

Republic of Lebanon
National Council for Scientific Research

Provisional Seismological Bulletin

from the

NATIONAL SEISMIC NETWORK

September

2004

Prepared by
The National Centre for Geophysical Research
Bhannes

*P.o.b. : 165432
Ashrafyeh Beirut 1100-2040*

*Tel : +9614-981885
Fax : +9614-981886
Email : geophys@cnrs.edu.lb*

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.

September 4 2004 Hour: 0:24 11.1 Lat: 34.11N Lon: 35.80E Depth: 48 Agency: REL Local
Magnitudes: 2.8MC REL Rms: 0.7 secs

STAT	CO	DIST	AZI	PHASE	P	HRMN	SECON	TRES	CODA	AMPL	PERI	BAZ	ARES	VELO	WT
HWQ	SZ	22.66	36	IPG		024	19.34	0.3	42						1.0
HWQ	SE	22.66	36	ISG		024	24.35	-0.5							1.0
BHL	SZ	26.84	211	IPG		024	20.46	1.2							1.0
BHL	SE	26.84	211	ISG		024	25.15	-0.1							1.0
MATL	SZ	81.86	213	IPG		024	23.81	-0.8							1.0

September 4 2004 Hour: 9:51 3.3 Lat: 34.22N Lon: 35.38E Depth: 0 Agency: REL Local
Magnitudes: 2.6MC REL Rms: 0.2 secs

STAT	CO	DIST	AZI	PHASE	P	HRMN	SECON	TRES	CODA	AMPL	PERI	BAZ	ARES	VELO	WT
BHL	SZ	42.63	144	IPG		951	10.50	0.3	33			324	0	11.8	1.0
BHL	SE	42.63	144	ISG		951	15.10	-0.2							1.0
HWQ	SZ	52.18	82	IPG		951	11.43	-0.3							1.0
HWQ	SN	52.18	82	ISG		951	18.10	0.1							1.0

September 6 2004 Hour: 15:39 1.2 Lat: 35.02N Lon: 35.14E Depth: 15 Agency: REL Local
Magnitudes: 3.4MC REL Rms: 4.0 secs

STAT	CO	DIST	AZI	PHASE	P	HRMN	SECON	TRES	CODA	AMPL	PERI	BAZ	ARES	VELO	WT
HWQ	SZ	110.3	138	IPG		1539	22.24	3.8	90			52	94	24.0	1.0
HWQ	SE	110.3	138	ISG		1539	35.40	4.2							1.0
BHL	SZ	132.1	159	IPG		1539	17.30	-4.3							1.0
BHL	SE	132.1	159	ISG		1539	33.05	-3.7							1.0

September 7 2004 Hour: 14:57 20.1 Lat: 34.15N Lon: 35.44E Depth: 15 Agency: REL Local
Magnitudes: 2.6MC REL Rms: 0.4 secs

STAT	CO	DIST	AZI	PHASE	P	HRMN	SECON	TRES	CODA	AMPL	PERI	BAZ	ARES	VELO	WT
BHL	SZ	33.52	143	IPG		1457	26.66	0.6	33			232	-90	8.5	1.0
BHL	SN	33.52	143	ISG		1457	30.66	0.2							1.0
HWQ	SZ	49.13	73	IPG		1457	28.04	-0.3							1.0
HWQ	SE	49.13	73	ISG		1457	33.88	-0.5							1.0

September 8 2004 Hour: 14:59 26.6 Lat: 34.12N Lon: 35.57E Depth: 34 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
BHL	SZ	25.59	162	IPG		1459	33.56	0.3				342	0	30.9	1.0
BHL	SN	25.59	162	ISG		1459	38.01	-0.2							1.0
HWQ	SZ	38.77	64	IPG		1459	34.31	-0.3	28						1.0
HWQ	SE	38.77	64	ISG		1459	40.73	0.2							1.0

September 9 2004 Hour: 11:7 33.7 Lat: 33.47N Lon: 35.69E Depth: 36 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
BHL	SZ	48.56	357	IPG		11 7	42.71	-0.3	29			177	0	16.4	1.0
BHL	SN	48.56	357	ISG		11 7	49.96	0.1							1.0
HWQ	SZ	93.10	15	IPG		11 7	48.69	0.3							1.0
HWQ	SE	93.10	15	ISG		11 7	59.17	-0.1							1.0

September 9 2004 Hour: 14:54 21.1 Lat: 34.04N Lon: 35.79E Depth: 40 Agency: REL Local
Magnitudes: 2.6MC REL Rms: 0.6 secs

STAT	CO	DIST	AZI	PHASE	P	HRMN	SECON	TRES	CODA	AMPL	PERI	BAZ	ARES	VELO	WT
BHL	SZ	19.47	221	IPG		1454	28.65	0.7	34			41	0	92.0	1.0
BHL	SN	19.47	221	ISG		1454	32.54	-0.4							1.0
HWQ	SZ	30.34	28	IPG		1454	28.02	-0.7							1.0
HWQ	SN	30.34	28	ISG		1454	34.84	0.4							1.0

September 10 2004 Hour: 5:55.7 Lat: 33.74N Lon: 35.87E Depth: 15 Agency: REL Local
Magnitudes: 2.0MC REL Rms: 0.3 secs

STAT	CO	DIST	AZI	PHASE	P	HRMN	SECON	TRES	CODA	AMPL	PERI	BAZ	ARES	VELO	WT
BHL	SZ	26.39	312	IPG		5 6	0.69	0.0	15			342	151	81.2	1.0
BHL	SE	26.39	312	ISG		5 6	3.84	-0.5							1.0
HWQ	SZ	59.71	7	IPG		5 6	5.79	0.3							1.0
HWQ	SN	59.71	7	ISG		5 6	12.95	0.2							1.0

September 11 2004 Hour: 13:35 36.5 Lat: 34.40N Lon: 35.19E 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
BHL	SZ	69.50	142	IPG		1335	47.71	0.0							1.0
BHL	SN	69.50	142	ISG		1335	55.62	-0.4							1.0
HWQ	SZ	70.84	101	IPG		1335	48.02	0.1	27			86	165	37.7	1.0
HWQ	SN	70.84	101	ISG		1335	56.62	0.3							1.0

September 13 2004 Hour: 15:50 53.1 Lat: 34.90N Lon: 35.58E Depth: 9 Agency: REL Local
Magnitudes: 2.8MC REL Rms: 0.9 secs

STAT	CO	DIST	AZI	PHASE	P	HRMN	SECON	TRES	CODA	AMPL	PERI	BAZ	ARES	VELO	WT
HWQ	SZ	76.58	154	IPG		1551	6.69	1.2	44			293	-40	15.9	1.0
HWQ	SE	76.58	154	ISG		1551	13.56	-1.2							1.0
BHL	SZ	110.6	177	IPG		1551	10.43	-0.5							1.0
BHL	SN	110.6	177	ISG		1551	24.82	0.6							1.0

September 13 2004 Hour: 16:19 27.6 Lat: 34.72N Lon: 36.26E 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
HWQ	SZ	56.84	211	IPG		1619	36.49	-0.3	58			31	0	40.7	1.0
HWQ	SN	56.84	211	ISG		1619	42.50	-1.1							1.0
BHL	SZ	106.3	212	IPG		1619	45.07	0.3							1.0
BHL	SN	106.3	212	ISG		1619	58.53	1.1							1.0

September 13 2004 Hour: 23:2 45.5 Lat: 34.97N Lon: 36.59E Depth: 15 Agency: REL Local
Magnitudes: 3.1MC REL Rms: 0.3 secs

STAT	CO	DIST	AZI	PHASE	P	HRMN	SECON	TRES	CODA	AMPL	PERI	BAZ	ARES	VELO	WT
HWQ	SZ	96.63	218	IPG		23 3	1.07	0.3							1.0
HWQ	SE	96.63	218	ISG		23 3	11.75	-0.2							1.0
BHL	SZ	146.0	216	IPG		23 3	7.70	-0.3	56			144	108	14.5	1.0
BHL	SE	146.0	216	ISG		23 3	24.74	0.1							1.0

September 15 2004 Hour: 15:4 8.7 Lat: 33.89N Lon: 36.03E Depth: 15 Agency: REL Local
Magnitudes: 2.6MC REL Rms: 0.3 secs

STAT	CO	DIST	AZI	PHASE	P	HRMN	SECON	TRES	CODA	AMPL	PERI	BAZ	ARES	VELO	WT
BHL	SZ	34.49	273	IPG		15 4	15.13	0.4	33			245	152	36.8	1.0
BHL	SN	34.49	273	ISG		15 4	19.25	0.0							1.0
HWQ	SZ	44.09	350	IPG		15 4	16.10	0.0							1.0
HWQ	SN	44.09	350	ISG		15 4	21.34	-0.4							1.0

September 16 2004 Hour: 14:54 0.5 Agency: REL Local

STAT	CO	DIST	AZI	PHASE	P	HRMN	SECON	TRES	CODA	AMPL	PERI	BAZ	ARES	VELO	WT
HWQ	SZ			IPG		1455	48.93								
HWQ	SE			ISG		1455	54.09								
BHL	SZ			IPG		1455	43.87								
BHL	SN			ISG		1455	52.03								

September 17 2004 Hour: 23:19 38.8 Lat: 34.43N Lon: 36.06E Depth: 0 Agency: REL Local
Magnitudes: 3.0MC REL Rms: 0.5 secs

STAT	CO	DIST	AZI	PHASE	P	HRMN	SECON	TRES	CODA	AMPL	PERI	BAZ	ARES	VELO	WT
HWQ	SZ	19.78	212	IPG		2319	41.46	-0.5	57			32	0	36.2	1.0
HWQ	SN	19.78	212	ISG		2319	43.69	-0.7							1.0
BHL	SZ	69.24	213	IPG		2319	49.95	0.0							1.0
BHL	SE	69.24	213	ISG		2319	58.89	0.7							1.0
MATL	SZ	124.3	213	IPG		2319	59.39	0.6							1.0

September 19 2004 Hour: 16:20 1.6

Agency: REL Local

STAT	CO	DIST	AZI	PHASE	P	HRMN	SECON	TRES	CODA	AMPL	PERI	BAZ	ARES	VELO	WT
HWQ	SZ			IPG		1620	33.59								
BHL	SE			ISG		1620	39.74								
HWQ	SE			ISG		1620	40.35								
BHL	SZ			IPG		1620	31.90								

September 20 2004 Hour: 15:0 1.1

Agency: REL Local

STAT	CO	DIST	AZI	PHASE	P	HRMN	SECON	TRES	CODA	AMPL	PERI	BAZ	ARES	VELO	WT
BHL	SZ			IPG		15 1	15.17								
BHL	SN			ISG		15 1	19.16								
HWQ	SZ			IPG		15 1	15.87								
HWQ	SN			ISG		15 1	21.20								

September 20 2004 Hour: 15:1 30.4

Agency: REL Local

STAT	CO	DIST	AZI	PHASE	P	HRMN	SECON	TRES	CODA	AMPL	PERI	BAZ	ARES	VELO	WT
BHL	SZ			IPG		15 1	33.95								
HWQ	SZ			IPG		15 1	34.79								
HWQ	SN			ISG		15 1	39.74								
BHL	SN			ISG		15 1	37.83								

September 21 2004 Hour: 14:11 27.3

Agency: REL Regional

STAT	CO	DIST	AZI	PHASE	P	HRMN	SECON	TRES	CODA	AMPL	PERI	BAZ	ARES	VELO	WT
MATL	SZ			EPN		1416	37.42								
BHL	SZ			EPN		1416	38.98								
HWQ	SZ			EPN		1416	41.93								

September 21 2004 Hour: 14:53 41.1 Lat: 34.20N Lon: 35.49E 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
BHL	SZ	36.01	155	IPG		1453	47.69	0.3							1.0
BHL	SE	36.01	155	ISG		1453	51.95	-0.2							1.0
HWQ	SZ	42.86	78	IPG		1453	48.55	0.1	27			74	175	23.2	1.0
HWQ	SN	42.86	78	ISG		1453	53.64	-0.2							1.0

September 22 2004 Hour: 15:4 5.2 Lat: 33.92N Lon: 36.03E Depth: 15 Agency: REL Local
Magnitudes: 2.7MC REL Rms: 0.3 secs

STAT	CO	DIST	AZI	PHASE	P	HRMN	SECON	TRES	CODA	AMPL	PERI	BAZ	ARES	VELO	WT
BHL	SZ	34.93	267	IPG		15 4	11.30	-0.1	37			357	90	40.5	1.0
BHL	SN	34.93	267	ISG		15 4	15.48	-0.4							1.0
HWQ	SZ	40.58	349	IPG		15 4	12.59	0.4							1.0
HWQ	SN	40.58	349	ISG		15 4	17.49	0.1							1.0

September 24 2004 Hour: 7:29 24.8 Lat: 33.95N Lon: 35.51E Depth: 15 Agency: REL Local
Magnitudes: 2.3MC REL Rms: 0.3 secs

STAT	CO	DIST	AZI	PHASE	P	HRMN	SECON	TRES	CODA	AMPL	PERI	BAZ	ARES	VELO	WT
BHL	SZ	14.53	112	IPG		729	28.50	0.2	24			347	55	10.9	1.0
BHL	SN	14.53	112	ISG		729	31.03	0.2							1.0
HWQ	SZ	54.03	48	IPG		729	33.20	-0.6							1.0
HWQ	SN	54.03	48	ISG		729	40.67	0.2							1.0

September 25 2004 Hour: 14:29 1.3

Agency: REL Regional

STAT	CO	DIST	AZI	PHASE	P	HRMN	SECON	TRES	CODA	AMPL	PERI	BAZ	ARES	VELO	WT
HWQ	SZ			EPN		1430	8.98								
BHL	SZ			EPN		1430	10.59								

September 28 2004 Hour: 8:2 55.7 Lat: 37.42N Lon: 35.69E Depth: 18 Agency: REL Regional
Magnitudes: 3.8MC REL Rms: 1.7 secs

STAT	CO	DIST	AZI	PHASE	P	HRMN	SECON	TRES	CODA	AMPL	PERI	BAZ	ARES	VELO	WT
HWQ	SZ	349.8	176	EPN		8 3	45.75	2.2	131			43	47	34.7	1.0
HWQ	SN	349.8	176	SN		8 4	19.60	0.7							1.0
BHL	SZ	390.5	180	EPN		8 3	48.13	-0.4							1.0
BHL	SN	390.5	180	SN		8 4	25.16	-2.5							1.0

September 28 2004 Hour: 9:41 26.0 Lat: 34.77N Lon: 36.06E Depth: 0 Agency: REL Local
 Magnitudes: 2.7MC REL Rms: 0.4 secs

STAT	CO	DIST	AZI	PHASE	P	HRMN	SECON	TRES	CODA	AMPL	PERI	BAZ	ARES	VELO	WT
HWQ	SZ	55.30	191	IPG		941	34.37	-0.5	38			11	0	25.2	1.0
HWQ	SE	55.30	191	ISG		941	41.53	0.0							1.0
BHL	SZ	102.8	202	IPG		941	43.11	0.5							1.0

September 28 2004 Hour: 15: 0 10.9 Lat: 33.72N Lon: 35.60E Depth: 0 Agency: REL Local
 Magnitudes: 2.4MC REL Rms: 0.5 secs

STAT	CO	DIST	AZI	PHASE	P	HRMN	SECON	TRES	CODA	AMPL	PERI	BAZ	ARES	VELO	WT
BHL	SZ	20.90	15	IPG		15 0	13.50	-0.8	27			194	0	13.6	1.0
BHL	SE	20.90	15	ISG		15 0	16.62	-0.1							1.0
HWQ	SZ	69.61	27	IPG		15 0	22.86	0.7							1.0
HWQ	SN	69.61	27	ISG		15 0	30.61	0.2							1.0

September 30 2004 Hour: 14:36 1.5 Agency: REL Local

STAT	CO	DIST	AZI	PHASE	P	HRMN	SECON	TRES	CODA	AMPL	PERI	BAZ	ARES	VELO	WT
BHL	SZ			IPG		1437	30.22								
HWQ	SZ			IPG		1437	30.59								
HWQ	SE			ISG		1437	36.04								
BHL	SN			ISG		1437	34.87								

Epicentral Map of Lebanon

SEPTEMBER 2004

Magnitudes

○ Ml = 2

○ Ml = 3

○ Ml = 4

○ Ml = 5

