

Republic of Lebanon
National Council for Scientific Research

Provisional Seismological Bulletin

from the

NATIONAL SEISMIC NETWORK

November

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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 by 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 localization 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 one 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 the coda duration. The coda wave magnitude is estimated via the formula:

$$M_c = 0.08 + 1.63 * \log_{10}(T) + 0.0009 * D.$$

where T is the coda duration (sec) and D is the epicentral distance (km). The coefficients above were adopted at the outset 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 otherwise since this might restrict later use of the data. Consequently, some event locations might be unrealistic such as zero depth earthquakes or teleseismic locations off by 1000 km. However, the locations are based on the available data and reflect the localization procedure and the models used.

STATIONS USED

The stations listed below are operated by the National Centre for Geophysical Research. They constitute 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 mentioning the systematic use of arrival times from the Cypriot seismic network CSS and the Syrian seismic network SNSN 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	Scheduled 2003
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/geophysicalresearch/>

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: GRL 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(mpulsive)

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 ($0.5 \times (\text{peak to peak})$), (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.

November 1 2004 Hour: 8:19 17.9 Lat: 33.27N Lon: 35.16E Depth: 0 Agency: REL Local
 Magnitudes: 3.2MC REL Rms: 0.1 secs

STAT	CO	DIST	AZI	PHASE	P	HRMN	SECON	TRES	CODA	AMPL	PERI	BAZ	ARES	VELO	WT
MATL	SZ	29.09	32	IPG		819	22.63	0.0							1.0
BHL	SZ	84.12	33	IPG		819	31.34	-0.2							1.0
BHL	SE	84.12	33	ISG		819	41.38	-0.2							1.0
HWQ	SZ	133.6	33	IPG		819	39.64	0.2	70						1.0
HWQ	SE	133.6	33	ISG		819	55.59	0.2							1.0

November 2 2004 Hour: 14:20 50.2 Lat: 34.16N Lon: 35.47E Depth: 15 Agency: REL Local
 Magnitudes: 2.6MC REL Rms: 0.7 secs

STAT	CO	DIST	AZI	PHASE	P	HRMN	SECON	TRES	CODA	AMPL	PERI	BAZ	ARES	VELO	WT
BHL	SZ	33.17	150	IPG		1420	56.96	0.9	32			278	-51	35.7	1.0
BHL	SE	33.17	150	ISG		1421	0.92	0.5							1.0
HWQ	SZ	45.37	74	IPG		1420	57.37	-0.5							1.0
HWQ	SE	45.37	74	ISG		1421	2.74	-0.8							1.0

November 3 2004 Hour: 15:9 30.0 Lat: 33.77N Lon: 35.43E Depth: 8 Agency: REL Local
 Magnitudes: 2.5MC REL Rms: 0.3 secs

STAT	CO	DIST	AZI	PHASE	P	HRMN	SECON	TRES	CODA	AMPL	PERI	BAZ	ARES	VELO	WT
BHL	SZ	25.45	55	IPG		15 9	33.99	-0.4	31			235	0	14.2	1.0
BHL	SE	25.45	55	ISG		15 9	37.86	0.2							1.0
HWQ	SZ	73.68	40	IPG		15 9	42.41	0.4							1.0
HWQ	SN	73.68	40	ISG		15 9	50.64	-0.2							1.0

November 4 2004 Hour: 6:19 48.4 Agency: REL Regional

STAT	CO	DIST	AZI	PHASE	P	HRMN	SECON	TRES	CODA	AMPL	PERI	BAZ	ARES	VELO	WT
MATL	SZ			EPN		624	58.47								
BHL	SZ			EPN		624	59.92								
HWQ	SZ			EPN		625	3.01								

November 5 2004 Hour: 2:12 42.6 Lat: 32.55N Lon: 35.20E Depth: 0 Agency: REL Local
 Magnitudes: 3.2MC REL Rms: 0.5 secs

STAT	CO	DIST	AZI	PHASE	P	HRMN	SECON	TRES	CODA	AMPL	PERI	BAZ	ARES	VELO	WT
MATL	SZ	105.0	7	IPG		212	59.38	-0.2							1.0
BHL	SZ	156.3	16	IPG		213	6.98	-0.5							1.0
BHL	SN	156.3	16	ISG		213	25.51	-0.4							1.0
HWQ	SZ	204.0	20	IPG		213	14.37	0.3	63						1.0
HWQ	SE	204.0	20	ISG		213	38.53	1.1							1.0

November 5 2004 Hour: 9:50 34.1 Lat: 33.64N Lon: 35.73E Depth: 0 Agency: REL Local
 Magnitudes: 3.0MC REL Rms: 0.1 secs

STAT	CO	DIST	AZI	PHASE	P	HRMN	SECON	TRES	CODA	AMPL	PERI	BAZ	ARES	VELO	WT
BHL	SZ	30.13	347	IPG		950	39.17	0.2	61						1.0
BHL	SN	30.13	347	ISG		950	42.51	-0.1							1.0
MATL	SZ	40.65	246	IPG		950	40.71	0.0							1.0
HWQ	SZ	73.61	16	IPG		950	45.84	-0.2							1.0
HWQ	SE	73.61	16	ISG		950	54.92	0.1							1.0

November 5 2004 Hour: 13:23 2.6 Lat: 33.59N Lon: 35.39E Depth: 49 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	12.69	207	IPG		1323	9.90	-0.1							1.0
BHL	SZ	42.43	35	IPG		1323	11.90	-0.2							1.0
BHL	SN	42.43	35	ISG		1323	19.39	0.3							1.0
HWQ	SZ	91.88	34	IPG		1323	17.92	0.4	49						1.0
HWQ	SE	91.88	34	ISG		1323	28.16	-0.3							1.0

November 5 2004 Hour: 13:49 0.2

Agency: REL Local

STAT	CO	DIST	AZI	PHASE	P	HRMN	SECON	TRES	CODA	AMPL	PERI	BAZ	ARES	VELO	WT
BHL	SZ			IPG		1349	50.55								
BHL	SE			ISG		1349	54.21								
HWQ	SZ			IPG		1349	51.17								
HWQ	SE			ISG		1349	57.48								

November 5 2004 Hour: 16:19 29.8 Lat: 33.78N

Lon: 36.38E Depth: 15 Agency: REL Local

Magnitudes: 2.5MC REL

Rms: 0.2 secs

STAT	CO	DIST	AZI	PHASE	P	HRMN	SECON	TRES	CODA	AMPL	PERI	BAZ	ARES	VELO	WT
HWQ	SZ	68.87	324	IPG		1619	40.87	0.0							1.0
HWQ	SE	68.87	324	ISG		1619	48.85	-0.3							1.0
BHL	SZ	68.97	282	IPG		1619	40.97	0.1	29			213	111	12.4	1.0
BHL	SE	68.97	282	ISG		1619	49.35	0.2							1.0

November 5 2004 Hour: 16:38 0.6

Agency: REL Local

STAT	CO	DIST	AZI	PHASE	P	HRMN	SECON	TRES	CODA	AMPL	PERI	BAZ	ARES	VELO	WT
HWQ	SZ			IPG		1639	35.12								
BHL	SZ			IPG		1639	46.00								
BHL	SN			ISG		1640	27.46								
HWQ	SE			ISG		1640	9.35								

November 7 2004 Hour: 16:36 0.9

Agency: REL Local

STAT	CO	DIST	AZI	PHASE	P	HRMN	SECON	TRES	CODA	AMPL	PERI	BAZ	ARES	VELO	WT
HWQ	SZ			IPG		1637	0.35								
BHL	SZ			IPG		1637	0.67								
HWQ	SE			ISG		1637	7.40								
BHL	SE			ISG		1637	8.08								

November 8 2004 Hour: 14:23 1.5

Agency: REL Local

STAT	CO	DIST	AZI	PHASE	P	HRMN	SECON	TRES	CODA	AMPL	PERI	BAZ	ARES	VELO	WT
BHL	SZ			IPG		1423	48.64								
BHL	SE			ISG		1423	52.61								
HWQ	SZ			IPG		1423	49.76								
HWQ	SE			ISG		1423	54.47								

November 10 2004 Hour: 9:39 1.4

Agency: REL Local

STAT	CO	DIST	AZI	PHASE	P	HRMN	SECON	TRES	CODA	AMPL	PERI	BAZ	ARES	VELO	WT
BHL	SZ			IPG		940	20.22								
BHL	SN			ISG		940	31.57								
HWQ	SZ			IPG		940	28.51								
HWQ	SE			ISG		940	39.25								

November 10 2004 Hour: 14:17 1.7

Agency: REL Local

STAT	CO	DIST	AZI	PHASE	P	HRMN	SECON	TRES	CODA	AMPL	PERI	BAZ	ARES	VELO	WT
HWQ	SZ			IPG		1418	25.33								
BHL	SE			ISG		1418	28.16								
HWQ	SE			ISG		1418	30.05								
BHL	SZ			IPG		1418	23.61								

November 11 2004 Hour: 10:48 39.1 Lat: 34.62N

Lon: 35.83E Depth: 0 Agency: REL Local

Magnitudes: 3.0MC REL

Rms: 0.6 secs

STAT	CO	DIST	AZI	PHASE	P	HRMN	SECON	TRES	CODA	AMPL	PERI	BAZ	ARES	VELO	WT
HWQ	SZ	39.12	164	IPG		1048	44.59	-0.8	58			343	0	26.2	1.0
HWQ	SN	39.12	164	ISG		1048	50.22	0.1							1.0
BHL	SZ	80.63	191	IPG		1048	52.86	0.7							1.0

November 11 2004 Hour: 16:24 36.5 Lat: 33.35N Lon: 35.25E Depth: 32 Agency: REL Local
 Magnitudes: 2.9MC REL Rms: 1.0 secs

STAT	CO	DIST	AZI	PHASE	P	HRMN	SECON	TRES	CODA	AMPL	PERI	BAZ	ARES	VELO	WT
MATL	SZ	16.39	26	IPG		1624	42.61	0.6							1.0
BHL	SZ	71.32	31	IPG		1624	47.22	-1.3	46						1.0
BHL	SE	71.32	31	ISG		1624	56.47	-1.0							1.0
HWQ	SZ	120.8	32	IPG		1624	56.14	0.6							1.0
HWQ	SE	120.8	32	ISG		1625	10.81	1.2							1.0

November 13 2004 Hour: 8:44 57.5 Lat: 33.69N Lon: 35.65E Depth: 7 Agency: REL Local
 Magnitudes: 2.5MC REL Rms: 0.6 secs

STAT	CO	DIST	AZI	PHASE	P	HRMN	SECON	TRES	CODA	AMPL	PERI	BAZ	ARES	VELO	WT
BHL	SZ	23.59	0	IPG		845	0.78	-0.8	31			180	0	13.8	1.0
BHL	SN	23.59	0	ISG		845	5.05	0.5							1.0
MATL	SZ	37.53	233	IPG		845	3.68	0.0							1.0
HWQ	SZ	70.47	23	IPG		845	9.85	0.9							1.0
HWQ	SE	70.47	23	ISG		845	16.93	-0.5							1.0

November 13 2004 Hour: 9:51 1.2 Agency: REL Local

STAT	CO	DIST	AZI	PHASE	P	HRMN	SECON	TRES	CODA	AMPL	PERI	BAZ	ARES	VELO	WT
BHL	SZ			IPG		951	37.74								
HWQ	SZ			IPG		951	39.46								
BHL	SE			ISG		951	42.28								
HWQ	SE			ISG		951	45.71								

November 15 2004 Hour: 1:8 19.2 Lat: 34.87N Lon: 34.14E Depth: 0 Agency: REL Regional
 Magnitudes: 3.2MC REL Rms: 0.7 secs

STAT	CO	DIST	AZI	PHASE	P	HRMN	SECON	TRES	CODA	AMPL	PERI	BAZ	ARES	VELO	WT
BHL	SZ	175.6	127	EPN		1 8	45.91	-1.2							1.0
BHL	SN	175.6	127	SN		1 9	7.26	-0.5							1.0
HWQ	SZ	178.3	111	EPN		1 8	47.68	0.2	66						1.0
HWQ	SE	178.3	111	SN		1 9	8.95	0.5							1.0
MATL	SZ	188.2	144	EPN		1 8	49.46	0.9							1.0
MATL	SZ	188.2	144	SN		1 9	10.46	0.1							1.0

November 15 2004 Hour: 18:20 51.6 Lat: 35.38N Lon: 37.73E Depth: 15 Agency: REL Regional
 Magnitudes: 3.3MC REL Rms: 0.6 secs

STAT	CO	DIST	AZI	PHASE	P	HRMN	SECON	TRES	CODA	AMPL	PERI	BAZ	ARES	VELO	WT
HWQ	SZ	204.0	234	EPN		1821	21.15	-0.4	78			54	2	19.5	1.0
HWQ	SE	204.0	234	SN		1821	42.91	-0.8							1.0
BHL	SZ	251.2	230	EPN		1821	27.79	0.4							1.0
BHL	SN	251.2	230	SN		1821	54.65	0.8							1.0

November 17 2004 Hour: 1:12 11.3 Lat: 32.27N Lon: 37.63E Depth: 0 Agency: REL Regional
 Magnitudes: 3.8MC REL Rms: 0.5 secs

STAT	CO	DIST	AZI	PHASE	P	HRMN	SECON	TRES	CODA	AMPL	PERI	BAZ	ARES	VELO	WT
MATL	SZ	254.7	303	EPN		112	49.61	0.6							1.0
BHL	SZ	259.2	315	EPN		112	49.01	-0.6							1.0
BHL	SE	259.2	315	SN		113	17.63	-0.4							1.0
HWQ	SZ	273.0	325	EPN		112	51.39	0.0	129						1.0
HWQ	SE	273.0	325	SN		113	21.44	0.4							1.0

November 20 2004 Hour: 12:1 8.2 Lat: 34.51N Lon: 37.13E Depth: 15 Agency: REL Local
 Magnitudes: 3.2MC REL Rms: 2.4 secs

STAT	CO	DIST	AZI	PHASE	P	HRMN	SECON	TRES	CODA	AMPL	PERI	BAZ	ARES	VELO	WT
HWQ	SZ	111.9	257	IPG		12 1	26.71	1.0	72						1.0
HWQ	SE	111.9	257	ISG		12 1	36.73	-1.9							1.0
BHL	SZ	151.7	244	IPG		12 1	34.26	2.7							1.0
BHL	SN	151.7	244	ISG		12 1	50.51	1.7							1.0
MATL	SZ	201.2	236	IPG		12 1	35.09	-3.6							1.0

Epicentral Map of Lebanon

NOVEMBER 2004

Magnitudes

- Ml = 2
- Ml = 3
- Ml = 4
- Ml = 5

