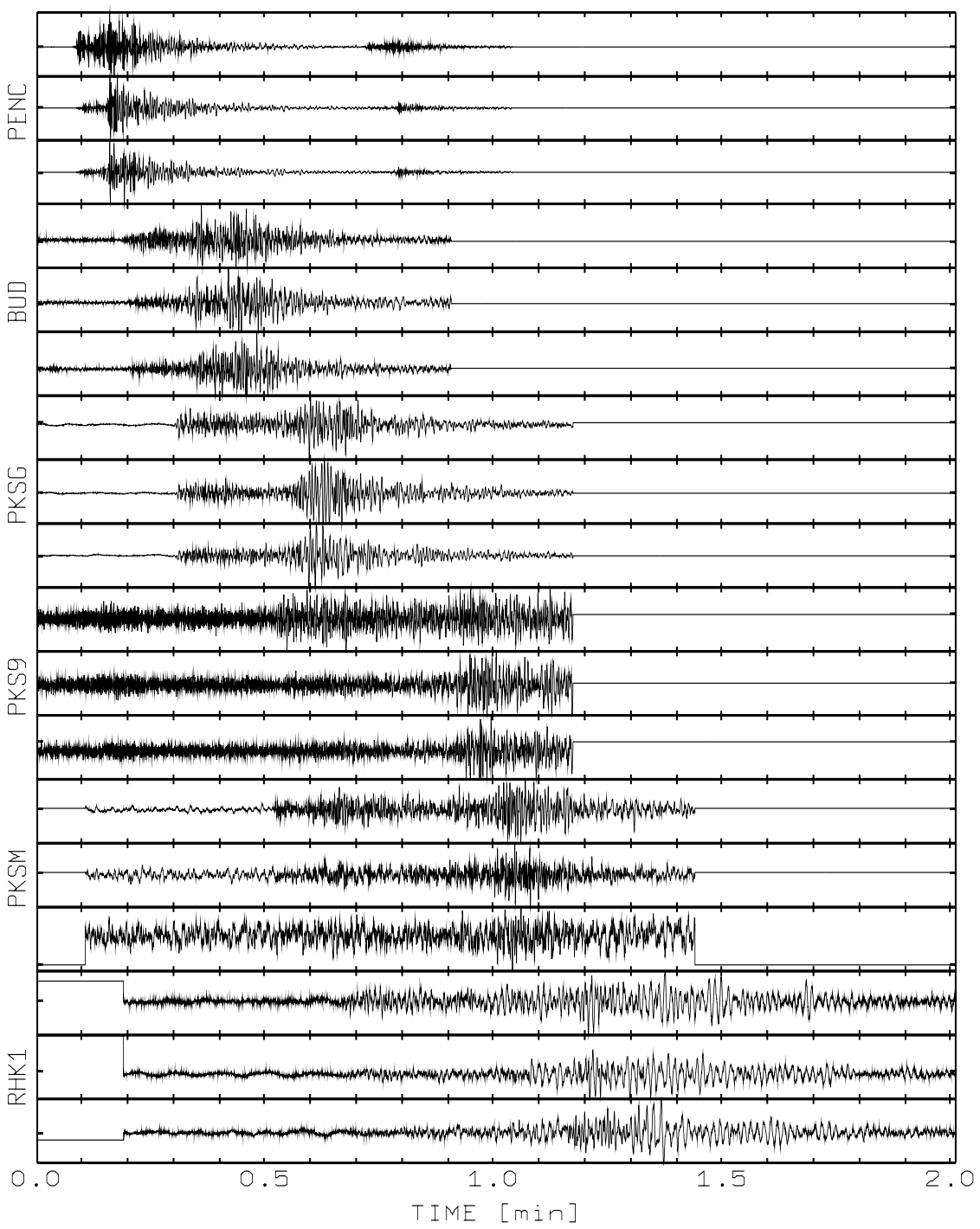
A rengés intenzitás eloszlását a 4.1. táblázat tartalmazza és a 4.2. ábra mutatja

DISCUSSION

On January 28th, a small magnitude (2.4 M_L) event was felt and produced reports of intensity 4-5 EMS from a very small epicentral area at Kutasó and Bokor.

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.



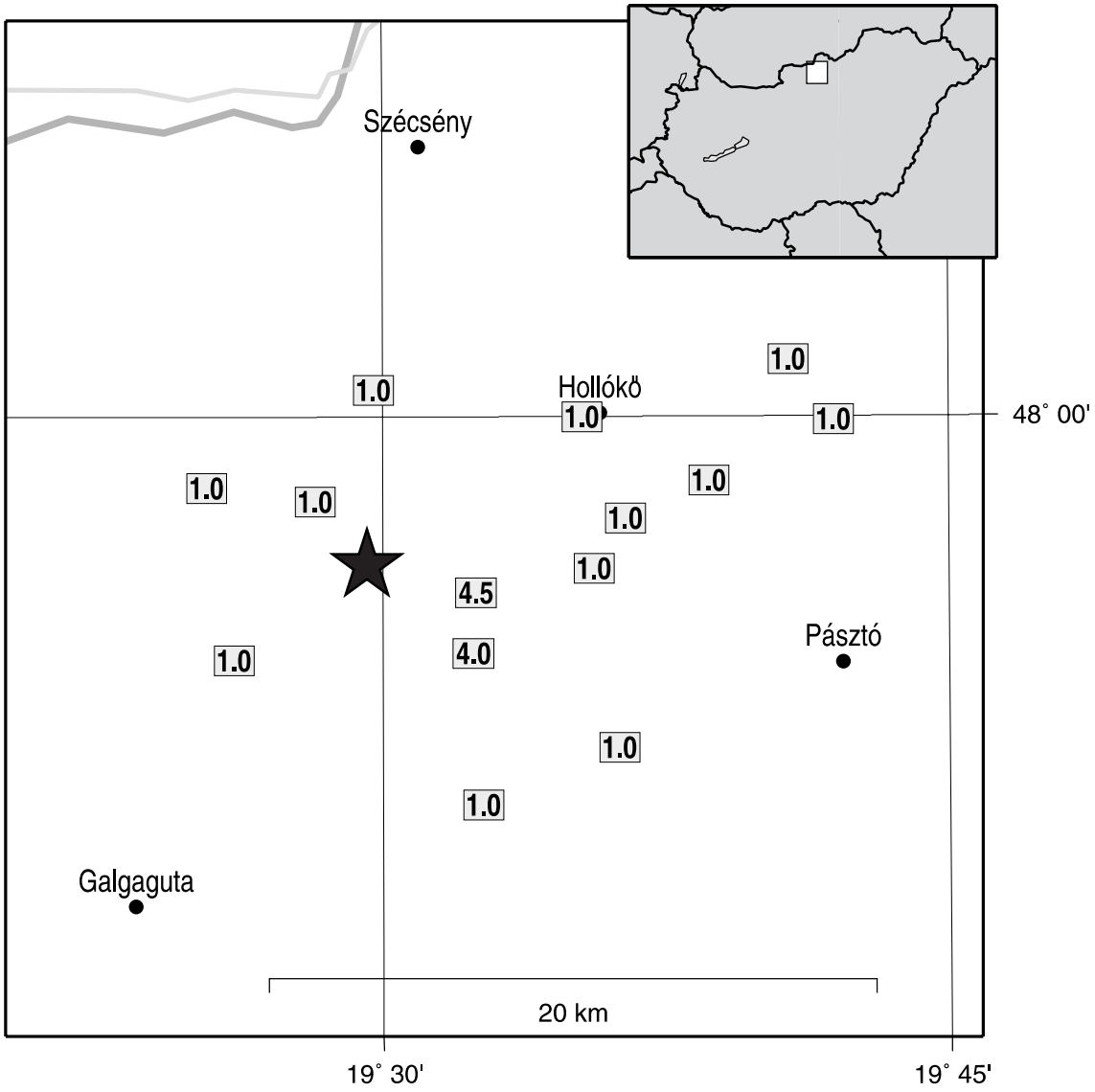
4.1. ábra A 2002. január 28-i kutasói földrengés (03:18:02 UTC) szeizmogramja

Figure 4.1. Seismograms of the Kutasó earthquake 28 January 2002, 03:18:02 UTC

4.1. Táblázat
A 2002. január 28-i, kutasói földrengés (03:18:02 UTC) intenzitás eloszlása

Table 4.1.
Intensity distribution of the Kutasó event 28th January 2002 (03:18:02 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	Alsótold	47.955	19.593	1.0	0%	1
2	Bokor	47.930	19.540	4.0	56%	1
3	Buják	47.885	19.544	1.0	0%	2
4	Cserhátsurány	47.979	19.422	1.0	0%	2
5	Ecseg	47.902	19.604	1.0	0%	2
6	Felsőtold	47.970	19.607	1.0	0%	1
7	Garáb	47.981	19.644	1.0	0%	1
8	Herencsény	47.975	19.470	1.0	0%	2
9	Hollókő	48.000	19.588	1.0	0%	1
10	Kisbárkány	48.017	19.679	1.0	0%	1
11	Kutasó	47.948	19.541	4.5	33%	2
12	Nagybárkány	47.999	19.699	1.0	0%	1
13	Nógrádsipek	48.008	19.496	1.0	0%	2
14	Szanda	47.928	19.434	1.0	0%	2



4.2. ábra A 2002. január 28-i kutasói földrengés (03:18:02 UTC) intenzitás eloszlása (a csillag a műszeresen meghatározott epicentrumot jelöli)

Figure 4.2. Intensity distribution of the Kutasó earthquake 28 January 2002, 03:18:02 UTC (star - instrumental epicentre)

2002. február 11. - Mezőnyárád / 11 February 2002 - Mezőnyárád

FÉSZEKPARAMÉTEREK / HYPOCENTER PARAMETERS

Dátum / Date:	2002/02/11
Kipattanási idő / Origin Time:	16:41:33.1 UTC
Szélesség és hosszúság / Latitude and Longitude:	47.689N 20.910E (S.D. 8.3 km)
Mélység / Depth:	0.4 km (S.D. 9 km)
Magnitúdó / Magnitude:	2.9 ML
Maximális intenzitás / Maximum Intensity:	5 EMS

LEÍRÁS

Február 11-én délután és este két hasonló méretű földrengés (2.9 és 3.0 M_L) volt érezhető mintegy 1000-1500 km^2 területen, a Bükk-hegység déli oldalán. Az első rengést helyi idő szerint 17:41-kor jelentették Mezőnyárád – Emőd – Cserépfalu környékéről. A makroszeizmikus felmérés alapján a rengés epicentrális intenzitása 5 EMS fokra becsülhető.

Az esemény szeizmogramja a 4.3. ábrán látható.

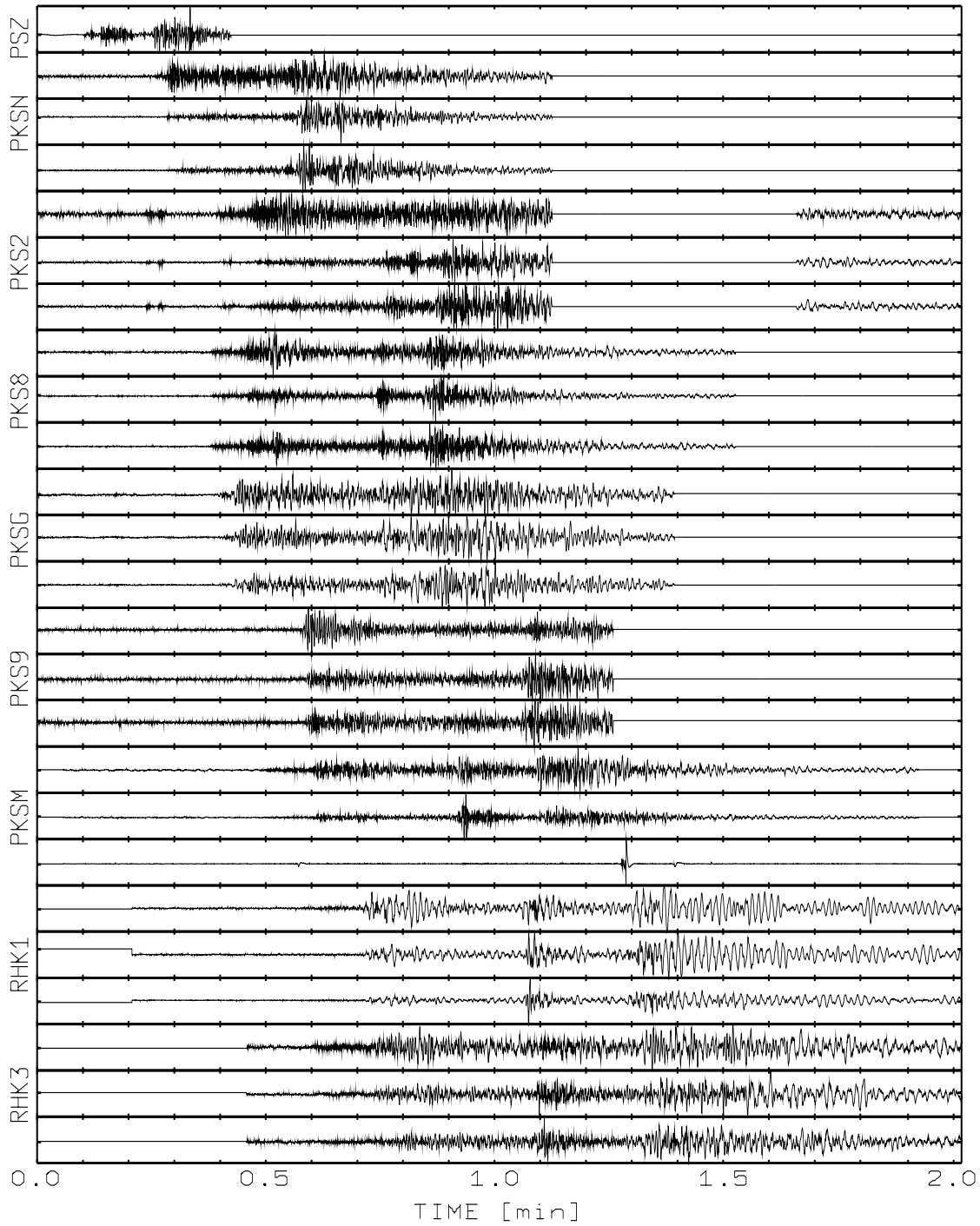
A rengés intenzitás eloszlását a 4.2. táblázat tartalmazza és a 4.4. ábra mutatja

DISCUSSION

On February 11th, two similar size earthquakes with magnitudes of 2.9 and 3.0 M_L were felt in a relatively large area of about 1000-1500 km^2 in the Bükk mountain region, NE of Hungary. The first one was reported at about 5:41 PM local time, from Mezőnyárád – Emőd – Cserépfalu area with maximum intensity of 5 EMS.

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.



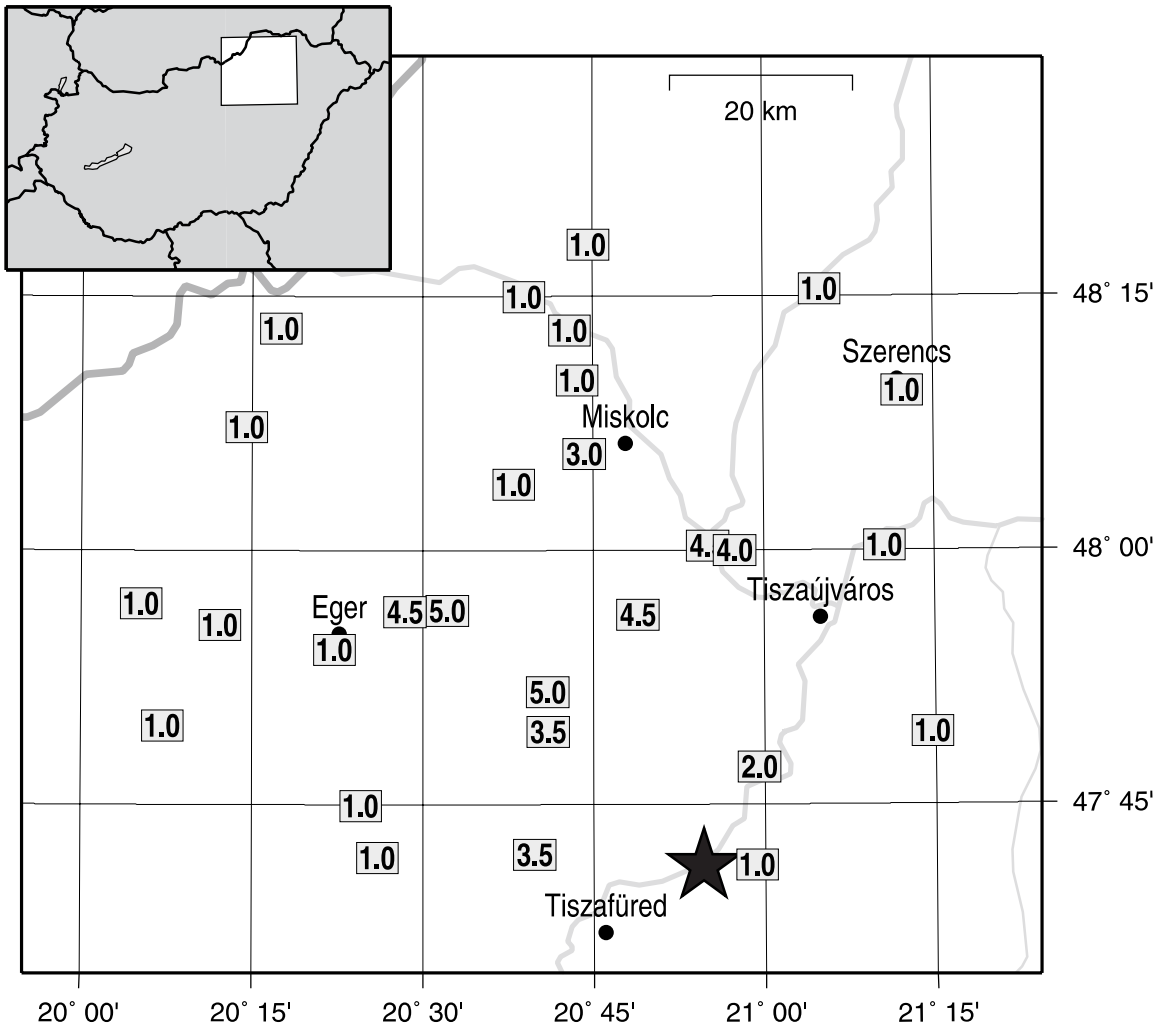
4.3. ábra A 2002. február 11-i mezőnyárádi földrengés (16:41:33 UTC) szeizmogramja

Figure 4.3. Seismograms of the Mezőnyárád earthquake 11 February 2002, 16:41:33 UTC

4.2. Táblázat
A 2002. február 11-i, mezőnyárádi földrengés (16:41:33 UTC) intenzitás eloszlása

Table 4.2.
Intensity distribution of the Mezőnyárád event 11th February 2002 (16:41:33 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	Besenyőtelek	47.698	20.433	1.0	0%	2
2	Borsodivánka	47.701	20.664	3.5	34%	1
3	Borsodnádasd	48.122	20.241	1.0	0%	1
4	Bükkszentkereszt	48.065	20.633	1.0	0%	1
5	Cserépfalu	47.941	20.536	5.0	24%	1
6	Domoszló	47.828	20.119	1.0	0%	2
7	Edelény	48.301	20.743	1.0	0%	2
8	Eger	47.903	20.370	1.0	0%	1
9	Emőd	47.937	20.815	4.5	30%	2
10	Felsődobsza	48.257	21.083	1.0	0%	1
11	Füzesabony	47.749	20.409	1.0	0%	2
12	Görbeháza	47.822	21.245	1.0	0%	1
13	Kazincbarcika	48.250	20.648	1.0	0%	2
14	Mátraderecske	47.948	20.087	1.0	0%	1
15	Mezőkeresztes	47.822	20.684	3.5	38%	1
16	Mezőnyárád	47.861	20.683	5.0	33%	1
17	Miskolc	48.095	20.737	3.0	38%	1
18	Noszvaj	47.940	20.474	4.5	34%	1
19	Ónod	48.005	20.918	4.5	35%	1
20	Ózd	48.219	20.291	1.0	0%	2
21	Sajóbábony	48.168	20.726	1.0	0%	1
22	Sajóhídvég	48.000	20.957	4.0	38%	1
23	Sajószentpéter	48.217	20.715	1.0	0%	2
24	Sirok	47.927	20.202	1.0	0%	1
25	Szerencs	48.157	21.203	1.0	0%	2
26	Tiszacsege	47.691	20.987	1.0	0%	2
27	Tiszadob	48.005	21.176	1.0	0%	1
28	Tiszakeszi	47.787	20.992	2.0	100%	1



4.4. ábra A 2002. február 11-i mezőnyárádi földrengés (16:41:33 UTC) intenzitás eloszlása (a csillag a műszeresen meghatározott epicentrumot jelöli)

Figure 4.4. Intensity distribution of the Mezőnyárád earthquake 11 February 2002, 16:41:33 UTC (star - instrumental epicentre)

2002. február 11. - Emőd / 11 February 2002 - Emőd

FÉSZEKPARAMÉTEREK / HYPOCENTER PARAMETERS

Dátum / Date:	2002/02/11
Kipattanási idő / Origin Time:	20:24:13.4 UTC
Szélesség és hosszúság / Latitude and Longitude:	47.791N 20.831E (S.D. 6.5 km)
Mélység / Depth:	7.4 km (S.D. 6 km)
Magnitúdó / Magnitude:	3.0 ML
Maximális intenzitás / Maximum Intensity:	4-5 EMS

LEÍRÁS

Február 11-én délután és este két hasonló méretű földrengés (2.9 és 3.0 M_L) volt érezhető mintegy 1000-1500 km^2 területen, a Bükk-hegység déli oldalán. A második rengést helyi idő szerint 21:24-kor jelentették Emőd – Ónod – Mezőkeresztes környékéről. A makroszeizmikus felmérés alapján a rengés epicentrális intenzitása 4-5 EMS fokra becsülhető.

Az esemény szeizmogramja a 4.5. ábrán látható.

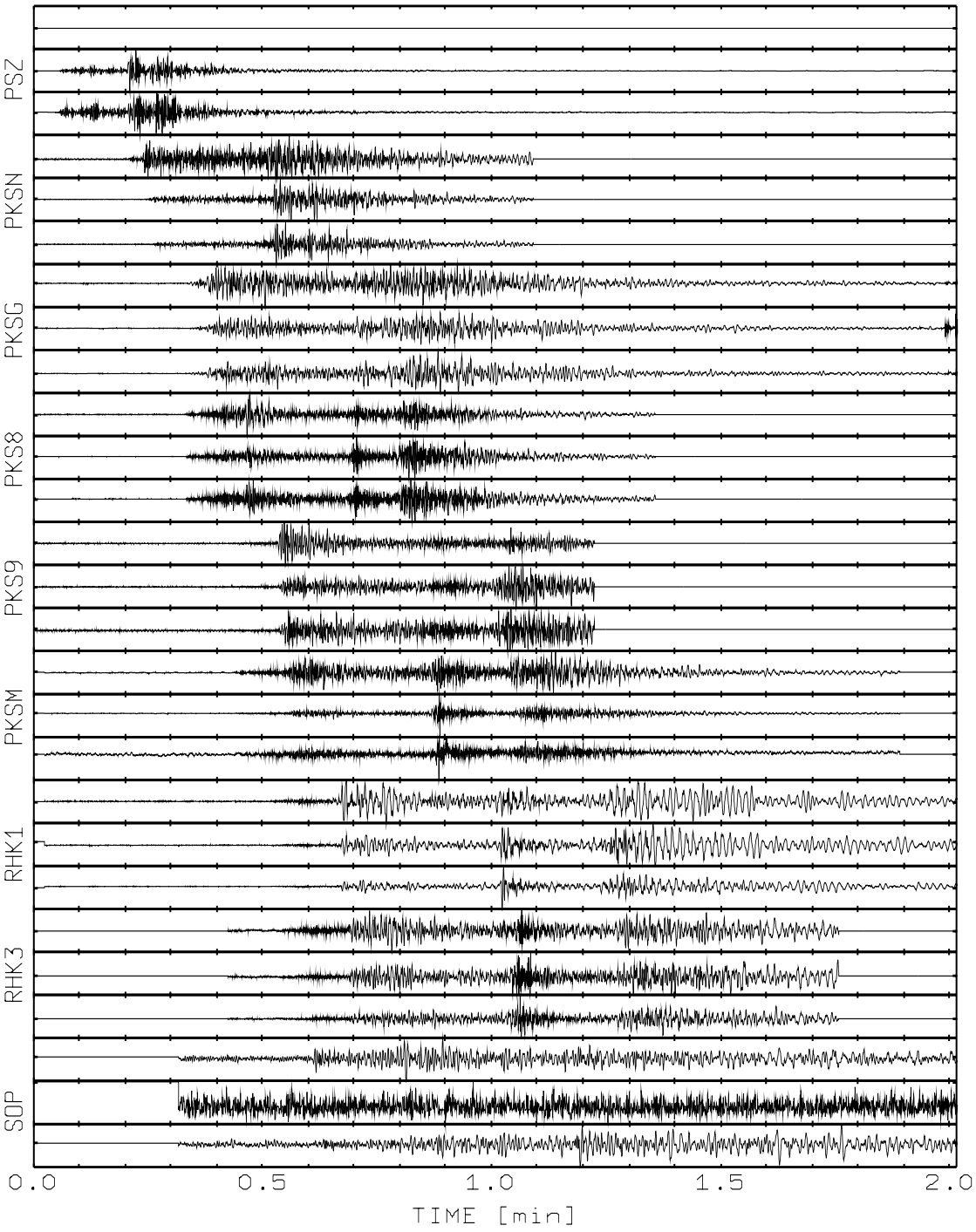
A rengés intenzitás eloszlását a 4.3. táblázat tartalmazza és a 4.6. ábra mutatja

DISCUSSION

On February 11th, two similar size earthquakes with magnitudes of 2.9 and 3.0 M_L were felt in a relatively large area of about 1000-1500 km^2 in the Bükk mountain region, NE of Hungary. The second one was reported at about 9:24 PM local time, from Emőd – Ónod – Mezőkeresztes area with maximum intensity of 4-5 EMS.

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.



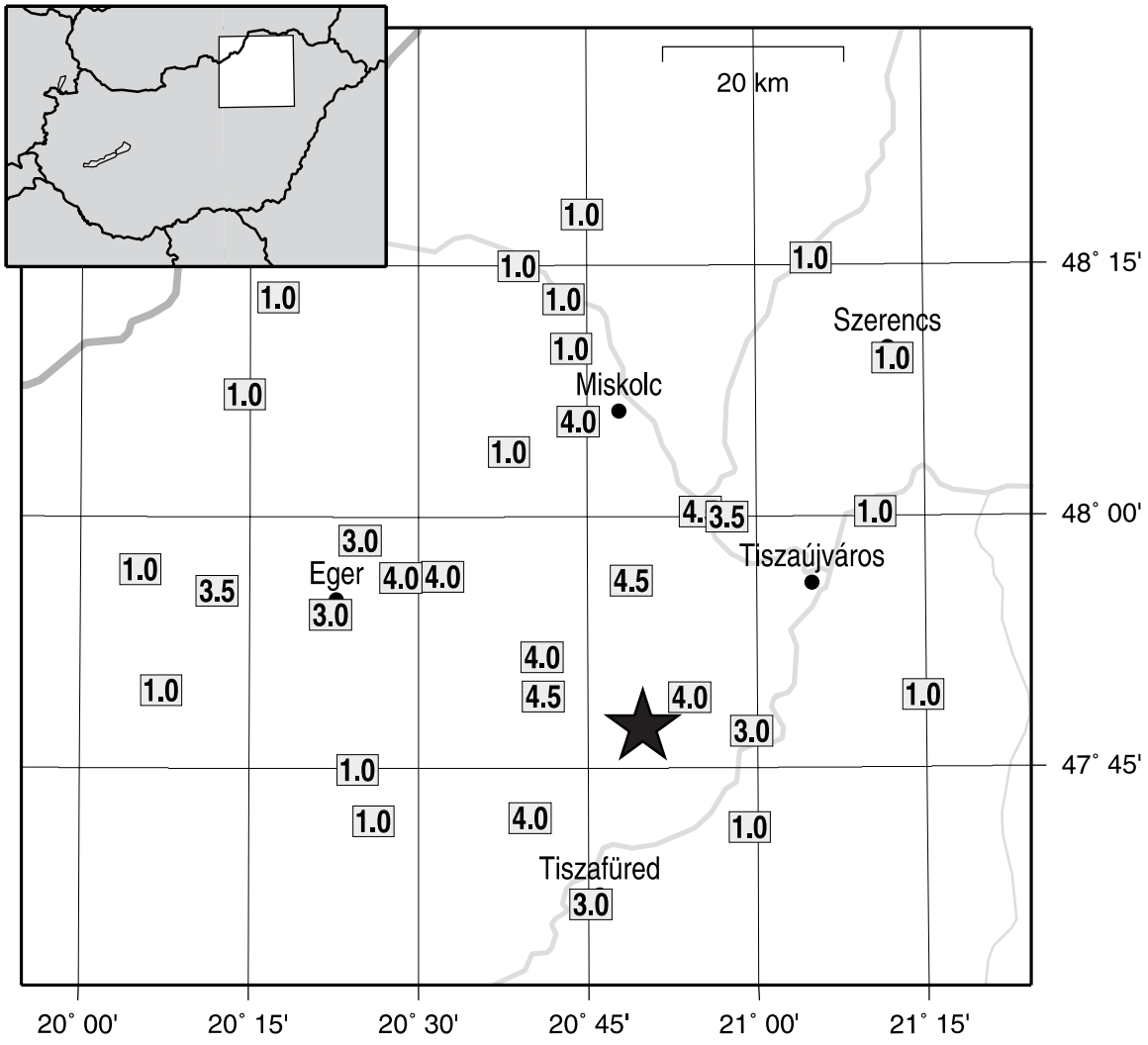
4.5. ábra A 2002. február 11-i emődi földrengés (20:24:13 UTC) szeizmogramja

Figure 4.5. Seismograms of the Emőd earthquake 11 February 2002, 20:24:13 UTC

4.3. Táblázat
A 2002. február 11-i, emődi földrengés (20:24:13 UTC) intenzitás eloszlása

Table 4.3.
Intensity distribution of the Emőd event 11th February 2002 (20:24:13 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	Besenyőtelek	47.698	20.433	1.0	0%	2
2	Borsodivánka	47.701	20.664	4.0	38%	2
3	Borsodnádasd	48.122	20.241	1.0	0%	2
4	Bükkszentkereszt	48.065	20.633	1.0	0%	1
5	Cserépfalu	47.941	20.536	4.0	35%	2
6	Domoszló	47.828	20.119	1.0	0%	2
7	Edelény	48.301	20.743	1.0	0%	2
8	Eger	47.903	20.370	3.0	38%	2
9	Emőd	47.937	20.815	4.5	30%	2
10	Felsődobsza	48.257	21.083	1.0	0%	1
11	Felsőtárkány	47.977	20.414	3.0	44%	1
12	Füzesabony	47.749	20.409	1.0	0%	2
13	Görbeháza	47.822	21.245	1.0	0%	1
14	Kazincbarcika	48.250	20.648	1.0	0%	2
15	Mátraderecske	47.948	20.087	1.0	0%	1
16	Mezőcsát	47.821	20.900	4.0	50%	1
17	Mezőkeresztes	47.822	20.684	4.5	33%	2
18	Mezőnyárád	47.861	20.683	4.0	35%	2
19	Miskolc	48.095	20.737	4.0	33%	2
20	Noszvaj	47.940	20.474	4.0	44%	2
21	Ónod	48.005	20.918	4.5	32%	3
22	Ózd	48.219	20.291	1.0	0%	2
23	Sajóbábony	48.168	20.726	1.0	0%	1
24	Sajóhídvég	48.000	20.957	3.5	38%	1
25	Sajószentpéter	48.217	20.715	1.0	0%	2
26	Sirok	47.927	20.202	3.5	25%	2
27	Szerencs	48.157	21.203	1.0	0%	2
28	Tiszacsege	47.691	20.987	1.0	0%	2
29	Tiszadob	48.005	21.176	1.0	0%	1
30	Tiszafüred	47.615	20.753	3.0	31%	1
31	Tiszakeszi	47.787	20.992	3.0	40%	1



4.6. ábra A 2002. február 11-i emődi földrengés (20:24:13 UTC) intenzitás eloszlása (a csillag a műszeresen meghatározott epicentrumot jelöli)

Figure 4.6. Intensity distribution of the Emőd earthquake 11 February 2002, 20:24:13 UTC (star - instrumental epicentre)

2002. február 22. - Környe / 22 February 2002 - Környe

FÉSZEKPARAMÉTEREK / HYPOCENTER PARAMETERS

Dátum / Date:	2002/02/22
Kipattanási idő / Origin Time:	11:52:34.7 UTC
Szélesség és hosszúság / Latitude and Longitude:	47.492N 18.248E (S.D. 2.6 km)
Mélység / Depth:	10.0 km (S.D. 2 km)
Magnitúdó / Magnitude:	2.9 ML
Maximális intenzitás / Maximum Intensity:	4 EMS

LEÍRÁS

Február 22-én 2.9 M_L magnitúdójú földrengés volt érezhető kb. 100-150 km^2 területen Környe – Bokod – Oroszlány térségében. A legnagyobb intenzitás 4 EMS volt.

Az esemény szeizmogramja a 4.7. ábrán látható.

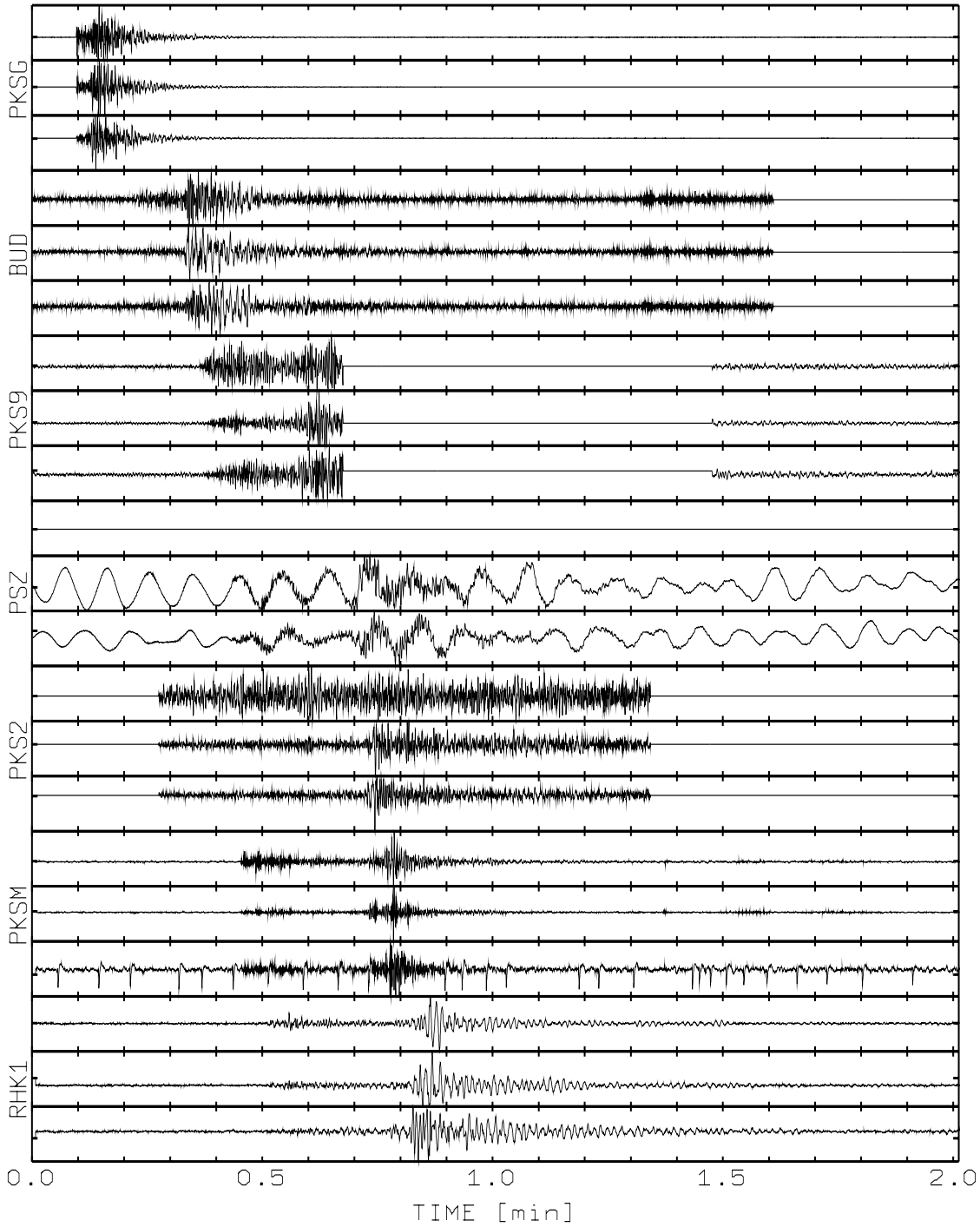
A rengés intenzitás eloszlását a 4.4. táblázat tartalmazza és a 4.8. ábra mutatja

DISCUSSION

On February 22nd , an earthquake with a magnitude of 2.9 M_L was felt in a relatively small area of about 100-150 km^2 (Környe – Bokod – Oroszlány). Maximum intensity of 4 EMS was reported from Környe.

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.



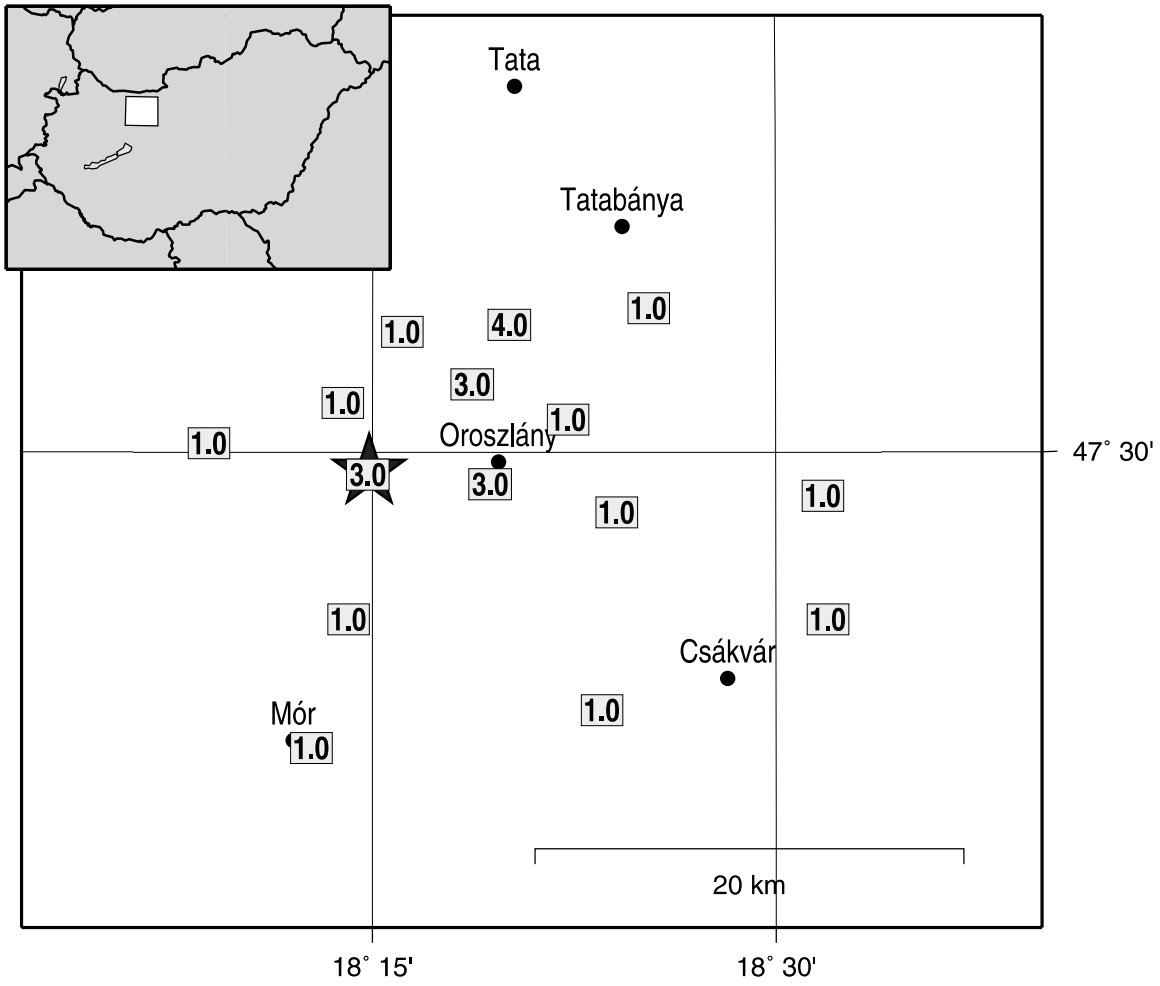
4.7. ábra A 2002. február 22-i környei földrengés (11:52:35 UTC) szeizmogramja

Figure 4.7. Seismograms of the Környe earthquake 22 February 2002, 11:52:35 UTC

4.4. Táblázat
A 2002. február 22-i, környei földrengés (11:52:35 UTC) intenzitás eloszlása

Table 4.4.
Intensity distribution of the Környe event 22nd February 2002 (11:52:35 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	Bokod	47.491	18.247	3.0	38%	2
2	Dad	47.521	18.231	1.0	0%	2
3	Császár	47.504	18.148	1.0	0%	2
4	Gánt	47.392	18.392	1.0	0%	1
5	Kecskéd	47.529	18.312	3.0	31%	1
6	Kömlőd	47.551	18.268	1.0	0%	1
7	Környe	47.554	18.335	4.0	41%	1
8	Mór	47.376	18.212	1.0	0%	1
9	Oroszlány	47.487	18.323	3.0	31%	2
10	Pusztavám	47.430	18.235	1.0	0%	2
11	Szár	47.482	18.529	1.0	0%	2
12	Tatabánya	47.561	18.421	1.0	0%	2
13	Várgesztes	47.475	18.401	1.0	0%	1
14	Vértesboglár	47.430	18.532	1.0	0%	2
15	Vértessomló	47.514	18.371	1.0	0%	2



4.8. ábra A 2002. február 22-i környei földrengés (11:52:35 UTC) intenzitás eloszlása (a csillag a műszeresen meghatározott epicentrumot jelöli)

Figure 4.8. Intensity distribution of the Környe earthquake 22 February 2002, 11:52:35 UTC (star - instrumental epicentre)

2002. február 25. - Hatvan / 25 February 2002 - Hatvan

FÉSZEKPARAMÉTEREK / HYPOCENTER PARAMETERS

Dátum / Date:	2002/02/25
Kipattanási idő / Origin Time:	23:10:19.6 UTC
Szélesség és hosszúság / Latitude and Longitude:	47.681N 19.622E (S.D. 4.0 km)
Mélység / Depth:	10.0 km (S.D. 4 km)
Magnitúdó / Magnitude:	2.2 ML
Maximális intenzitás / Maximum Intensity:	3-4 EMS

LEÍRÁS

Február 25-én éjjel kisebb rengést (2.2 M_L) éreztek a Mátra-hegység nyugati oldalán. A rengés epicentruma Hatvan környékén volt, melyet Heréd és Zagyvaszántó településeken is éreztek 3-4 EMS intenzitással.

Az esemény szeizmogramja a 4.9. ábrán látható.

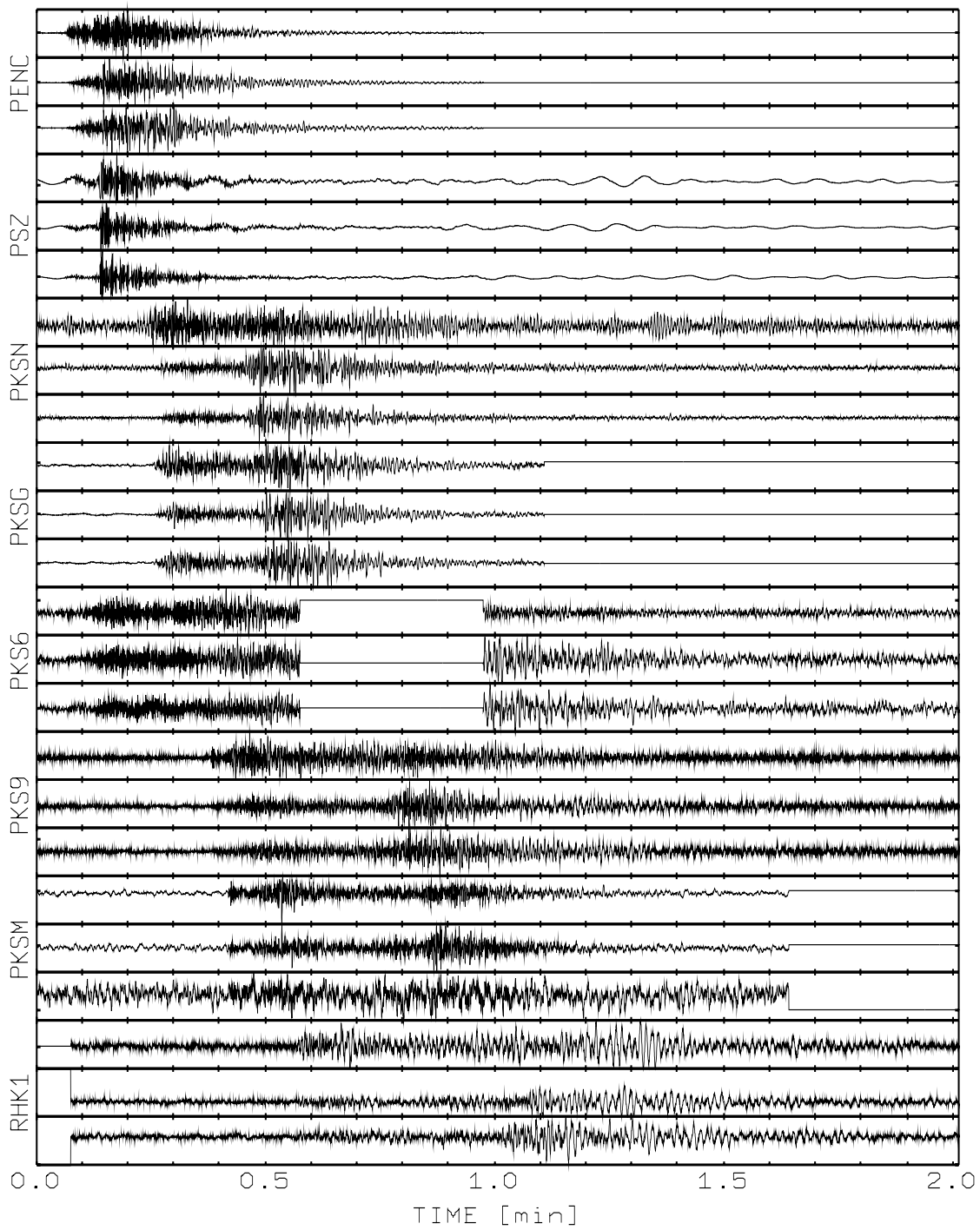
A rengés intenzitás eloszlását a 4.5. táblázat tartalmazza és a 4.10. ábra mutatja

DISCUSSION

On February 25th, a small magnitude (2.2 M_L) event was felt and reported from the Mátra mountain and produced reports of intensity 3-4 EMS in Hatvan, Heréd and Zagyvaszántó.

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.



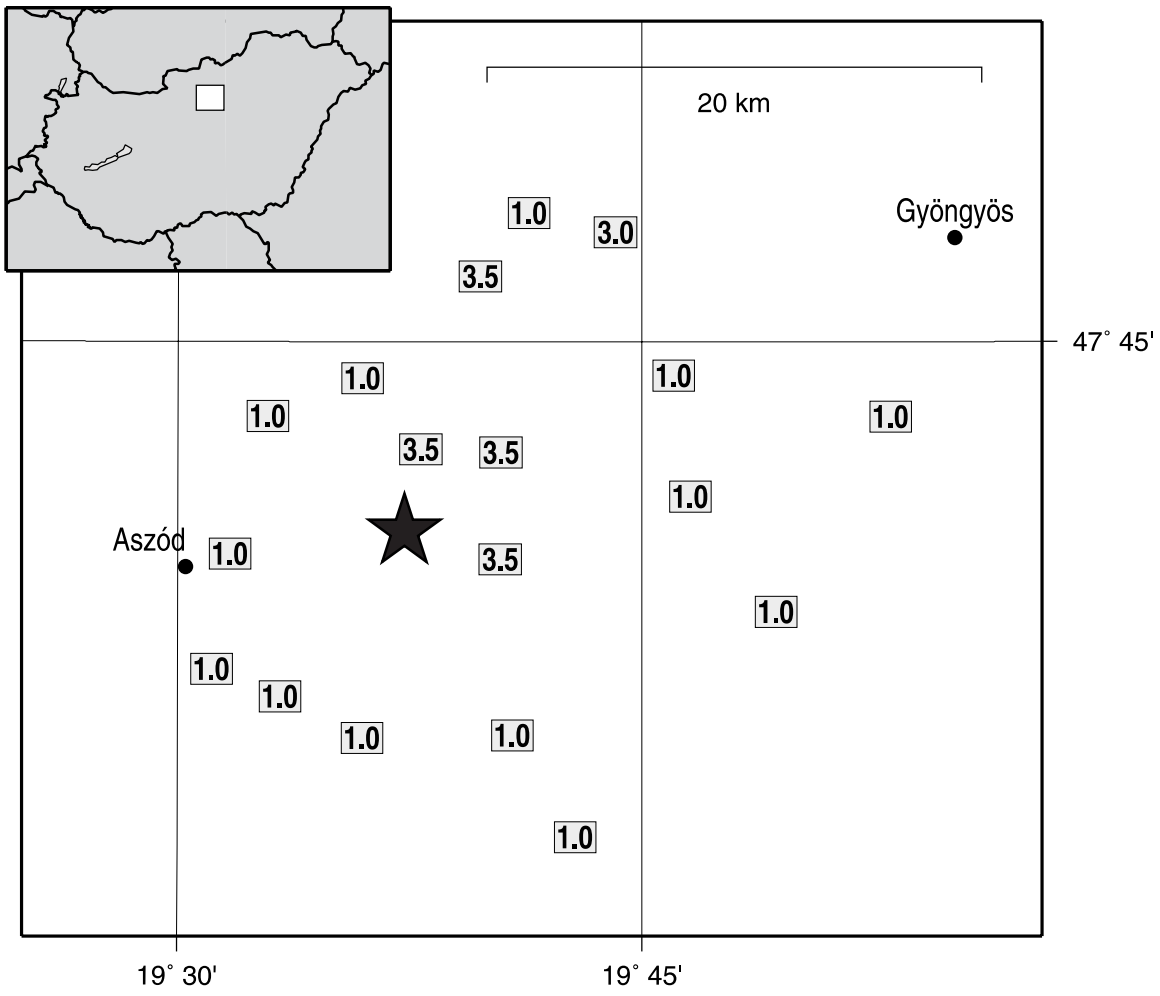
4.9. ábra A 2002. február 25-i hatvani földrengés (23:10:20 UTC) szeizmogramja

Figure 4.9. Seismograms of the Hatvan earthquake 25 February 2002, 23:10:20 UTC

4.5. Táblázat
A 2002. február 25-i, hatvani földrengés (23:10:20 UTC) intenzitás eloszlása

Table 4.5.
Intensity distribution of the Hatvan event 25th February 2002 (23:10:20 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	Apc	47.797	19.689	1.0	0%	2
2	Atkár	47.723	19.884	1.0	0%	1
3	Boldog	47.607	19.680	1.0	0%	1
4	Csány	47.652	19.822	1.0	0%	1
5	Ecséd	47.738	19.767	1.0	0%	1
6	Galgahévíz	47.621	19.555	1.0	0%	2
7	Hatvan	47.671	19.674	3.5	33%	3
8	Heréd	47.711	19.631	3.5	24%	2
9	Hévizgyörk	47.631	19.518	1.0	0%	1
10	Hort	47.694	19.776	1.0	0%	2
11	Jászfényszaru	47.570	19.714	1.0	0%	2
12	Kartal	47.673	19.528	1.0	0%	1
13	Mátraderecske	47.948	20.087	1.0	0%	1
14	Mátravidéki Erőmű	47.710	19.674	3.5	44%	1
15	Nagykökényes	47.737	19.599	1.0	0%	1
16	Rózsaszentmárton	47.790	19.736	3.0	50%	2
17	Tura	47.606	19.599	1.0	0%	1
18	Verseg	47.723	19.548	1.0	0%	2
19	Zagyvaszántó	47.774	19.663	3.5	42%	2



4.10. ábra A 2002. február 25-i hatvani földrengés (23:10:20 UTC) intenzitás eloszlása (a csillag a műszeresen meghatározott epicentrumot jelöli)

Figure 4.10. Intensity distribution of the Hatvan earthquake 25 February 2002, 23:10:20 UTC (star - instrumental epicentre)

2002. május 8. - Tófalu / 8 May 2002 - Tófalu

FÉSZEKPARAMÉTEREK / HYPOCENTER PARAMETERS

Dátum / Date:	2002/05/08
Kipattanási idő / Origin Time:	14:57:04.9 UTC
Szélesség és hosszúság / Latitude and Longitude:	47.811N 20.188E (S.D. 4.9 km)
Mélység / Depth:	14.8 km (S.D. 3 km)
Magnitúdó / Magnitude:	2.9 ML
Maximális intenzitás / Maximum Intensity:	4 EMS

LEÍRÁS

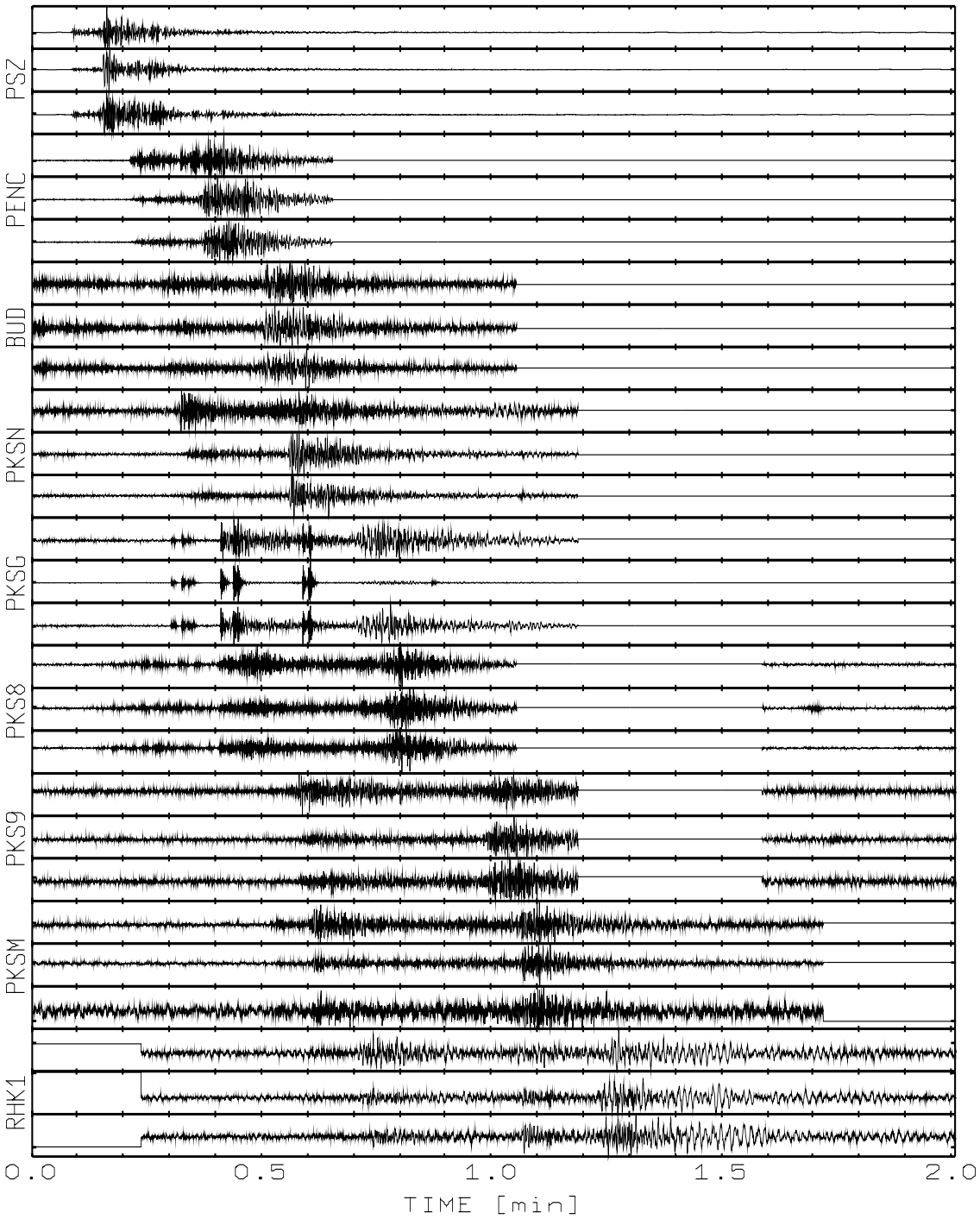
Május 8-án Aldebrő – Kerecsend – Tófalu körzetben mozdult meg a föld, egy M_L 2.9 rengés volt érezhető 4 EMS intenzitással.
Az esemény szeizmogramja a 4.11. ábrán látható.

A rengés intenzitás eloszlását a 4.6. táblázat tartalmazza és a 4.12. ábra mutatja

DISCUSSION

On May 8th, an earthquake of magnitude 2.9 M_L was felt and produced reports of 4 EMS from Aldebrő – Kerecsend – Tófalu.
Seismograms of the event are shown in Figure 4.11.

The intensity distribution of the event is shown in Table 4.6. and Figure 4.12.



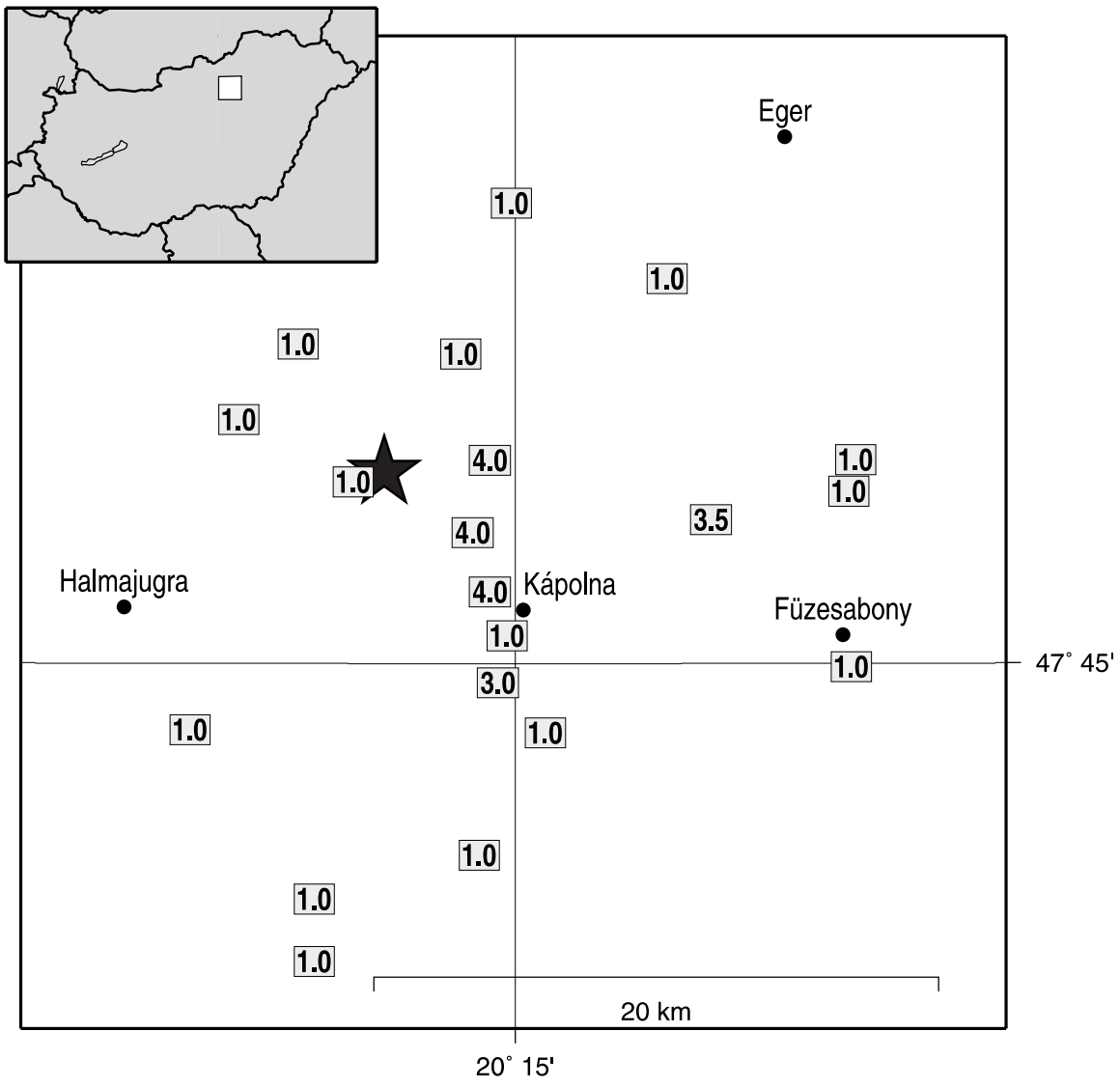
4.11. ábra A 2002. május 8-i tófalui földrengés (14:57:05 UTC) szeizmogramja

Figure 4.11. Seismograms of the Tófalu earthquake 8 May 2002, 14:57:05 UTC

4.6. Táblázat
A 2002. május 8-i, tófalui földrengés (14:57:05 UTC) intenzitás eloszlása

Table 4.6.
Intensity distribution of the Tófalu event 8th May 2002 (14:57:05 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	Aldebrő	47.792	20.230	4.0	38%	1
2	Domoszló	47.828	20.119	1.0	0%	2
3	Egerszalók	47.873	20.322	1.0	0%	1
4	Egerszólát	47.897	20.248	1.0	0%	1
5	Feldebrő	47.815	20.238	4.0	21%	2
6	Füzesabony	47.749	20.409	1.0	0%	1
7	Kál	47.728	20.264	1.0	0%	1
8	Kápolna	47.759	20.246	1.0	0%	1
9	Kerecsend	47.796	20.343	3.5	40%	2
10	Kisnána	47.852	20.147	1.0	0%	2
11	Kompolt	47.744	20.242	3.0	38%	1
12	Ludas	47.729	20.096	1.0	0%	1
13	Maklár	47.805	20.408	1.0	0%	1
14	Nagytálya	47.815	20.411	1.0	0%	1
15	Tarnabod	47.689	20.233	1.0	0%	1
16	Tarnaméra	47.655	20.155	1.0	0%	1
17	Tarnazsadány	47.675	20.155	1.0	0%	1
18	Tófalu	47.773	20.238	4.0	45%	1
19	Verpelét	47.849	20.224	1.0	0%	1
20	Vécs	47.808	20.173	1.0	0%	1



4.12. ábra A 2002. május 8-i tófalui földrengés (14:57:05 UTC) intenzitás eloszlása (a csillag a műszeresen meghatározott epicentrumot jelöli)

Figure 4.12. Intensity distribution of the Tófalu earthquake 8 May 2002, 14:57:05 UTC (star - instrumental epicentre)

2002. október 12. - Jászapáti / 12 October 2002 - Jászapáti

FÉSZEKPARAMÉTEREK / HYPOCENTER PARAMETERS

Dátum / Date:	2002/10/12
Kipattanási idő / Origin Time:	18:49:11.1 UTC
Szélesség és hosszúság / Latitude and Longitude:	47.543N 20.010E (S.D. 1.9 km)
Mélység / Depth:	14.6 km (S.D. 1 km)
Magnitúdó / Magnitude:	3.3 ML
Maximális intenzitás / Maximum Intensity:	4-5 EMS

LEÍRÁS

Októberben a Jászságban kétszer is éreztek földrengést. Először 12-én este Jászapáti környékén pattant ki egy M_L 3.3 magnitúdójú rengés, melynek intenzitása 4-5 EMS fokra becsülhető (Jászapáti – Jászjákóhalma – Alattyán). A rengés mintegy 600-800 km^2 területen volt érezhető Jászberénytől keleti irányban.

Az esemény szeizmogramja a 4.13. ábrán látható.

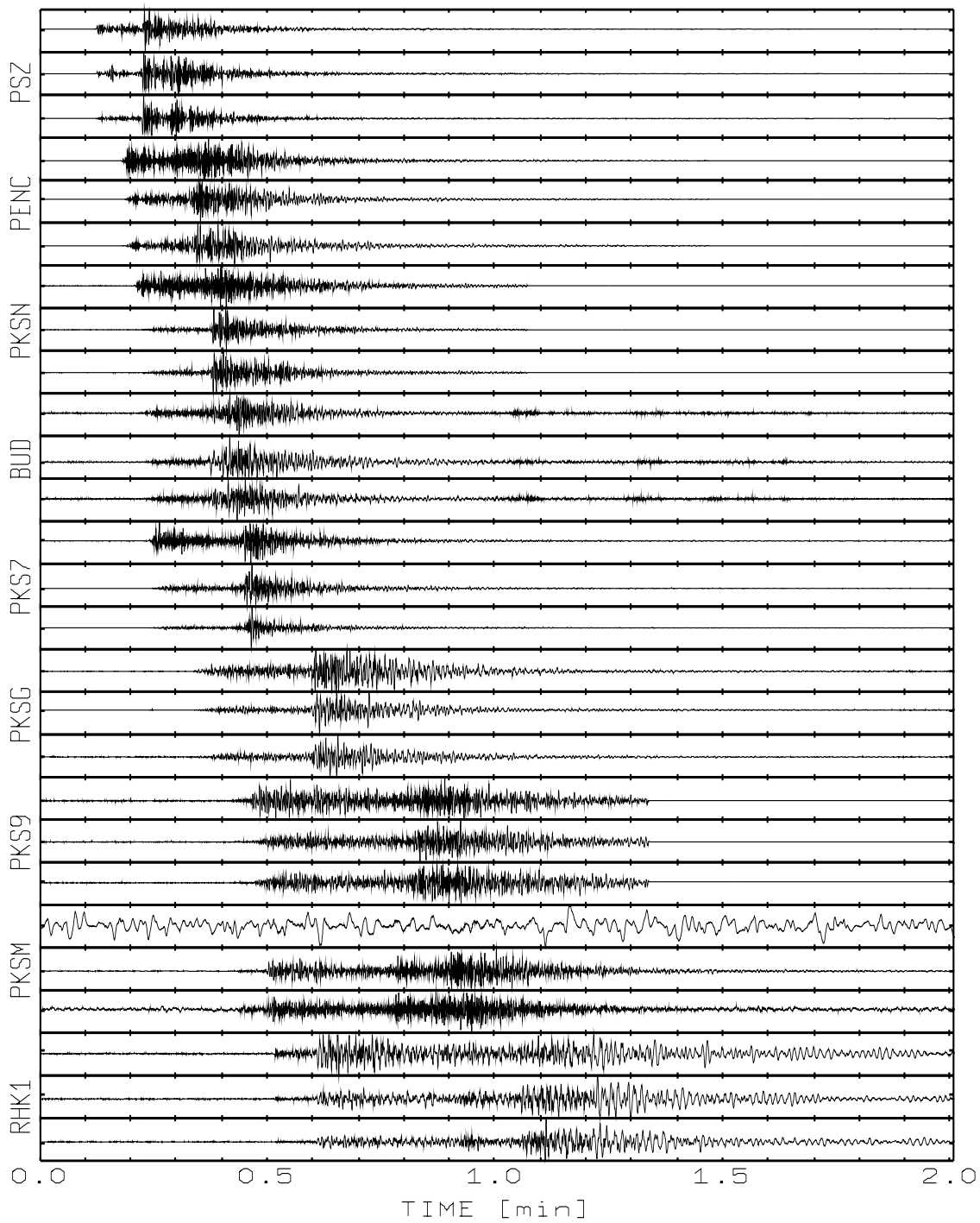
A rengés intenzitás eloszlását a 4.7. táblázat tartalmazza és a 4.14. ábra mutatja

DISCUSSION

Two earthquakes were felt in the Jászság region in October. The first shock of 3.3 M_L on 12th night was felt in an area of 600-800 km^2 and produced reports of 4-5 EMS from Jászapáti – Jászjákóhalma - Alattyán.

Seismograms of the event are shown in Figure 4.13.

The intensity distribution of the event is shown in Table 4.7. and Figure 4.14.



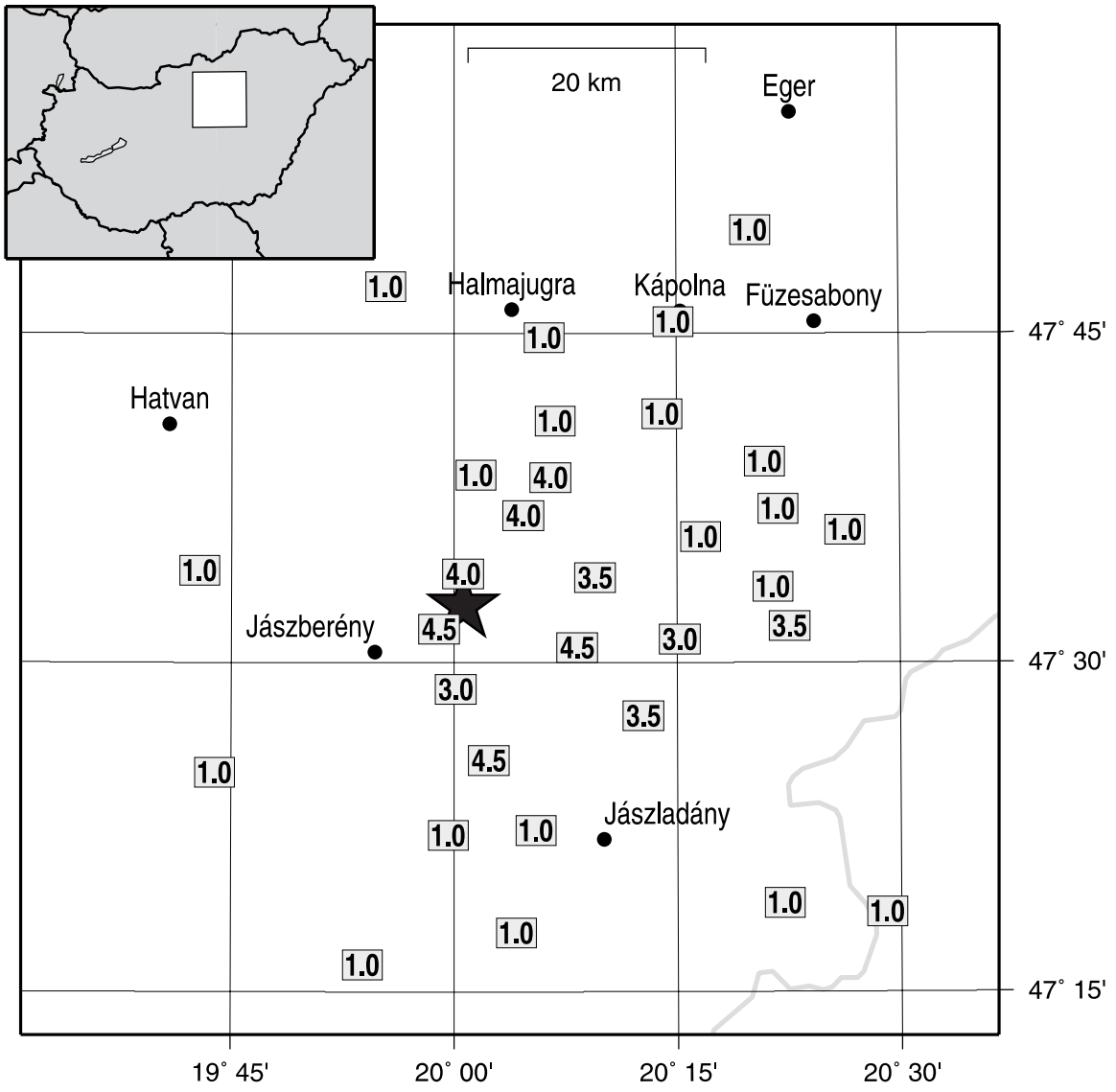
4.13. ábra A 2002. október 12-i jászapáti földrengés (18:49:11 UTC) szeizmogramja

Figure 4.13. Seismograms of the Jászapáti earthquake 12 October 2002, 18:49:11 UTC

4.7. Táblázat
A 2002. október 12-i, jászapáti földrengés (18:49:11 UTC) intenzitás eloszlása

Table 4.7.
Intensity distribution of the Jászapáti event 12th October 2002 (18:49:11 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	Alattyán	47.426	20.039	4.5	35%	1
2	Átány	47.617	20.363	1.0	0%	1
3	Demjén	47.829	20.333	1.0	0%	1
4	Detk	47.747	20.101	1.0	0%	1
5	Erk	47.612	20.078	4.0	36%	3
6	Gyöngyös	47.786	19.922	1.0	0%	2
7	Hunyadfalva	47.318	20.369	1.0	0%	1
8	Heves	47.596	20.276	1.0	0%	1
9	Hevesvezekény	47.558	20.357	1.0	0%	1
10	Jászalsószentgyörgy	47.373	20.091	1.0	0%	1
11	Jászapáti	47.512	20.138	4.5	33%	2
12	Jászboldogháza	47.369	19.993	1.0	0%	1
13	Jászdózsa	47.568	20.010	4.0	31%	2
14	Jászfényszaru	47.570	19.714	1.0	0%	2
15	Jászivány	47.518	20.253	3.0	26%	2
16	Jászjákóhalma	47.526	19.983	4.5	35%	2
17	Jászkisér	47.460	20.212	3.5	37%	1
18	Jászszentandrás	47.565	20.158	3.5	43%	1
19	Jásztelek	47.480	20.002	3.0	28%	2
20	Kápolna	47.759	20.246	1.0	0%	1
21	Kömlő	47.601	20.438	1.0	0%	1
22	Nagyfüged	47.684	20.113	1.0	0%	1
23	Nagykáta	47.417	19.731	1.0	0%	2
24	Tarnabod	47.689	20.233	1.0	0%	2
25	Tarnaszentmiklós	47.528	20.376	3.5	47%	2
26	Tenk	47.653	20.348	1.0	0%	2
27	Tiszabő	47.311	20.484	1.0	0%	2
28	Újszász	47.295	20.069	1.0	0%	1
29	Újszilvás	47.271	19.897	1.0	0%	2
30	Visznek	47.643	20.024	1.0	0%	1
31	Zaránk	47.641	20.108	4.0	33%	2



4.14. ábra A 2002. október 12-i jászapáti földrengés (18:49:11 UTC) intenzitás eloszlása (a csillag a műszeresen meghatározott epicentrumot jelöli)

Figure 4.14. Intensity distribution of the Jászapáti earthquake 12 October 2002, 18:49:11 UTC (star - instrumental epicentre)

2002. október 23. - Jászapáti / 23 October 2002 - Jászapáti

FÉSZEKPARAMÉTEREK / HYPOCENTER PARAMETERS

Dátum / Date:	2002/10/23
Kipattanási idő / Origin Time:	02:52:15.1 UTC
Szélesség és hosszúság / Latitude and Longitude:	47.545N 20.043E (S.D. 2.3 km)
Mélység / Depth:	14.3 km (S.D. 2 km)
Magnitúdó / Magnitude:	3.7 ML
Maximális intenzitás / Maximum Intensity:	5 EMS

LEÍRÁS

A második földrengés, melyet a Jászságban, októberben éreztek, az év legnagyobb magnitúdójú rengése volt. 23-án hajnalban M_L 3.7 magnitúdójú földrengés keletkezett, melynek epicentrális intenzitása 5 EMS körüli volt. Kisebb épületsérülést (vakolatrepedések) jelentettek néhány hagyományos épület esetében Jászapáti, Jászjákóhalma, Jászladány településekről. A rengés mintegy 800-1000 km^2 területen volt érezhető.

Az esemény szeizmogramja a 4.15. ábrán látható.

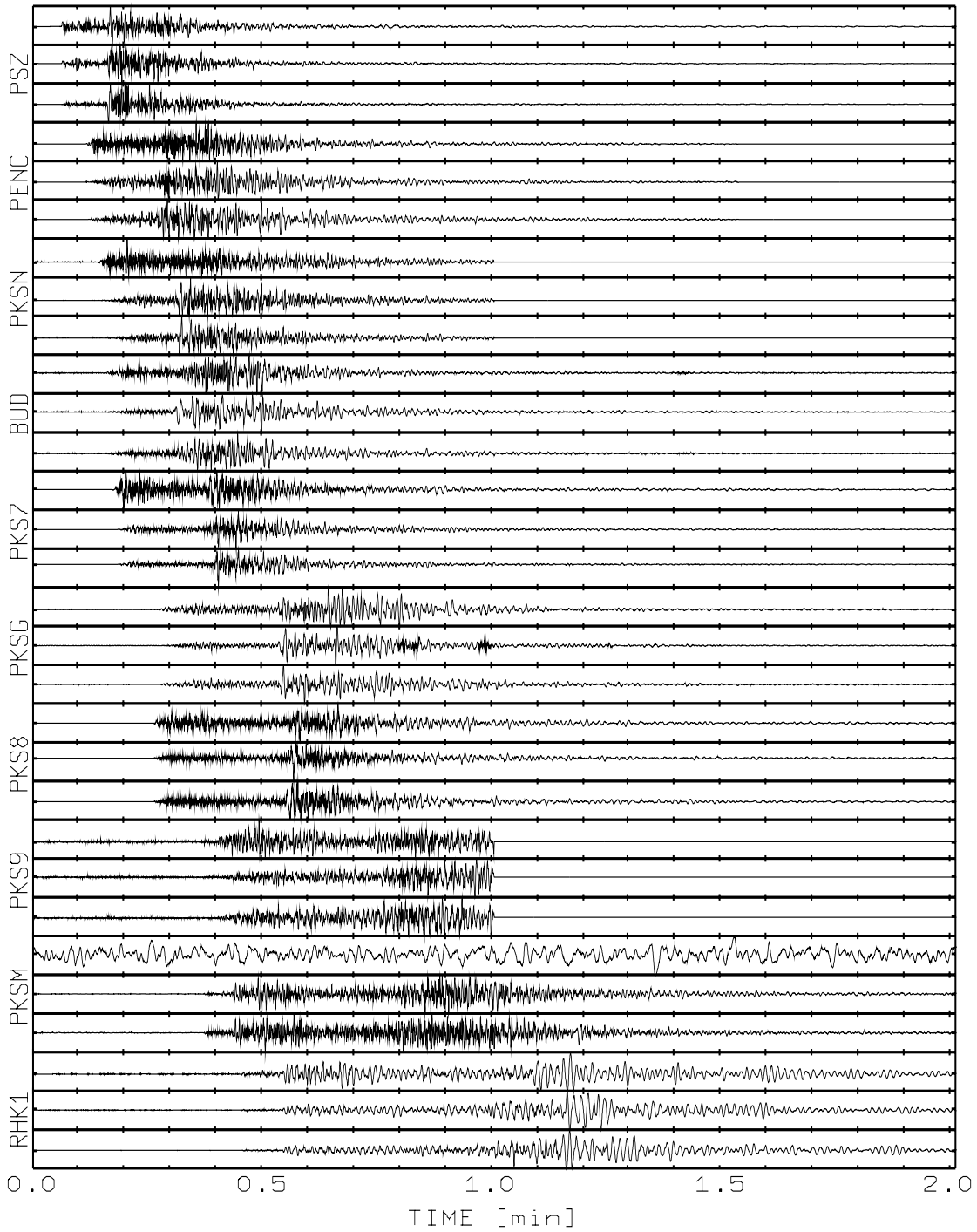
A rengés intenzitás eloszlását a 4.8. táblázat tartalmazza és a 4.16. ábra mutatja

DISCUSSION

The second earthquake felt in the Jászság region in October was the highest magnitude event during the year. The shock of 3.7 M_L in the night of 23rd was felt in an area of 800-1000 km^2 and produced reports of 5 EMS from the epicentral area. Slight damage to a few ordinary buildings (fine cracks in plaster) were reported from Jászapáti, Jászjákóhalma and Jászladány.

Seismograms of the event are shown in Figure 4.15.

The intensity distribution of the event is shown in Table 4.8. and Figure 4.16.



4.15. ábra A 2002. október 23-i jászapáti földrengés (02:52:15 UTC) szeizmogramja

Figure 4.15. Seismograms of the Jászapáti earthquake 23 October 2002, 02:52:15 UTC

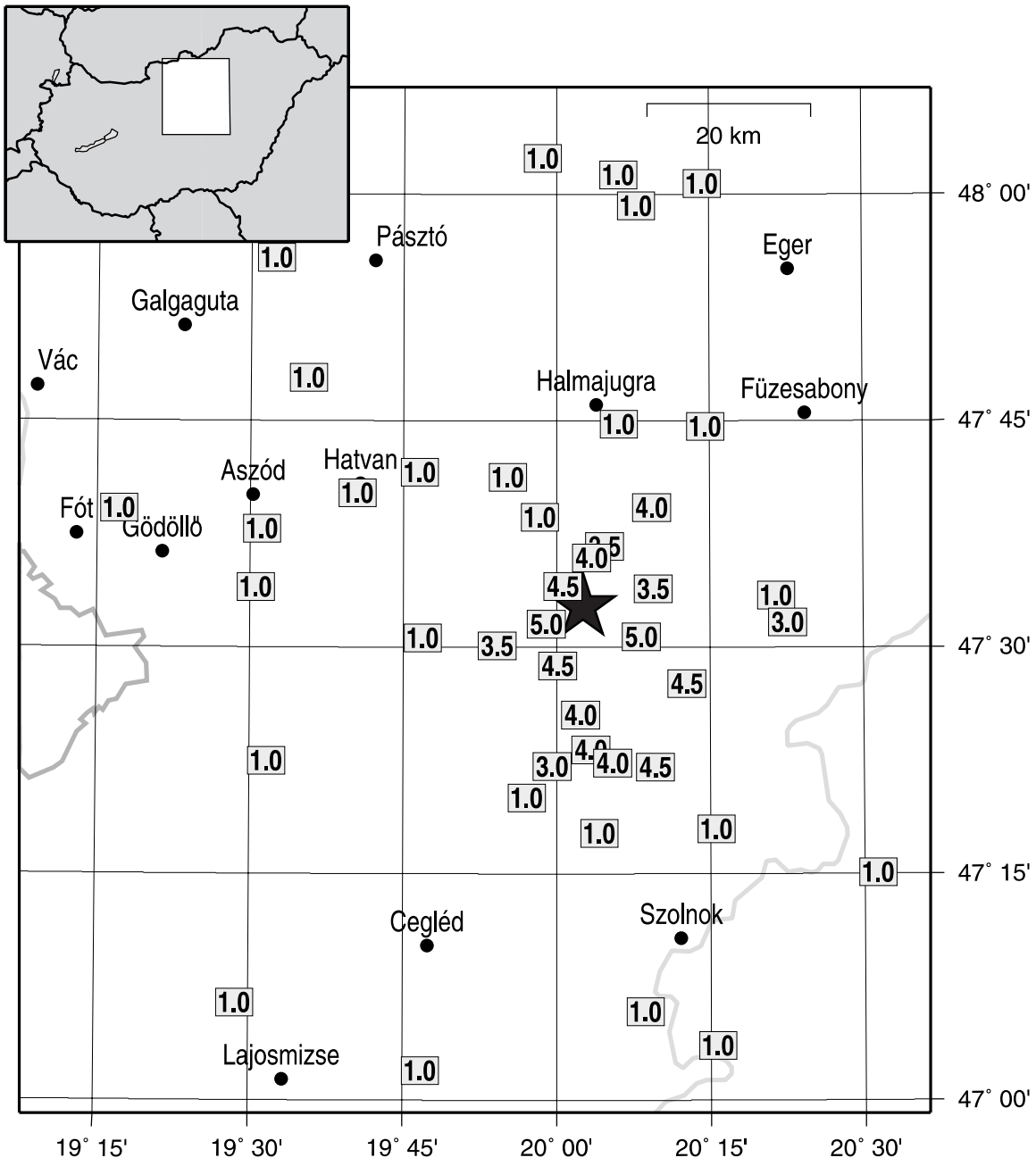
4.8. Táblázat

A 2002. október 23-i, jászapáti földrengés (02:52:15 UTC) intenzitás eloszlása

Table 4.8.

Intensity distribution of the Jászapáti event 23rd October 2002 (02:52:15 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	Alattyán	47.426	20.039	4.0	35%	2
2	Besenyszög	47.300	20.259	1.0	0%	2
3	Bokor	47.930	19.540	1.0	0%	1
4	Detk	47.747	20.101	1.0	0%	1
5	Erk	47.612	20.078	3.5	39%	2
6	Fegyvernek	47.252	20.521	1.0	0%	1
7	Gomba	47.375	19.527	1.0	0%	1
8	Hatvan	47.671	19.674	1.0	0%	2
9	Hevesaranyos	48.012	20.238	1.0	0%	2
10	Hevesvezekény	47.558	20.357	1.0	0%	1
11	Hévízgyörk	47.631	19.518	1.0	0%	2
12	Hort	47.694	19.776	1.0	0%	2
13	Jánoshida	47.387	20.056	4.0	35%	2
14	Jászalsószentgyörgy	47.373	20.091	4.0	33%	2
15	Jászapáti	47.512	20.138	5.0	43%	2
16	Jászárokszállás	47.644	19.972	1.0	0%	1
17	Jászberény	47.502	19.903	3.5	42%	1
18	Jászboldogháza	47.369	19.993	3.0	36%	1
19	Jászdózsa	47.568	20.010	4.5	34%	1
20	Jászfelsőszentgyörgy	47.511	19.781	1.0	0%	1
21	Jászjákóhalma	47.526	19.983	5.0	49%	2
22	Jászkisér	47.460	20.212	4.5	34%	2
23	Jászladány	47.368	20.161	4.5	50%	1
24	Jászszentandrás	47.565	20.158	3.5	35%	2
25	Jásztelek	47.480	20.002	4.5	34%	2
26	Kisfüzes	47.988	20.130	1.0	0%	1
27	Kompolt	47.744	20.242	1.0	0%	1
28	Mátranovák	48.040	19.977	1.0	0%	2
29	Nagykőrös	47.033	19.779	1.0	0%	2
30	Palotás	47.798	19.594	1.0	0%	2
31	Pétervására	48.022	20.101	1.0	0%	1
32	Rákócziújfalu	47.061	20.260	1.0	0%	2
33	Tarnaméra	47.655	20.155	4.0	31%	2
34	Tarnaőrs	47.599	20.057	4.0	27%	1
35	Tarnaszentmiklós	47.528	20.376	3.0	42%	2
36	Táborfalva	47.108	19.478	1.0	0%	2
37	Tápiógyörgye	47.334	19.951	1.0	0%	1
38	Tószeg	47.098	20.143	1.0	0%	2
39	Újszász	47.295	20.069	1.0	0%	2
40	Valkó	47.567	19.509	1.0	0%	1
41	Vámosgyörk	47.688	19.920	1.0	0%	2
42	Veresegyház	47.653	19.285	1.0	0%	1



4.16. ábra A 2002. október 23-i jászapáti földrengés (02:52:15 UTC) intenzitás eloszlása (a csillag a műszeresen meghatározott epicentrumot jelöli)

Figure 4.16. Intensity distribution of the Jászapáti earthquake 23 October 2002, 02:52:15 UTC (star - instrumental epicentre)

2002. december 25. - Jásztelek / 25 December 2002 - Jásztelek

FÉSZEKPARAMÉTEREK / HYPOCENTER PARAMETERS

Dátum / Date:	2002/12/25
Kipattanási idő / Origin Time:	21:58:23.0 UTC
Szélesség és hosszúság / Latitude and Longitude:	47.540N 20.002E (S.D. 2.7 km)
Mélység / Depth:	12.1 km (S.D. 2 km)
Magnitúdó / Magnitude:	2.6 ML
Maximális intenzitás / Maximum Intensity:	4-5 EMS

LEÍRÁS

December 25-én este újra megmozdult a föld Jásztelek – Jászjákóhalma környékén. 4-5 EMS intenzitású földrengés volt érezhető, melynek műszeresen mért magnitúdója M_L 2.6 volt.

Az esemény szeizmogramja a 4.17. ábrán látható.

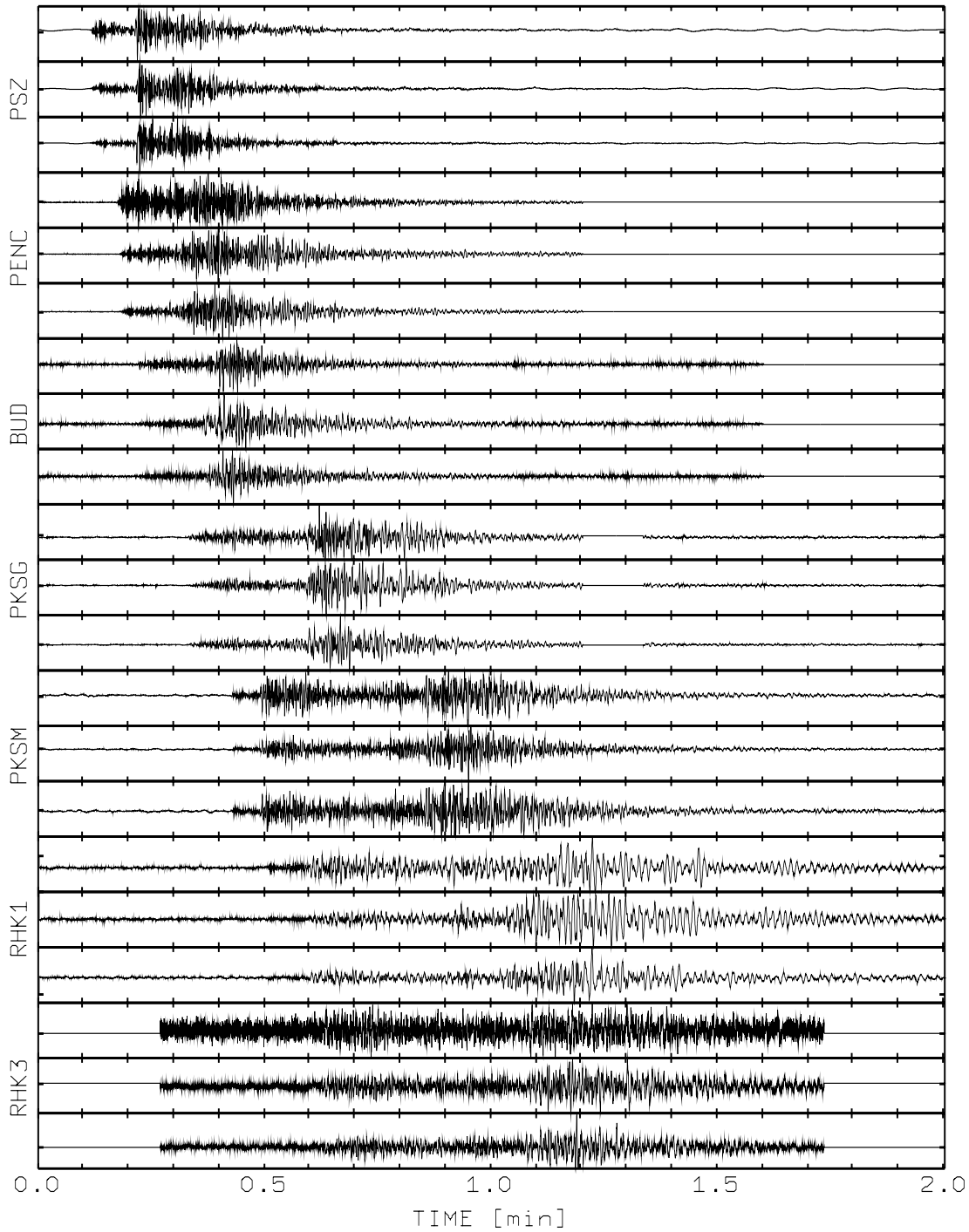
A rengés intenzitás eloszlását a 4.9. táblázat tartalmazza és a 4.18. ábra mutatja

DISCUSSION

The last felt earthquake in the year was in the Jászság region again. In the night of 25th of December, a magnitude 2.6 M_L event was felt with 4-5 EMS at Jásztelek, Jászjákóhalma, Alattyán.

Seismograms of the event are shown in Figure 4.17.

The intensity distribution of the event is shown in Table 4.9. and Figure 4.18.



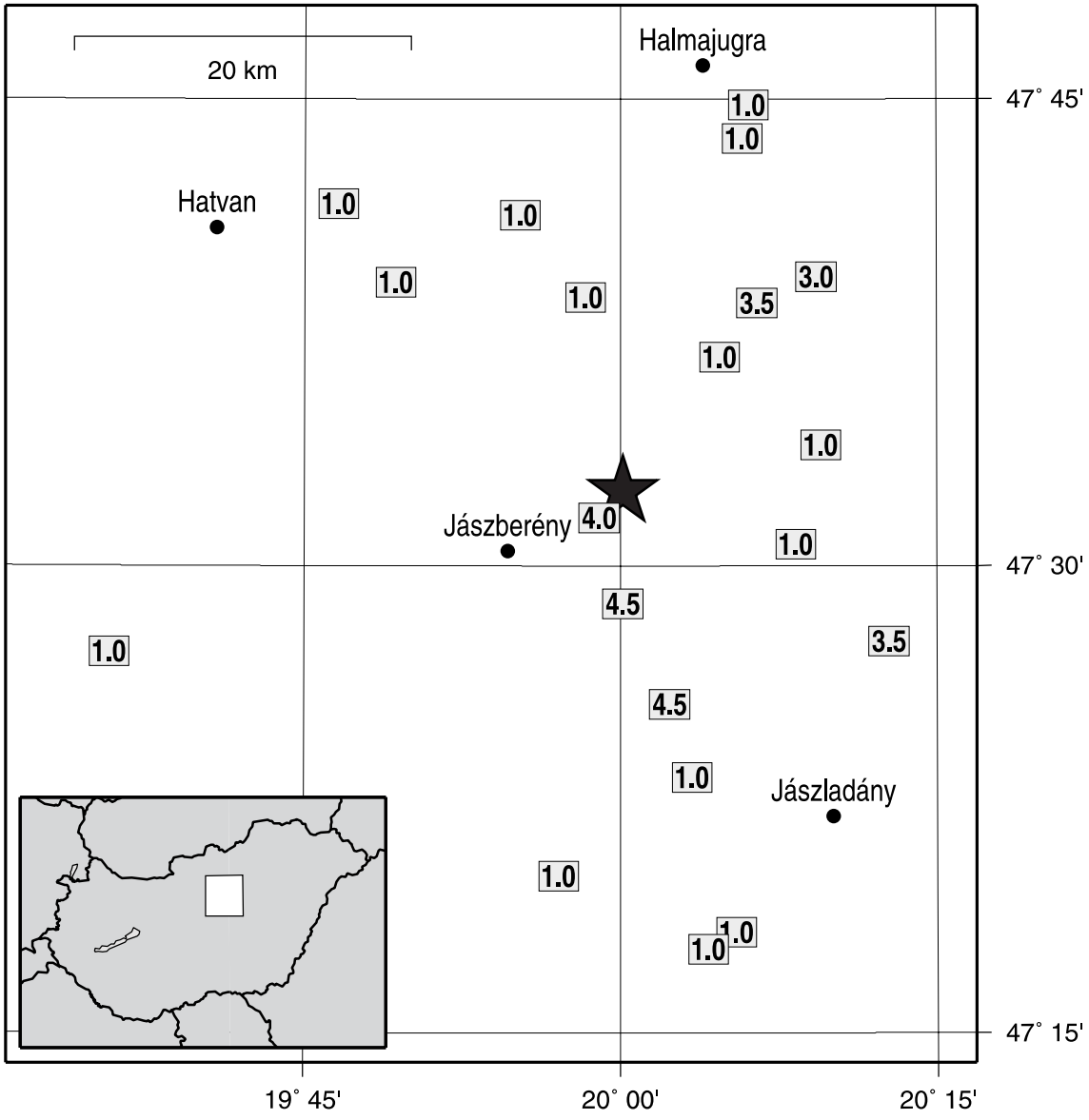
4.17. ábra A 2002. december 25-i jásztelki földrengés (21:58:23 UTC) szeizmogramja

Figure 4.17. Seismograms of the Jásztelek earthquake 25 December 2002, 21:58:23 UTC

4.9. Táblázat
A 2002. december 25-i, jásztelki földrengés (21:58:23 UTC) intenzitás eloszlása

Table 4.9.
Intensity distribution of the Jásztelek event 25th December 2002 (21:58:23 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	Alattyán	47.426	20.039	4.5	36%	1
2	Csány	47.652	19.822	1.0	0%	1
3	Detk	47.747	20.101	1.0	0%	1
4	Erk	47.612	20.078	1.0	0%	1
5	Hort	47.694	19.776	1.0	0%	1
6	Jánoshida	47.387	20.056	1.0	0%	1
7	Jászapáti	47.512	20.138	1.0	0%	2
8	Jászárokszállás	47.644	19.972	1.0	0%	1
9	Jászjákóhalma	47.526	19.983	4.0	46%	2
10	Jászkisér	47.460	20.212	3.5	27%	2
11	Jászszentandrás	47.565	20.158	1.0	0%	1
12	Jásztelek	47.480	20.002	4.5	33%	1
13	Ludas	47.729	20.096	1.0	0%	1
14	Szászberek	47.304	20.091	1.0	0%	1
15	Tarnaméra	47.655	20.155	3.0	33%	2
16	Tápiógyörgye	47.334	19.951	1.0	0%	2
17	Tápiószecső	47.454	19.596	1.0	0%	1
18	Újszász	47.295	20.069	1.0	0%	2
19	Vámosgyörk	47.688	19.920	1.0	0%	1
20	Zaránk	47.641	20.108	3.5	40%	2



4.18. ábra A 2002. december 25-i jászteleki földrengés (21:58:23 UTC) intenzitás eloszlása (a csillag a műszeresen meghatározott epicentrumot jelöli)

Figure 4.18. Intensity distribution of the Jásztelek earthquake 25 December 2002, 21:58:23 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

2002

Forrás:

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

APPENDIX B

SIGNIFICANT EARTHQUAKES OF THE WORLD

2002

Source:

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

Halálos áldozatot követelő földrengések a világon 2002-ben

Deaths from Earthquakes in 2002

Dátum Date	Ország, terület Region	Magnitúdó Magnitude	Áldozatok száma Number killed
2002/01/09	Tajikistan	5.2	3
2002/01/10	Near N Coast of New Guinea	6.7	1
2002/01/20	Democratic Republic of the Congo	4.7	7
2002/01/22	Crete, Greece	6.3	1
2002/02/03	Turkey	6.5	44
2002/02/17	Southern Iran	5.4	1
2002/03/03	Hindu Kush Region, Afghanistan	7.4	166
2002/03/05	Mindanao, Philippines	7.5	15
2002/03/25	Hindu Kush Region, Afghanistan	6.1	1000
2002/03/31	Taiwan Region	7.1	5
2002/04/01	Eastern New Guinea Region,	5.9	36
2002/04/12	Hindu Kush Region, Afghanistan	5.9	50
2002/04/22	Near Coast of Peru	4.4	1
2002/04/24	Northwestern Balkan Region	5.7	1
2002/04/24	Western Iran	4.9	2
2002/04/25	Northwestern Caucasus	4.7	5
2002/05/15	Taiwan	6.2	1
2002/05/18	Lake Victoria Region	5.5	2
2002/06/22	Western Iran	6.5	261
2002/09/06	Sicily, Italy	5.9	2
2002/09/08	Near North Coast of New Guinea,	7.6	4
2002/09/13	Andaman Islands, India Region	6.5	2
2002/10/10	Irian Jaya Region, Indonesia	7.6	8
2002/10/24	Democratic Republic of Congo	6.2	2
2002/10/31	Southern Italy	5.9	29
2002/11/01	Northwestern Kashmir	5.4	17
2002/11/02	Northern Sumatra Indonesia	7.4	3
2002/11/20	Northwestern Kashmir	6.4	30
	Összesen / Total		1699

A 7.0 vagy annál nagyobb magnitúdójú földrengések a világon 2002-ben

Earthquakes of magnitude 7.0 and greater in 2002

	Év Year	Hónap Month	Nap Day	Idő Time (UTC)	Szélesség Latitude	Hosszúság Longitude	Mélység Depth (km)	Magnitúdó Magnitude	Ország, terület Region
1	2002	1	2	17:22	17.600S	167.856E	21	7.3	Vanuatu Islands
2	2002	3	3	12:08	36.502N	70.482E	226	7.4	Hindu Kush Region, Afghanistan
3	2002	3	5	21:16	6.033N	124.249E	31	7.5	Mindanao, Philippines
4	2002	3	31	06:52	24.279N	122.179E	33	7.1	Taiwan Region
5	2002	4	26	16:06	13.088N	144.619E	86	7.1	Mariana Islands
6	2002	6	28	17:19	43.752N	130.666E	566	7.3	E. Russia - N.E. China Border Region
7	2002	8	19	11:01	21.696S	179.513W	580	7.6	Fiji Islands Region
8	2002	8	19	11:08	23.884S	178.495E	675	7.7	South of Fiji Islands
9	2002	9	8	18:44	3.271S	142.855E	13	7.6	Near North Coast of New Guinea, PNG
10	2002	10	10	10:50	1.681S	134.157E	10	7.6	Irian Jaya Region, Indonesia
11	2002	11	2	01:26	3.024N	96.181E	33	7.4	Northern Sumatra, Indonesia
12	2002	11	3	22:12	63.743N	147.687W	10	7.9	Central Alaska
13	2002	11	17	04:53	47.98N	146.29E	507	7.3	Northwest of Kuril Islands

A 6.5 vagy annál nagyobb magnitúdójú, és a jelentősebb károkat okozó földrengések a világon 2002-ben

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

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 02	17 22 48.7	17.600 S	167.856 E	21 G	7.3	0.9	427	VANUATU ISLANDS. MW 7.3 (HRV), 7.1 (GS). mb 6.3 (GS). MS 7.5 (GS). ME 7.3 (GS). Mo 8.7*10**19 Nm (HRV), 5.5*10**19 Nm (GS), 1.4*10**20 Nm (PPT). Es 1.7*10**15 Nm (GS). Several people injured, two bridges destroyed and buildings and roads damaged on Efate. Rockslides blocked access to the wharf at Port Vila. A local tsunami with wave heights of 40 cm (peak-to-trough) observed at Port Vila.
JAN 03	07 05 27.6	36.088 N	70.687 E	129 D	6.2	0.9	431	HINDU KUSH REGION, AFGHANISTAN. MW 6.2 (GS), 6.1 (HRV). mb 5.8 (GS). ME 6.0 (GS). Mo 1.9*10**18 Nm (GS), 1.6*10**18 Nm (HRV). Es 2.5*10**13 Nm (GS). At least one person injured and felt strongly in the Mazar-e Sharif-Kabul area. Also felt in Tajikstan, northern Pakistan and northwestern India.
JAN 03	10 17 36.3	17.664 S	168.004 E	10 G	6.7	1.1	386	VANUATU ISLANDS. MW 6.7 (HRV), 6.4 (GS). mb 5.8 (GS). MS 6.4 (GS). Mo 5.2*10**18 Nm (GS), 1.1*10**19 Nm (HRV). Felt on Efate.
JAN 09	06 45 57.5	38.673 N	69.902 E	33 N	5.2	0.8	240	TAJIKISTAN. mb 5.2 (GS). MS 5.2 (GS). At least 3 people killed, 50 injured and 200 houses, 5 schools and 4 hospitals damaged in the Roghun area.
JAN 10	11 14 56.9	3.212 S	142.427 E	11 G	6.7	1.2	333	NEAR N COAST OF NEW GUINEA, PNG. MW 6.7 (HRV), 6.6 (GS). mb 6.0 (GS). MS 6.6 (GS). ME 6.4 (GS). Mo 1.3*10**19 Nm (HRV), 1.0*10**19 Nm (GS), 1.7*10**19 Nm (PPT). Es 9.0*10**13 Nm (GS). One person killed; 200 houses and 250 water tanks destroyed in the Aitape area.
JAN 17	20 01 29.2	1.684 S	29.077 E	15 D	4.7	0.9	40	LAKE TANGANYIKA REGION. mb 4.7 (GS). mbLg 4.9 (GS). Several people killed and at least 307 buildings destroyed in the Gisenyi area, Rwanda. Felt at Kimironko, Rwanda. This is one of the largest of a series of earthquakes associated with the eruption of Volcan Nyiragongo, Congo. Lava flows from this eruption killed at least 45 people, destroyed parts of 14 villages and caused damage to about one-half of the city of Goma, Congo. The series of earthquakes has caused subsidence of about 70 cm at Bukavu, 50 cm at Goma and 50 cm on Idjwi, Congo.
JAN 19	17 09 29.1*	1.931 S	29.579 E	10 G	4.6	1.3	35	LAKE TANGANYIKA REGION. mb 4.6 (GS). mbLg 4.7 (GS). Casualties and damage are included with the event of January 17 at 20:01 UTC.
JAN 20	00 14 44.3	1.681 S	28.981 E	10 G	4.9	1.0	77	DEMOCRATIC REPUBLIC OF CONGO. mb 4.9 (GS). MS 4.6 (GS). mbLg 5.2 (GS). Casualties and damage are included with the event of January 17 at 20:01 UTC. Felt strongly at Kimironko; felt at Ruhengeri, Rwanda. Also felt at Bukavu and Goma, Congo.
JAN 21	01 19 32.6*	1.726 S	28.854 E	10 G	4.6	1.3	40	DEMOCRATIC REPUBLIC OF CONGO. mb 4.6 (GS). mbLg 4.9 (GS). Casualties and damage are included with the event of January 17 at 20:01 UTC.
JAN 21	04 39 21.6	1.776 S	29.041 E	10 G	4.9	1.0	97	LAKE TANGANYIKA REGION. mb 4.9 (GS). MS 4.5 (GS). mbLg 5.1 (GS). Casualties and damage are included with the event of January 17 at 20:01 UTC. Felt at Kimironko, Rwanda.
JAN 21	10 55 03.7	1.903 S	29.117 E	10 G	4.7	1.0	36	LAKE TANGANYIKA REGION. mb 4.7 (GS). mbLg 5.1 (GS). Casualties and damage are included with the event of January 17 at 20:01 UTC.
JAN 22	04 53 52.6	35.790 N	26.617 E	88 G	6.3	0.9	390	CRETE, GREECE. MW 6.3 (GS), 6.2 (HRV). mb 6.2 (GS). ME 6.0 (GS).

										Mo 2.7*10**18 Nm (GS), 2.0*10**18 Nm (HRV). Es 2.5*10**13 Nm (GS). One person reportedly died from a heart attack at Antalya, Turkey. Felt strongly in southwestern Turkey and in eastern Greece. Felt (III) throughout Cyprus. Also felt in southern Greece, in the Cairo, Egypt area, in northern Israel and in parts of Lebanon.
JAN	22	15 32 05.5	1.515 S	28.993 E	10 G	4.9	1.0	58	DEMOCRATIC REPUBLIC OF CONGO. mb 4.9 (GS). MS 4.7 (GS). mbLg 5.2 (GS). Casualties and damage are included with the event of January 17 at 20:01 UTC. Felt at Kimironko, Rwanda.
FEB	03	07 11 28.4&	38.573 N	31.271 E	5	6.5		482	TURKEY. <ISK>. MW 6.5 (HRV), 6.2 (GS), 6.0 (CSEM). mb 5.7 (GS). MS 6.4 (GS). ML 6.0 (ISK), 5.7 (THE). Mo 5.9*10**18 Nm (HRV), 2.4*10**18 Nm (GS), 1.1*10**18 Nm (CSEM). At least 44 people killed, 318 injured and 622 buildings damaged in Afyon Province. Felt in much of west-central Turkey. Also felt in the Dodecanese Islands, Greece. Maximum acceleration of 0.113 g was recorded at Afyon. Preliminary reports indicate 30 km of surface faulting with vertical offset in the Cay-Sultandagi area. Two new hot springs formed in the area and others changed their flow rates. Most of this information was obtained from reports on the websites of Bogazici University, Turkey and GeoForschungZentrum Potsdam, Germany.
FEB	03	20 59 27.6	38.773 N	69.924 E	44 *	4.9	1.0	147	TAJIKISTAN. mb 4.9 (GS). Several people injured and several buildings damaged in the Roghun area.
FEB	05	13 27 24.6	5.345 S	151.248 E	39 G	6.6	0.9	444	NEW BRITAIN REGION, P.N.G. MW 6.6 (GS), 6.6 (HRV). mb 5.8 (GS). MS 6.3 (GS). ME 6.2 (GS). Mo 8.4*10**18 Nm (GS), 8.2*10**18 Nm (HRV), 9.7*10**18 Nm (PPT). Es 4.4*10**13 Nm (GS).
FEB	17	13 03 52.7	28.093 N	51.755 E	33 N	5.4	1.1	343	SOUTHERN IRAN. MW 5.4 (GS), 5.3 (HRV). mb 5.6 (GS). MS 5.0 (GS). Mo 9.9*10**16 Nm (HRV), 1.6*10**17 Nm (GS). One person killed, 30 injured and 80 percent of houses damaged at Baghan.
FEB	20	11 27 43.6&	51.561 N	16.082 E	1	4.9		158	POLAND. <WAR>. mb 4.9 (GS). ML 5.0 (STR), 4.9 (GRF), 4.6 (VIE). Mining induced event. At least 3 people injured, equipment damaged and several tunnels collapsed in the Rudna mine. Also minor damage to buildings at Polkowice.
MAR	03	12 08 19.7	36.502 N	70.482 E	226 D	7.4	1.1	138	HINDU KUSH REGION, AFGHANISTAN. MW 7.4 (HRV), 7.3 (GS). mb 6.6 (GS). ME 7.3 (GS). Mo 1.2*10**20 Nm (HRV), 1.1*10**20 Nm (GS). Es 2.3*10**15 Nm (GS). At least 150 people killed, several injured and 400 houses damaged or destroyed by a landslide that dammed and flooded Surkundara Valley, Samanghan Province. At least 13 people killed at Kabul and Rustaq and 3 people killed at Bajaua, Pakistan. At least 300 houses destroyed in Badakhshan and Takhar Provinces. A 50 yard wide fissure opened in Xiker Reservoir in Xinjiang Province, China. Felt in much of Afghanistan and Pakistan. Also felt in India, Kazakhstan, Kyrgyzstan, Tajikistan, Uzbekistan and Xinjiang, China.
MAR	05	21 16 09.1	6.033 N	124.249 E	31 G	7.5	0.9	321	MINDANAO, PHILIPPINES. MW 7.5 (HRV), 7.2 (GS). mb 6.3 (GS). MS 7.2 (GS). ME 7.2 (GS). Mo 8.1*10**19 Nm (GS), 2.0*10**20 Nm (HRV). Es 1.2*10**15 Nm (GS). At least 15 people killed, more than 100 injured and many buildings damaged or destroyed in southern and central Mindanao. In South Cotabato Province landslides breached the crater wall of Mount Parker volcano and fell into Lake Maughan, creating a flood which washed away houses and flooded 9 sub-districts in the province. Local tsunamis with heights estimated at 3 meters caused damage at Kiamba, Maitum and Palimbang.
MAR	25	14 56 33.8	36.062 N	69.315 E	8 G	6.1	1.1	416	HINDU KUSH REGION, AFGHANISTAN. MW 6.1 (HRV), 6.0 (GS). mb 5.9 (GS). MS 6.2 (GS). ME 6.0 (GS). Mo 1.5*10**18 Nm (HRV), 1.2*10**18 Nm (GS). Es 1.9*10**13 Nm (GS). At least 1,000 people killed, several hundred injured and several thousand homeless in Baghlan Province. At least 1,500 houses destroyed or damaged at Nahrin and several hundred more in other areas of Baghlan Province. Landslides blocked many roads in the epicentral area. Felt strongly in much of northern Afghanistan. Also felt in the Islamabad-Peshawar area, Pakistan and at Dushanbe, Tajikistan.
MAR	27	08 52 52.2	36.023 N	69.338 E	10 G	5.6	0.9	433	HINDU KUSH REGION, AFGHANISTAN. MW 5.6 (GS), 5.6 (HRV). mb 5.9 (GS). MS 5.4 (GS). Mo 2.5*10**17 Nm (GS), 2.4*10**17 Nm (HRV). Casualties are included with the event of March 25 at 14:56 UTC.

Additional landslides and damage in the epicentral area. Felt in the Islamabad-Peshawar area, Pakistan.

MAR 28 04 56 22.4 21.663 S 68.329 W 125 D 6.5 1.0 486 CHILE-BOLIVIA BORDER REGION. MW 6.5 (GS), 6.5 (HRV). mb 6.1 (GS). Mo 7.0*10**18 Nm (GS), 6.1*10**18 Nm (HRV). Landslides blocked roads and power outages occurred at Pica, Chile. Felt (V) at Calama, Camina, Chuquicamata, Guatacondo, Huara, Huatacondo, La Tirana, Mamina, Oficina Pedro de Valdivia, Pica, Pozo Almonte, Tarapaca and Tocopilla; (IV) at Azapa, Camar, Camarones, Cuya and Iquique; (III) at Antofagasta, Arica and Putre, Chile. Felt (III) at Arequipa, Peru. Also felt in parts of southwestern Bolivia.

MAR 31 06 52 50.4 24.279 N 122.179 E 33 7.1 1.0 550 TAIWAN REGION. MW 7.1 (GS), 7.1 (HRV). mb 6.4 (GS). MS 7.4 (GS). ME 7.0 (GS). ML 6.8 (TAP). Mo 5.5*10**19 Nm (GS), 4.8*10**19 Nm (HRV). Es 6.4*10**14 Nm (GS). At least 5 people killed, 200 injured, 3 buildings collapsed and 100 houses destroyed in the T'ai-pei area. Water and gas lines were broken and some bridges were damaged. Landslides blocked highways in eastern Taiwan. Felt throughout Taiwan. A tsunami of 20 cm (peak-to-trough) occurred on Yonaguni-jima, Ryukyu Islands. Recorded (6 TAP) in I-lan; (5 TAP) in Hua-lien and Miao-li; (4 TAP) in Hsin-chu, Nan-tou, T'ai-chung, T'ai-pei, T'ao-yuan and Yun-lin; (3 TAP) in Chia-i and T'ai-tung; (2 TAP) in T'ai-nan Counties. Also recorded (5 TAP) at T'ai-pei and I-lan. Recorded (3 JMA) on Yonaguni-jima; (2 JMA) on Iriomote-jima and Ishigaki-jima; (1 JMA) on Miyako-jima, Ryukyu Islands.

APR 01 06 14 15.2 6.191 S 147.421 E 81 D 5.0 1.0 122 EASTERN NEW GUINEA REG., P.N.G. mb 5.0 (GS). Thirty-six people presumed killed by a landslide in Morobe Province.

APR 12 04 00 23.7 35.959 N 69.417 E 10 G 5.9 1.3 361 HINDU KUSH REGION, AFGHANISTAN. MW 5.9 (HRV), 5.7 (GS). mb 5.8 (GS). MS 5.9 (GS). Mo 7.2*10**17 Nm (HRV), 4.4*10**17 Nm (GS). At least 50 people killed, 150 injured and buildings extensively damaged in the Do Abi-Nahrin area. Landslides blocked a road to Nahrin. Felt at Kabul. Also felt at Peshawar, Pakistan and Dushanbe, Tajikistan.

APR 18 16 08 36.7 27.535 S 70.586 W 62 D 6.7 1.1 462 NEAR COAST OF NORTHERN CHILE. MW 6.7 (GS), 6.6 (HRV). mb 6.2 (GS). Mo 9.4*10**18 Nm (HRV), 1.2*10**19 Nm (GS). Damage (VII) at Copiapo and three houses damaged at Taltal. Felt (VI) at Chanaral and Vallenar; (V) at Alto del Carmen, Caldera, Diego del Almagro, Huasco and Mejillones; (IV) at Antofagasta, Calama, La Serena, Oficina Maria Elena, Ovalle and San Pedro de Atacama; (III) at Quillota, San Antonio, Santiago and Valparaiso; (II) at Rancagua and Talca.

APR 22 04 57 02.4* 12.386 S 76.518 W 67 * 4.4 1.3 27 NEAR COAST OF PERU. mb 4.4 (GS). Felt (IV) at Chilca and (III) at Lima. This earthquake caused panic in parts of Lima, where a girl died of a heart attack.

APR 24 10 51 50.9 42.436 N 21.466 E 10 G 5.7 1.1 522 NORTHWESTERN BALKAN REGION. MW 5.7 (HRV), 5.6 (GS). mb 5.6 (GS). MS 5.6 (GS). ML 5.5 (ATH), 5.4 (THE), 5.3 (PDG), 5.3 (ROM), 5.2 (SKO). Mo 4.4*10**17 Nm (HRV), 3.2*10**17 Nm (GS). One person killed and at least 60 injured in Kosovo, Yugoslavia. Minor damage in southern Yugoslavia and the northern part of the former Yugoslav Republic of Macedonia. Power outages and broken gas lines at Gnjilane, Yugoslavia. Felt (VII) at Kumanovo and Skopje; (V) at Kocani, Stip, Tetovo and Veles; (III) at Bitola, Gostivar, Kavadarci, Ohrid, Prilep, Radovis and Strumica, former Yugoslav Republic of Macedonia. Felt throughout Yugoslavia and at Sofia, Bulgaria.

APR 24 19 48 07.1 34.642 N 47.400 E 33 N 5.2 1.1 261 WESTERN IRAN. mb 5.2 (GS). MS 5.2 (GS). At least 2 people killed, 56 injured, 10 villages destroyed and 50 villages considerably damaged in Kermanshah Province. Felt at Heris, Kangavar, Qoreh and Sahneh.

APR 25 17 41 21.5 41.765 N 44.960 E 10 G 4.8 1.1 72 NORTHWESTERN CAUCASUS. mb 4.8 (GS). MS 4.3 (GS). At least 5 people killed, 52 injured and 2,400 buildings damaged or destroyed (VII) at Tbilisi. Power and telephone outages occurred and landslides partially blocked roads at Tbilisi.

APR 26 16 06 07.0 13.088 N 144.619 E 86 7.1 1.0 257 MARIANA ISLANDS. MW 7.1 (GS), 7.1 (HRV). mb 6.5 (GS). ME 6.9 (GS). Mo 5.2*10**19 Nm (GS), 4.6*10**19 Nm (HRV), 3.9*10**19 Nm (PPT). Es 4.9*10**14 Nm (GS). At least 5 people slightly injured and some minor damage (VII) to buildings on Guam. Water and sewer

lines broke and power outages occurred throughout the island. Felt strongly on Guam. Also felt on Saipan.

MAY 15 03 46 05.7 24.636 N 121.922 E 10 G 6.2 1.0 335 TAIWAN. MW 6.2 (GS), 6.2 (HRV). mb 5.5 (GS). MS 6.2 (GS). ML 6.2 (TAP). Mo 2.2*10**18 Nm (GS), 2.0*10**18 Nm (HRV). One person killed, one injured and 2 houses damaged at Tung-shan. Felt in northern Taiwan. Also felt in Fujian and Zhejiang Provinces. Landslides occurred on Kuei-shan Tao. Recorded (5 TAP) in I-lan; (4 TAP) in Hua-lien and T'ai-pei; (3 TAP) in Hsin-chu, Miao-li, Nan-t'ou, T'ai-chung and T'ao-yuan; (2 TAP) in Chang-hua, Chia-i and Yun-lin Counties. Recorded (3 JMA) on Yonaguni-jima, (2 JMA) on Iriomote-jima and (1 JMA) on Ishigaki-jima, Ryukyu Islands.

MAY 18 15 15 08.8 2.907 S 33.733 E 10 G 5.5 0.9 172 LAKE VICTORIA REGION. mb 5.2 (GS). MS 5.5 (GS). Two people killed, at least 690 huts collapsed and 700 damaged and more than 400 families homeless in the Bunda area, Tanzania. Felt in the Nairobi-Nakuru-Kericho area, Kenya.

MAY 24 20 42 26.7 44.761 N 21.611 E 10 G 4.7 1.2 227 NORTHWESTERN BALKAN REGION. mb 4.7 (GS). Five people slightly injured and some buildings damaged in southwestern Romania.

MAY 25 05 36 31.9 53.815 N 161.116 W 33 6.5 1.3 307 SOUTH OF ALASKA. MW 6.5 (HRV), 6.4 (GS). mb 5.5 (GS). MS 6.1 (GS). ML 5.9 (PMR). Mo 5.5*10**18 Nm (HRV), 4.4*10**18 Nm (GS).

MAY 28 04 04 22.5 28.937 S 66.797 W 22 D 6.0 1.0 354 CATAMARCA PROVINCE, ARGENTINA. MW 6.0 (HRV), 5.9 (GS). mb 6.0 (GS). MS 5.7 (GS). ML 5.6 (GUC). Mo 9.4*10**17 Nm (GS), 1.0*10**18 Nm (HRV). Twenty-seven people injured and at least 40 houses destroyed at Aminga, Anillaco, Agua Blanca and Chuquis. Fifty percent of houses damaged in Castro Barros Department. Landslides occurred in the epicentral area. Felt strongly in Catamarca, Cordoba, La Rioja, San Juan, Santiago del Estero and Tucuman Provinces.

JUN 13 01 27 19.4 47.801 S 99.751 E 10 G 6.6 1.1 153 SOUTHEAST INDIAN RIDGE. MW 6.6 (HRV), 6.5 (GS). mb 5.5 (GS). MS 6.6 (GS). Mo 8.1*10**18 Nm (HRV), 6.6*10**18 Nm (GS).

JUN 14 02 42 47.2 36.222 N 139.850 E 52 D 4.9 0.9 205 EASTERN HONSHU, JAPAN. mb 4.9 (GS). One person injured at Toride. Felt in the Tokyo area. Bullet train service temporarily interrupted on several lines. Recorded (4 JMA) Chiba, Ibaraki and Saitama; (3 JMA) in Gumma, Kanagawa, Tochigi and Tokyo; (2 JMA) in Fukushima and Shizuoka; (1 JMA) in Miyagi, Nagano, Niigata and Yamanashi Prefectures. Also recorded (1 JMA) on Miyake-jima and O-shima.

JUN 17 21 26 22.9 12.592 S 166.383 E 33 N 6.7 1.1 272 SANTA CRUZ ISLANDS. MW 6.7 (HRV), 6.6 (GS). mb 6.0 (GS). MS 6.7 (GS). ME 6.3 (GS). Mo 1.3*10**19 Nm (HRV), 1.0*10**19 Nm (GS), 2.2*10**19 Nm (PPT). Es 5.9*10**13 Nm (GS).

JUN 18 13 56 22.8 30.805 S 71.124 W 54 G 6.6 1.0 420 NEAR COAST OF CENTRAL CHILE. MW 6.6 (GS), 6.4 (HRV). mb 6.0 (GS). ME 6.3 (GS). Mo 8.5*10**18 Nm (GS), 5.3*10**18 Nm (HRV). Es 6.2*10**13 Nm (GS). Two houses destroyed at Illapel and one at Monte Patria. Several schools slightly damaged in Limari Province. Felt (VII) at Combarbala and Ovalle; (VI) at Illapel, La Serena and Monte Patria; (V) at La Higuera, Paihuano, Salamanca and Vicuna; (IV) at Concon, La Ligua, Quintero, San Antonio, San Felipe, Santiago, Valparaiso and Vina del Mar; (III) at Copiapo, Curico and Rancagua; (II) at Cauquenes and Talca. Also felt by people in high-rise buildings at Buenos Aires, Argentina.

JUN 20 05 40 43.3 25.842 N 88.932 E 40 * 4.5 1.1 30 INDIA-BANGLADESH BORDER REGION. mb 4.5 (GS). Fifty people injured at Rangpur, 5 people injured at Thakurgaon and minor damage to buildings at Rangpur and Almanagar, Bangladesh. Felt throughout Bangladesh. Also felt in much of West Bengal, India.

JUN 22 02 58 21.3 35.626 N 49.047 E 10 G 6.5 1.1 555 WESTERN IRAN. MW 6.5 (GS), 6.5 (HRV), 6.4 (CSEM). mb 6.2 (GS). MS 6.4 (GS). ME 6.2 (GS). Mo 7.1*10**18 Nm (HRV), 6.9*10**18 Nm (GS), 4.5*10**18 Nm (CSEM). Es 4.9*10**13 Nm (GS). At least 261 people killed, 1300 injured and thousands of buildings destroyed or damaged (VIII) in the Ab Garm-Abhar-Avaj-Shirin Su area. Water and irrigation systems were severely damaged in the area. Surface fissures were observed between Abdarreh and Changureh, which were the villages that sustained the heaviest damage. Damage was estimated at 91 million U.S. dollars. Felt strongly in much of western Iran, including Tehran. For detailed information about this earthquake, see the International

Institute of Earthquake Engineering and Seismology, online at http://www.iiees.ac.ir/bank/eng_avaj.html.

JUN 24 01 20 35.6 35.767 N 9.870 E 10 G 5.0 1.4 113 TUNISIA. mb 5.0 (GS). MS 4.7 (GS). Twelve people injured and some houses collapsed in the Kairouan area. Felt in much of northern Tunisia.

JUN 26 18 18 14.4 35.487 N 48.861 E 10 G 4.6 1.0 45 WESTERN IRAN. mb 4.6 (GS). Two people injured at Razan. Felt in parts of Hamadan and Qazvin Provinces.

JUN 27 05 50 35.1 6.963 S 104.181 E 11 G 6.6 1.1 428 SUNDA STRAIT, INDONESIA. MW 6.6 (GS), 6.5 (HRV). mb 6.0 (GS). MS 6.9 (GS). ME 6.6 (GS). Mo 7.6*10**18 Nm (GS), 6.2*10**18 Nm (HRV). Es 1.7*10**14 Nm (GS). Felt (II) at Bengkulu and Jakarta.

JUN 28 17 19 30.2 43.752 N 130.666 E 566 G 7.3 0.9 712 E. RUSSIA-N.E. CHINA BORDER REG. MW 7.3 (GS), 7.3 (HRV). mb 6.7 (GS). ME 7.0 (GS). Mo 8.9*10**19 Nm (GS), 1.0*10**20 Nm (HRV), 8.0*10**19 Nm (PPT). Es 7.8*10**14 Nm (GS). Felt throughout Heilongjiang, Jilin, Liaoning and in parts of Hebei, Henan, Inner Mongolia, Shandong and Zhejiang Provinces, China. Felt at Beijing. Also felt at Seoul, South Korea and Vladivostok, Russia. Recorded (2 JMA) in parts of eastern Honshu and south-central Hokkaido. Recorded (1 JMA) in central and northern Honshu and southern Hokkaido.

JUN 30 21 29 36.3 22.201 S 179.250 E 620 D 6.5 0.9 534 SOUTH OF FIJI ISLANDS. MW 6.5 (GS), 6.4 (HRV). mb 5.5 (GS). Mo 6.6*10**18 Nm (GS), 5.3*10**18 Nm (HRV).

JUL 31 00 16 44.6 7.929 N 82.793 W 10 G 6.5 1.2 533 SOUTH OF PANAMA. MW 6.5 (HRV), 6.4 (GS). mb 6.0 (GS). MS 6.4 (GS). MD 5.9 (CASC). Mo 5.9*10**18 Nm (HRV), 4.8*10**18 Nm (GS). At least 11 people injured, some houses collapsed and many buildings damaged (VII) in Baru. Buildings damaged at Alanje and David. A wharf also damaged at Puerto Armuelles. Felt strongly in Bocas del Toro and Chiriqui Provinces. Four people injured, 6 homes collapsed and dozens damaged at Laurel, Costa Rica. Four people injured and some houses damaged at Neily, Costa Rica. Felt strongly in Buenas Aires, Corredores, Coto Brus and Golfito Cantons, Costa Rica.

AUG 08 11 42 05.0 30.916 N 99.927 E 33 N 5.2 0.9 326 SICHUAN, CHINA. MW 5.2 (GS), 5.2 (HRV). mb 5.4 (GS). MS 4.7 (GS). Mo 7.7*10**16 Nm (HRV), 7.2*10**16 Nm (GS). Eight houses destroyed and 66 damaged in Rulong County.

AUG 14 13 57 52.1 14.101 N 146.199 E 30 G 6.5 1.0 260 MARIANA ISLANDS. MW 6.5 (HRV), 6.4 (GS). mb 6.1 (GS). MS 6.4 (GS). ME 6.3 (GS). Mo 6.4*10**18 Nm (HRV), 5.3*10**18 Nm (GS). Es 6.9*10**13 Nm (GS). Minor damage to some buildings on Saipan. Felt strongly in northern and central Guam and as far south as Talofofo.

AUG 15 05 30 26.2 1.196 S 121.333 E 10 G 6.2 1.0 169 SULAWESI, INDONESIA. MW 6.2 (HRV), 6.1 (GS). mb 5.7 (GS). MS 5.8 (GS). Mo 2.5*10**18 Nm (HRV), 1.4*10**18 Nm (GS). At least 48 people injured and several hundred buildings damaged in the Tojo area. Felt (V) at Poso, (IV) at Soroako and (III) at Luwuk and Palu.

AUG 19 11 01 01.1 21.696 S 179.513 W 580 G 7.6 0.9 670 FIJI ISLANDS REGION. MW 7.6 (GS). mb 6.7 (GS). ME 7.7 (GS). Mo 2.4*10**20 Nm (GS), 3.5*10**20 Nm (PPT). Es 7.0*10**15 Nm (GS).

AUG 19 11 08 24.3 23.884 S 178.495 E 675 D 7.7 1.1 302 SOUTH OF THE FIJI ISLANDS. MW 7.7 (GS). mb 7.0 (GS). ME 7.4 (GS). Mo 3.6*10**20 Nm (GS), 1.7*10**20 Nm (PPT). Es 3.2*10**15 Nm (GS). Felt at Suva. Also felt in the Auckland area, New Zealand.

SEP 06 01 21 28.6& 38.381 N 13.701 E 5 G 5.9 528 SICILY, ITALY. <ROM>. MW 5.9 (GS), 5.9 (HRV), 5.8 (CSEM). mb 5.8 (GS). MS 5.5 (GS). ME 5.7 (GS). ML 5.6 (ROM). Mo 9.1*10**17 Nm (GS), 7.3*10**17 Nm (HRV), 6.2*10**17 Nm (CSEM). Es 7.7*10**12 Nm (GS). Two people died from heart attacks, twenty injured and several buildings damaged in the Palermo area. Also felt at Agrigento, Caltanissetta, Catania, Enna, Messina and Trapani.

SEP 08 18 44 23.7 3.302 S 142.945 E 13 G 7.6 1.2 428 NEAR NORTH COAST OF NEW GUINEA, P.N.G. MW 7.6 (HRV), 7.3 (GS). mb 6.5 (GS). MS 7.8 (GS). ME 7.9 (GS). Mo 2.7*10**20 Nm (HRV), 1.0*10**20 Nm (GS), 2.5*10**20 Nm (PPT). Es 1.8*10**16 Nm (GS). Four people killed and at least 70 injured on Kairiru and Muschu Islands and in the Wewak area. At least 500 dwellings destroyed and 200 damaged, water tanks, pipelines and a bridge damaged on the islands and in the Maprik-Suain-Wewak area. A local tsunami with an estimated maximum wave height of 1.5 meters damaged some buildings in the area. Landslides occurred and new hot springs

appeared on Kairiru Island. Muschu and Kairiru Islands uplifted approximately one half meter. Felt (III) at Jayapura, Indonesia.

SEP 13 22 28 29.4 13.036 N 93.068 E 21 G 6.5 0.9 646 ANDAMAN ISLANDS, INDIA REGION. MW 6.5 (GS), 6.5 (HRV). mb 6.2 (GS). MS 6.7 (GS). ME 6.3 (GS). Mo 6.6*10**18 Nm (HRV), 6.0*10**18 Nm (GS). Es 7.4*10**13 Nm (GS). Two people killed at Rongat and 40 houses destroyed on Middle Andaman. Several buildings damaged at Diglipur on North Andaman. A local tsunami damaged several shops at Ariel Bay on Middle Andaman and a lighthouse on East Island. The tsunami was observed on Ross and Smith Islands. Felt from Diglipur south to Mayabunder.

SEP 20 15 43 35.4 1.680 S 134.234 E 10 G 6.4 1.3 241 IRIAN JAYA REGION, INDONESIA. MW 6.4 (HRV), 6.3 (GS). mb 5.9 (GS). MS 6.4 (GS). Mo 4.9*10**18 Nm (HRV), 3.0*10**18 Nm (GS). At least 31 houses damaged at Ransiki. Felt in the Manokwari area and as far east as Jayapura.

SEP 22 23 53 14.6& 52.520 N 2.150 W 9 4.8 268 UNITED KINGDOM. <BGS>. mb 4.8 (GS). ML 5.0 (BGS), 4.8 (STR). MD 4.8 (LDG). One person injured at Mansfield. At least one chimney collapsed and other minor damage (VI) in the Dudley area. Items knocked from shelves and utilities disrupted over a wide area in the West Midlands. Felt from Liverpool to London and from Lincolnshire to Wales.

SEP 25 18 14 48.5& 16.870 N 100.113 W 6 5.2 260 OFFSHORE GUERRERO, MEXICO. <UNM>. mb 5.2 (GS). MS 4.7 (GS). MD 5.2 (UNM). Two people injured and some buildings damaged at Acapulco. Felt strongly at Coyuca. Also felt at Ixtapan de la Sal and Mexico City.

SEP 25 22 28 11.9 31.995 N 49.329 E 10 G 5.6 1.0 417 WESTERN IRAN. MW 5.6 (HRV), 5.5 (GS). mb 5.5 (GS). MS 5.1 (GS). Mo 2.8*10**17 Nm (HRV), 2.2*10**17 Nm (GS). Five people injured and at least 30 percent of the houses damaged in the Masjed-e Soleyman area.

OCT 03 16 08 29.6 23.324 N 108.530 W 10 G 6.5 1.4 265 GULF OF CALIFORNIA. MW 6.5 (HRV), 6.4 (GS). mb 5.4 (GS). MS 6.2 (GS). Mo 5.9*10**18 Nm (HRV), 5.1*10**18 Nm (GS), 7.3*10**18 Nm (PPT). Felt at Mazatlan.

OCT 10 10 50 20.5 1.757 S 134.297 E 10 G 7.6 1.1 375 IRIAN JAYA REGION, INDONESIA. MW 7.6 (HRV), 7.4 (GS). mb 6.5 (GS). MS 7.7 (GS). Mo 2.6*10**20 Nm (HRV), 1.3*10**20 Nm (GS), 5.5*10**20 Nm (PPT). Eight people killed, at least 632 injured, more than 1,000 houses destroyed or severely damaged and about 900 buildings partially damaged in the Manokwari-Oransbari-Ransiki area. Landslides blocked roads in the area. A surface fault 3 km long occurred at Ransiki. Many houses were flooded by a local tsunami with estimated wave heights of 3 to 5 meters at Oransbari and Ransiki and 1 meter at Manokwari. Liquefaction occurred along the coast at Manokwari, Oransbari and Ransiki and subsidence of 2 to 3 meters occurred at Oransbari. Felt (IV) at Biak, Sorong and Timika; (III) at Nabire and Wamena.

OCT 10 12 28 25.8 1.511 S 133.973 E 10 G 6.7 1.0 250 IRIAN JAYA REGION, INDONESIA. mb 6.2 (GS). MS 6.7 (GS).

OCT 12 20 09 11.4 8.295 S 71.738 W 534 D 6.9 1.1 700 WESTERN BRAZIL. MW 6.9 (GS), 6.9 (HRV). mb 6.5 (GS). Mo 2.7*10**19 Nm (GS), 2.5*10**19 Nm (HRV). Felt (IV) at Pucallpa, Peru.

OCT 23 11 27 19.4& 63.514 N 147.912 W 4 6.7 651 CENTRAL ALASKA. <AEIC>. MW 6.7 (GS), 6.7 (HRV). mb 6.0 (GS). MS 6.7 (GS). ME 7.4 (GS). Mo 1.4*10**19 Nm (GS), 1.3*10**19 Nm (HRV), 1.7*10**19 Nm (PPT). Es 2.8*10**15 Nm (GS). Damage (VIII) at Cantwell. Felt (VI) at Denali National Park, Healy and Nenana; (V) at Anderson, Eielson AFB, Fairbanks, Palmer and Talkeetna; (IV) at Anchorage, Chugiak, Copper Center, Delta Junction, Eagle River, Fort Wainwright, Kenai, North Pole, Tok, Valdez, Wasilla and Willow; (III) at Girdwood, Glennallen and Seward. Felt as far as Homer and Juneau. Rockfalls and snow avalanches observed in the epicentral area. Also fresh ground cracks observed in the Denali Highway roadbed.

OCT 24 06 08 37.9 1.884 S 29.004 E 11 G 6.2 1.0 345 LAKE TANGANYIKA REGION. MW 6.2 (HRV), 6.1 (GS). mb 5.9 (GS). MS 6.3 (GS). ME 5.7 (GS). Mo 2.2*10**18 Nm (HRV), 1.4*10**18 Nm (GS). Es 7.4*10**12 Nm (GS). Two people killed at Goma, several buildings damaged or destroyed at Lwiro and minor damage to buildings at Bukavu and Goma, Democratic Republic of the Congo. One building destroyed at Mugera and several buildings damaged at Kigali, Rwanda. Felt as far south as Bujumbura, Burundi and

as far north as Rutshuru, Democratic Republic of the Congo.

OCT 29 10 02 21.5 37.670 N 15.267 E 10 G 4.3 1.4 68 SICILY, ITALY. mb 4.3 (GS). MD 4.4 (PDG). At least 9 people injured and dozens of buildings damaged in the Santa Venerina area. Felt at Catania.

OCT 31 10 32 58.7 41.789 N 14.872 E 10 G 5.9 1.3 471 SOUTHERN ITALY. MW 5.9 (GS), 5.7 (HRV). mb 5.3 (GS). MS 5.6 (GS). ML 5.8 (PDG), 5.6 (ZAG), 5.5 (VIE), 5.4 (LDG). Mo 7.3*10**17 Nm (GS), 4.0*10**17 Nm (HRV). Twenty-nine people killed at San Giuliano di Puglia. At least 135 people injured and seventy percent of the houses damaged in the Campobasso area. Some ground cracks and small landslides were observed in the area. Felt throughout central Italy, as far north as Rome and as far south as Potenza.

NOV 01 15 09 01.4 41.784 N 14.871 E 10 G 5.8 1.3 248 SOUTHERN ITALY. MW 5.8 (GS), 5.7 (HRV), 5.5 (CSEM). mb 5.5 (GS). MS 5.6 (GS). Mo 6.5*10**17 Nm (GS), 3.5*10**17 Nm (HRV), 2.1*10**17 Nm (CSEM). Three people injured and additional damage at San Giuliano di Puglia.

NOV 01 22 09 29.2 35.517 N 74.654 E 33 N 5.3 1.2 264 NORTHWESTERN KASHMIR. mb 5.3 (GS). MS 5.3 (GS). At least 11 people killed, 40 injured, 4,000 left homeless and 1,000 houses damaged in the Gilgit area. Landslides blocked a portion of the Karakoram Highway and killed hundreds of cattle.

NOV 02 01 26 10.7 2.824 N 96.085 E 30 G 7.4 1.2 418 NORTHERN SUMATRA, INDONESIA. MW 7.4 (GS), 7.4 (HRV). mb 6.2 (GS). MS 7.6 (GS). ME 7.0 (GS). Mo 1.3*10**20 Nm (GS), 1.3*10**20 Nm (HRV). Es 6.5*10**14 Nm (GS). At least 30 people killed, 65 injured and 994 buildings damaged on Simeulue. Felt (VI) at Tapaktuan; (V) at Meulaboh and Singkil; (IV) at Banda Aceh; (III) at Lhokseumawe and Medan. Also felt at Kuala Lumpur and Port Kelang, Malaysia.

NOV 03 07 33 38.0 35.415 N 74.600 E 33 N 5.3 1.0 211 NORTHWESTERN KASHMIR. mb 5.3 (GS). MS 5.0 (GS). Casualties and damage are included with the event of November 1 at 22:09 UTC.

NOV 03 22 12 41.0& 63.517 N 147.444 W 5 7.9 771 CENTRAL ALASKA. <AEIC>. MW 7.9 (HRV). mb 7.0 (GS). MS 8.5 (GS). Mo 7.6*10**20 Nm (HRV), 8.4*10**20 Nm (PPT). One person injured and extensive damage to roads and bridges. Structural damage in the villages of Slana and Mentasta Lake, minor structural damage at Fairbanks and items knocked from shelves at Cantwell, Denali National Park, Glenallen, Paxon and Tok. Damage estimated at 20 million U.S. dollars. Some supports on the Trans-Alaska Pipeline were damaged and operation was suspended. Maximum intensities (IX) assigned to the surface rupture; (VIII) at Gakona; (VII) at Cantwell, Denali National Park and Tok. Felt throughout Alaska, northern British Columbia, western Alberta and western Northwest Territories. Also felt by people in high-rise buildings in Seattle, Washington. Surface fault rupture on the Denali fault and Totschunda fault began about 25 kilometers east of the magnitude 6.7 Oct. 23 foreshock and extended east and southeast for about 300 kilometers to an area east of Nabesna. Maximum offset 8.8 meters near the Tok Cutoff Highway. Landslides, rock slides, ground cracks and snow avalanches observed in the area of the fault rupture. Liquefaction was observed in the Northway area. Seiches and muddied water wells observed in a large number of states, including Washington, Idaho, Louisiana, Oklahoma, Missouri, Wisconsin and Pennsylvania.

NOV 07 15 14 06.7 51.197 N 179.334 E 33 N 6.6 1.0 553 RAT ISLANDS, ALEUTIAN ISLANDS, ALASKA. MW 6.6 (HRV), 6.5 (GS). mb 5.8 (GS). MS 6.4 (GS). ME 6.2 (GS). ML 6.3 (PMR), 6.2 (AEIC). Mo 6.5*10**18 Nm (GS), 1.0*10**19 Nm (HRV), 1.2*10**19 Nm (PPT). Es 4.8*10**13 Nm (GS).

NOV 15 19 58 31.7 56.051 S 36.404 W 10 G 6.7 1.5 202 SOUTH GEORGIA ISLAND REGION. MW 6.7 (HRV), 6.4 (GS). mb 6.1 (GS). MS 6.6 (GS). Mo 5.1*10**18 Nm (GS), 1.1*10**19 Nm (HRV).

NOV 17 04 53 53.5 47.824 N 146.209 E 459 D 7.3 1.0 326 NORTHWEST OF THE KURIL ISLANDS. MW 7.3 (GS), 7.3 (HRV). Mo 9.6*10**19 Nm (GS), 9.6*10**19 Nm (HRV), 1.3*10**20 Nm (PPT). Felt in eastern Hokkaido and in Aomori Prefecture, Honshu. Recorded (3 JMA) in eastern Hokkaido and northern Honshu; (2 JMA) in south-central Hokkaido and northeastern Honshu; (1 JMA) in southwestern Hokkaido and in Akita, Ishikawa, Nagano, Yamagata and Yamanashi Prefectures, Honshu. Also recorded (1 JMA) in Kochi Prefecture, Shikoku and Kumamoto Prefecture, Kyushu.

NOV 20	21 32 30.8	35.414 N	74.515 E	33 N	6.4	1.0	400	NORTHWESTERN KASHMIR. MW 6.4 (HRV), 6.0 (GS). mb 5.7 (GS). MS 6.5 (GS). Mo 3.9*10**18 Nm (HRV), 1.0*10**18 Nm (GS). Nineteen people killed, at least 40 injured, 100 houses destroyed, at least 1,256 buildings damaged and extensive damage to utilities in the Dashkin-Doian-Mushkin area. Dozens of cattle killed and landslides blocked and damaged many roads in the area. Felt (IV) at Srinagar, Jammu and Kashmir. Also felt as far as Islamabad and Peshwar, Pakistan.
NOV 27	16 43 17.5	14.490 S	167.827 E	33 N	5.9	1.0	240	VANUATU ISLANDS. MW 5.9 (GS), 5.8 (HRV). mb 5.6 (GS). MS 5.8 (GS). Mo 7.9*10**17 Nm (GS), 6.3*10**17 Nm (HRV). Three people injured, at least 100 buildings damaged, several water lines damaged or destroyed and landslides blocked many roads on Mere Lava.
DEC 02	04 58 55.1	37.747 N	21.087 E	10 G	5.6	1.2	234	SOUTHERN GREECE. MW 5.6 (HRV), 5.5 (GS). mb 5.2 (GS). MS 5.4 (GS). ML 5.3 (ATH), 5.2 (THE), 5.2 (PDG). Mo 3.3*10**17 Nm (HRV), 1.8*10**17 Nm (GS). At least 17 people injured when a rockslide near Megalopolis caused a train to derail. At least 8 houses destroyed and 100 damaged in the Vartholomion area. Felt strongly on Zakynthos. Also felt in Arkadia and Korinthia Provinces.
DEC 12	08 30 43.2	4.660 S	153.051 E	33 N	6.7	1.1	73	NEW IRELAND REGION, PAPUA NEW GUINEA. MW 6.7 (GS), 6.6 (HRV). mb 6.0 (GS). MS 6.6 (GS). ME 6.4 (GS). Mo 1.1*10**19 Nm (GS), 1.0*10**19 Nm (HRV), 1.3*10**19 Nm (PPT). Es 8.8*10**13 Nm (GS).
DEC 14	13 27 30.8	39.759 N	97.424 E	33 N	5.6	0.8	200	GANSU, CHINA. MW 5.6 (GS), 5.5 (HRV). mb 5.6 (GS). MS 5.3 (GS). Mo 3.3*10**17 Nm (GS), 2.2*10**17 Nm (HRV). Two people killed and 13,380 houses, five highways and three bridges damaged in Gansu Province.
DEC 24	17 03 02.6	34.527 N	47.371 E	33 N	5.0	0.9	42	WESTERN IRAN. mb 5.0 (GS). MS 4.4 (GS). Fifteen people injured and about 3,000 homes destroyed in Kermanshah Province. The homes had been damaged by the earthquake of April 24. Felt in Hamadan, Lorestan and Kordestan Provinces.

Compiled by Waverly J. Person
USGS NEIC

A 2002. október 23-i jászapáti földrengés Piszkéstetőn (PSZ) regisztrált szeizmogramja

A vízszintes tengely az időt, a függőleges tengely a talajmozgás sebességét mutatja

Az egész napos felvételen az alábbi földrengések láthatók:
02:52:15 Jászapáti M=3.7
03:34:00 Jászapáti M=1.6
11:01:28 Adriai-tenger M=4.6
11:27:18 Alaszka M=6.7

Seismogram of the Jászapáti earthquake 23rd October 2002, recorded at PSZ

The horizontal axis is time, vertical axis is ground velocity

The seismogram shows the following earthquakes:
02:52:15 Jászapáti M=3.7
03:34:00 Jászapáti M=1.6
11:01:28 Adriatic sea M=4.6
11:27:18 Alaska M=6.7