

Republic of Lebanon
National Council for Scientific Research

Provisional Seismological Bulletin

from the

NATIONAL SEISMIC NETWORK

February

2006

Prepared by
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GENERAL BULLETIN INFORMATION

The National Centre for Geophysical Research is a governmental agency established 1975 in Lebanon by the National Council for Scientific Research (CNRS). The mission of the Centre, among other assignments, is the monitoring of seismic activity within the national territory. Currently, the national seismic network is under deployment; it has been officially registered as GRAL, an acronym for Geophysical Research Arrays of Lebanon. Station coordinates and status are given below.

Since 1993, the Centre has been participating in a regional initiative of the UNESCO and the USGS known as RELEMR, i.e. Reducing Earthquake Losses in the Eastern Mediterranean Region.

Within this framework, the Centre routinely contributes to the database set up for this purpose and maintained by the Euro-Mediterranean Seismological Centre (EMSC). For coherence, the Centre has adopted the recommended seismic analysis system SEISAN developed by Jens Havskov and Lars Ottemoller from the University of Bergen, Norway.

The location program currently used for locating earthquakes is Hypocenter (Lienert et al., 1986). Plane parallel layers are assumed for local and regional events, while the IASPEI travel time tables are used for distant events.

The velocity model used for all local and regional events is the currently adopted by the RELEMR initiative.

P-wave velocity (km/sec)	depth to top of layer (km)
6.2	0.0
6.8	14.0
8.05	34.0
8.25	50.0
8.5	80.0

Magnitudes are calculated from coda duration. The coda wave magnitude is estimated via the formula:

$$Mc = 0.08 + 1.63 * \log_{10}(T) + 0.009 * D.$$

where T is the coda duration (sec) and D is the epicentral distance (km). The coefficients were adopted at the beginning of operation of our Centre in 1980 and thus are still in use for the sake of continuity.

All available coda values are used for magnitude calculations. No station corrections are used for either travel times or magnitudes calculations. The Vp/Vs velocity ratio used in both layered models above is 1.74.

As a general policy, neither depths nor epicenters are fixed unless stated since this might restrict later use of the data. As a consequence, some event locations might be unrealistic like zero depth earthquakes or teleseismic locations off by 1000 km. However, the locations are based on the available data and reflect the location procedure and the models used.

STATIONS USED

The stations listed below are operated by the National Centre for Geophysical Research. They form the basic setup of the National Seismic Network of Lebanon.

However, readings from other cooperating agencies are also used in locating the events and thus more stations may appear in the event lists than in the station list; it is worth to mention the systematic use of arrival times from the Cypriot seismic network CSS in order to constrain events corresponding to an active zone off the Lebanese shorelines.

STATION	LATITUDE	LONGITUDE	HEIGHT (m)	NAME	COMMENTS
BHL	3354.25N	3539.25E	1000	BHANNES	Opened May 1980
HWQ	3416.68N	3556.78E	1161	HAWQA	Opened Jan 2001
MATL	3329.32N	3519.78E	5	MATARIH	Opened Nov 2000
FKH	3414.13N	3624.11E	1170	FAKEHEH	Opened Dec 2004
RCY	3329.08N	3549.13E	1360	RACHAYA	Scheduled 2003
DWR	3323.13N	3524.08E	420	DWEIR	Scheduled 2003

MACROSEISMIC DATA

Macroseismic data, if available, are included in the bulletin.

MONTHLY EPICENTER MAPS

Maps will be found on the last page.

ELECTRONIC PUBLICATION

This provisional bulletin will be available for download in pdf format on:
<http://www.cnrs.edu.lb/research/grdownload.html>

REFERENCES

- Havskov, J. and Ottemoller, L.(2001). SEISAN: The Earthquake Analysis Software.
-version 7.2-
Institute of Solid Earth Physics, University of Bergen.
<http://www.ifjf.uib.no/seismo/software/seisan.html>
- Lienert, B.R., Berg, E. and Frazer, L.N.(1986). Hypocenter: An earthquake location method using centered, scaled, and adaptively least squares. Bull. Seism. Soc. Am., 76., pp 771-783.

Abbreviations:

TIME: Origin time in UTC (hr. min. and sec.) or data file onset time if event is not located.

LAT: Latitude of epicenter

LON: Longitude of epicenter

DEPTH: Focal depth in kilometer (trailing F indicates fixed depth)

AGENCY: REL throughout the bulletin, aka. Geophysical Research Lebanon

MAGNITUDES: Up to 3 different magnitudes can be given followed by type and reporting agency, e.g. 3.1 MC GRL - coda magnitude calculated according to GRL standard parameters.

RMS: Root mean square value of travel time residuals

STAT: Station code

CO: Component; S:short period, L:long period, B:broadband.

DIST: Epicenter distance (km)

AZI: Azimuth from source to station

PHAS: Phase; The first letter characterizes onset E(mergent) or I(impulsive)

P: Polarity (C for compression, D for dilatation)

HR: Hour

MN: Minute

SECON: Seconds

TRES: Residual (seconds)

CODA: Signal duration in seconds

AMPL: Ground Amplitude (0.5*(peak to peak)), (nm) at period PERI

PERI: Period where amplitude is measured

BAZ: Back azimuth (station to event)

ARES: Back azimuth residual

VELO: Apparent phase velocity (km/sec)

WT: Weight of phase in the location

*: An asterisk before the phase arrival time implies a potential timing error. If an S phase is read, differential S-P times will be used in the hypocenter location.

February 1 2006 Hour: 11:52 0.3 'Fqfgecpwg'Krepfu'!!!!!!O ?6@ **Agency: REL Regional**

STAT CO DIST AZI PHASE P HRMN SECON TRES CODA AMPL PERI BAZ ARES VELO WT
HWQ SZ EPn 1153 3.92

February 1 2006 Hour: 12:31 1.6 **Agency: REL Local**

STAT CO DIST AZI PHASE P HRMN SECON TRES CODA AMPL PERI BAZ ARES VELO WT
HWQ SZ EPg 1231 16.26
BHL SZ EPg 1231 17.58
BHL SE ESg 1231 32.03
HWQ SN ESg 1231 30.66

February 1 2006 Hour: 12:46 1.3 **Agency: REL Local**

STAT CO DIST AZI PHASE P HRMN SECON TRES CODA AMPL PERI BAZ ARES VELO WT
FKH SZ EPg 1247 57.35
HWQ SZ EPg 1248 5.01
FKH SN ESg 1248 2.86
HWQ SN ESg 1248 13.62

February 1 2006 Hour: 12:50 17.1 Lat: 33.76N Lon: 37.13E Depth: 0 Agency: REL Local Magnitudes: 3.1MC REL Rms: 0.2 secs

STAT CO DIST AZI PHASE P HRMN SECON TRES CODA AMPL PERI BAZ ARES VELO WT
FKH SZ 85 308 EPg 1250 30.67 -0.2 67 1.0
FKH SN 85 308 ESg 1250 41.13 0.1 1.0
HWQ SZ 123 298 EPg 1250 37.35 0.4 1.0
HWQ SE 123 298 ESg 1250 51.52 -0.2 1.0
BHL SZ 137 277 EPg 1250 39.08 -0.2 1.0
BHL SN 137 277 ESg 1250 55.75 0.1 1.0

February 1 2006 Hour: 13: 6 0.9 **Agency: REL Local**

STAT CO DIST AZI PHASE P HRMN SECON TRES CODA AMPL PERI BAZ ARES VELO WT
FKH SZ EPg 13 8 45.21
FKH SN ESg 13 8 50.41
HWQ SZ EPg 13 8 53.83
HWQ SE ESg 13 9 2.49

February 1 2006 Hour: 13: 8 0.2 **Agency: REL Local**

STAT CO DIST AZI PHASE P HRMN SECON TRES CODA AMPL PERI BAZ ARES VELO WT
FKH SZ EPg 13 8 45.47
HWQ SE ESg 13 9 2.71
FKH SN ESg 13 8 50.40
HWQ SZ EPg 13 8 53.85

February 1 2006 Hour: 13:19 1.3 **Agency: REL Local**

STAT CO DIST AZI PHASE P HRMN SECON TRES CODA AMPL PERI BAZ ARES VELO WT
FKH SN ESg 1319 54.32
HWQ SZ EPg 1319 55.77
HWQ SE ESg 1320 4.03
FKH SZ EPg 1319 44.59

February 1 2006 Hour: 13:40 0.6 **Agency: REL Local**

STAT CO DIST AZI PHASE P HRMN SECON TRES CODA AMPL PERI BAZ ARES VELO WT
FKH SZ EPg 1340 52.02
FKH SN ESg 1340 58.74
HWQ SE ESg 1341 8.48

February 1 2006 Hour: 14:43 47.6 Lat: 34.40N Lon: 36.87E Depth: 0 Agency: REL Local Magnitudes: 3.4MC REL Rms: 0.5 secs

STAT CO DIST AZI PHASE P HRMN SECON TRES CODA AMPL PERI BAZ ARES VELO WT
FKH SZ 46 248 EPg 1443 54.12 -0.9 100 1.0
FKH SE 46 248 ESg 1444 0.51 -0.1 1.0
HWQ SZ 86 262 EPg 1444 1.67 0.3 1.0
HWQ SE 86 262 ESg 1444 11.58 0.0 1.0
BHL SZ 124 244 EPg 1444 8.27 0.6 1.0

BHL SE 124 244 ESG 1444 22.59 0.1 1.0

February 1 2006 Hour: 18:46 55.4 'Hk'*****O ?70 Agency: REL Distant
STAT CO DIST AZI PHASE P HRMN SECON TRES CODA AMPL PERI BAZ ARES VELO WT
BHL BZ EP 1847 25.74
FKH SZ EP 1847 24.47

February 2 2006 Hour: 9:48 10.9 'Tgf' Ugc*****O ?68 Agency: REL Regional
STAT CO DIST AZI PHASE P HRMN SECON TRES CODA AMPL PERI BAZ ARES VELO WT
BHL BZ EP 951 28.87
HWQ SZ EP 951 32.30
FKH SZ EP 951 50.68

February 2 2006 Hour: 11:17 36.1 Lat: 34.54N Lon: 36.90E Depth: 0 Agency: REL Local
Magnitudes: 3.2MC REL
Rms: 0.4 secs

STAT CO DIST AZI PHASE P HRMN SECON TRES CODA AMPL PERI BAZ ARES VELO WT
FKH SZ 57 234 EPg 1117 44.94 -0.4 72 1.0
FKH SN 57 234 ESG 1117 51.77 -0.3 1.0
HWQ SZ 93 252 EPg 1117 50.65 -0.4 1.0
HWQ SE 93 252 ESG 1118 2.11 0.0 1.0
BHL SZ 135 239 EPg 1117 58.61 0.8 1.0
BHL SE 135 239 ESG 1118 14.21 0.3 1.0

February 2 2006 Hour: 12:16 1.5 Agency: REL Local
STAT CO DIST AZI PHASE P HRMN SECON TRES CODA AMPL PERI BAZ ARES VELO WT
FKH SE ESG 1217 24.96
HWQ SZ EPg 1217 26.07
HWQ SN ESG 1217 35.77
FKH SZ EPg 1217 19.76

February 2 2006 Hour: 13:3 58.5 'Hk'*****O ?80 Agency: REL Distant
STAT CO DIST AZI PHASE P HRMN SECON TRES CODA AMPL PERI BAZ ARES VELO WT
BHL BZ EP 13 7 15.06
FKH SZ EP 13 7 14.27

February 3 2006 Hour: 0:7 14.0 Lat: 33.58N Lon: 34.90E Depth: 27 Agency: REL Local
Magnitudes: 2.9MC REL
Rms: 0.3 secs

STAT CO DIST AZI PHASE P HRMN SECON TRES CODA AMPL PERI BAZ ARES VELO WT
MATL SZ 41 104 EPg 0 7 21.67 0.1 1.0
BHL SZ 78 62 EPg 0 7 26.28 -0.5 1.0
BHL SN 78 62 ESG 0 7 36.20 0.0 1.0
HWQ SN 124 51 ESG 0 7 47.80 0.2 1.0
FKH SZ 156 62 EPg 0 7 38.37 0.3 43 1.0
FKH SN 156 62 ESG 0 7 55.76 -0.2 1.0

February 3 2006 Hour: 14:38 55.3 'Hk'*****O ?70 Agency: REL Distant
STAT CO DIST AZI PHASE P HRMN SECON TRES CODA AMPL PERI BAZ ARES VELO WT
FKH SZ EP 1439 23.50
BHL BZ EP 1439 25.14

February 3 2006 Hour: 15:9 13.5 Lat: 33.63N Lon: 35.02E Depth: 23 Agency: REL Local
Magnitudes: 2.8MC REL
Rms: 0.2 secs

STAT CO DIST AZI PHASE P HRMN SECON TRES CODA AMPL PERI BAZ ARES VELO WT
MATL SZ 33 118 EPg 15 9 19.89 0.2 42 1.0
BHL SZ 67 62 EPg 15 9 24.05 -0.4 1.0
BHL SN 67 62 ESG 15 9 32.45 -0.1 1.0
HWQ SZ 112 50 EPg 15 9 31.25 0.1 1.0
HWQ SE 112 50 ESG 15 9 44.33 0.2 1.0

February 23 2006 Hour: 20:13 3.5 'Kpf k'""O ?78 Agency: REL Distant
STAT CO DIST AZI PHASE P HRMN SECON TRES CODA AMPL PERI BAZ ARES VELO WT
BHL BZ EP 2013 36.57

February 24 2006 Hour: 14:33 30.1 'Hk'""O ?80 Agency: REL Distant
STAT CO DIST AZI PHASE P HRMN SECON TRES CODA AMPL PERI BAZ ARES VELO WT
BHL BZ EP 1434 13.92
FKH SZ EP 1434 12.29

February 24 2006 Hour: 21:16 0.8 Agency: REL Local
STAT CO DIST AZI PHASE P HRMN SECON TRES CODA AMPL PERI BAZ ARES VELO WT
BHL BZ EPg 2116 50.93
BHL BN ESG 2116 54.00
HWQ SE ESG 2117 3.49

February 26 2006 Hour: 3:26 3.7 'Hk'""O ?80 Agency: REL Distant
STAT CO DIST AZI PHASE P HRMN SECON TRES CODA AMPL PERI BAZ ARES VELO WT
BHL BZ EP 327 8.20
FKH SZ EP 327 11.08

February 26 2006 Hour: 4:47 24.6 'Hk'""O ?78 Agency: REL Distant
STAT CO DIST AZI PHASE P HRMN SECON TRES CODA AMPL PERI BAZ ARES VELO WT
BHL BZ EP 448 20.95

February 26 2006 Hour: 11:55 1.7 Agency: REL Local
STAT CO DIST AZI PHASE P HRMN SECON TRES CODA AMPL PERI BAZ ARES VELO WT
BHL BZ EPg 1155 26.72
HWQ SZ EPg 1155 27.00
BHL BN ESG 1155 38.71
HWQ SE ESG 1155 39.86

February 26 2006 Hour: 12:28 1.5 'Kcp'""O ?60 Agency: REL Regional
STAT CO DIST AZI PHASE P HRMN SECON TRES CODA AMPL PERI BAZ ARES VELO WT
BHL BZ EP 1228 32.32

February 26 2006 Hour: 12:48 2.5 Lat: 34.35N Lon: 36.95E Depth: 0 Agency: REL Local
Magnitudes: 3.0MC REL Rms: 0.8 secs
STAT CO DIST AZI PHASE P HRMN SECON TRES CODA AMPL PERI BAZ ARES VELO WT
FKH SZ 52 256 EPg 1248 10.65 -0.2 56 1.0
FKH SN 52 256 ESG 1248 16.10 -0.9 1.0
HWQ SZ 93 265 EPg 1248 18.44 1.0 1.0
HWQ SE 93 265 ESG 1248 28.31 -0.1 1.0
BHL SZ 129 248 EPg 1248 22.39 -0.9 1.0
BHL SN 129 248 ESG 1248 39.76 1.1 1.0

February 26 2006 Hour: 21:42 25.7 'Uwo ctc'""O ?76"" Agency: REL Distant
STAT CO DIST AZI PHASE P HRMN SECON TRES CODA AMPL PERI BAZ ARES VELO WT
BHL BZ EP 2143 3.90

February 27 2006 Hour: 9:50 15.6 Lat: 33.79N Lon: 37.19E Depth: 33 Agency: REL Local
Magnitudes: 3.2MC REL Rms: 0.3 secs
STAT CO DIST AZI PHASE P HRMN SECON TRES CODA AMPL PERI BAZ ARES VELO WT
FKH SZ 88 305 EPg 950 29.96 0.0 69 1.0
FKH SE 88 305 ESG 950 41.02 0.3 1.0
HWQ SZ 127 296 EPg 950 35.66 0.1 1.0
HWQ SN 127 296 ESG 950 49.67 -0.6 1.0
BHL SZ 142 276 EPg 950 37.77 0.0 1.0
BHL SN 142 276 ESG 950 54.46 0.2 1.0

February 28 2006 Hour: 0:50 14.0 "Vqpic""""O ?76 **Agency: REL Distant**
 STAT CO DIST AZI PHASE P HRMN SECON TRES CODA AMPL PERI BAZ ARES VELO WT
 FKH SZ EP 052 27.90
 BHL BZ EP 052 28.89

February 28 2006 Hour: 2:56 21.6 "Ukpfc'Qegcp""O ?70" **Agency: REL Distant**
 STAT CO DIST AZI PHASE P HRMN SECON TRES CODA AMPL PERI BAZ ARES VELO WT
 BHL BZ EP 256 36.98

February 28 2006 Hour: 7:29 8.5 "Kcp""""O ?80 **Agency: REL Regional**
 STAT CO DIST AZI PHASE P HRMN SECON TRES CODA AMPL PERI BAZ ARES VELO WT
 FKH SZ EPn 735 20.63
 HWQ SZ EPn 735 24.05
 BHL BZ EPn 735 24.58
 MATL SZ EPn 735 29.90

February 28 2006 Hour: 11: 6 44.6 Lat: 33.63N Lon: 35.86E Depth: 0 **Agency: REL Local**
Magnitudes: 3.1MC REL **Rms: 0.2 secs**
 STAT CO DIST AZI PHASE P HRMN SECON TRES CODA AMPL PERI BAZ ARES VELO WT
 BHL BZ 35 328 EPg 11 6 50.20 -0.1 1.0
 BHL BN 35 328 ESG 11 6 54.49 -0.1 1.0
 HWQ SZ 72 6 EPg 11 6 56.32 0.1 61 1.0
 HWQ SE 72 6 ESG 11 7 4.97 0.2 1.0
 FKH SZ 83 37 EPg 11 6 58.21 0.1 1.0
 FKH SE 83 37 ESG 11 7 7.77 -0.3 1.0

February 28 2006 Hour: 12:52 57.3 Lat: 34.39N Lon: 36.78E Depth: 0 **Agency: REL Local**
Magnitudes: 2.9MC REL **Rms: 0.5 secs**
 STAT CO DIST AZI PHASE P HRMN SECON TRES CODA AMPL PERI BAZ ARES VELO WT
 FKH SZ 39 243 EPg 1253 2.87 -0.7 54 1.0
 FKH SE 39 243 ESG 1253 7.92 -0.2 1.0
 HWQ SZ 78 261 EPg 1253 10.44 0.7 1.0
 HWQ SN 78 261 ESG 1253 18.69 -0.4 1.0
 BHL SN 117 243 ESG 1253 30.67 0.6 1.0

February 28 2006 Hour: 13:21 1.0 **Agency: REL Local**
 STAT CO DIST AZI PHASE P HRMN SECON TRES CODA AMPL PERI BAZ ARES VELO WT
 FKH SZ EPg 1321 30.84
 HWQ SE ESG 1321 48.42
 FKH SN ESG 1321 36.23
 HWQ SZ EPg 1321 37.44

February 28 2006 Hour: 15: 5 49.4 Lat: 34.44N Lon: 36.85E Depth: 0 **Agency: REL Local**
Magnitudes: 2.9MC REL **Rms: 0.4 secs**
 STAT CO DIST AZI PHASE P HRMN SECON TRES CODA AMPL PERI BAZ ARES VELO WT
 FKH SZ 47 242 EPg 15 5 56.84 -0.2 52 1.0
 FKH SE 47 242 ESG 15 6 1.96 -0.7 1.0
 HWQ SZ 85 258 EPg 15 6 3.15 0.0 1.0
 HWQ SN 85 258 ESG 15 6 13.34 0.0 1.0
 BHL SZ 125 242 EPg 15 6 9.85 0.2 1.0
 BHL SN 125 242 ESG 15 6 25.35 0.7 1.0

Epicentral Map of Lebanon

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