

A satellite map of Israel and the surrounding Middle East region, showing the Mediterranean Sea to the west, the Red Sea to the south, and the Jordan River to the east. The text is overlaid on the map.

Antelope User Group Evolution in Israel - Foundation of the Israeli Antelope User Group (IAUG)

Ittai Kurzon

The Geological Survey of Israel

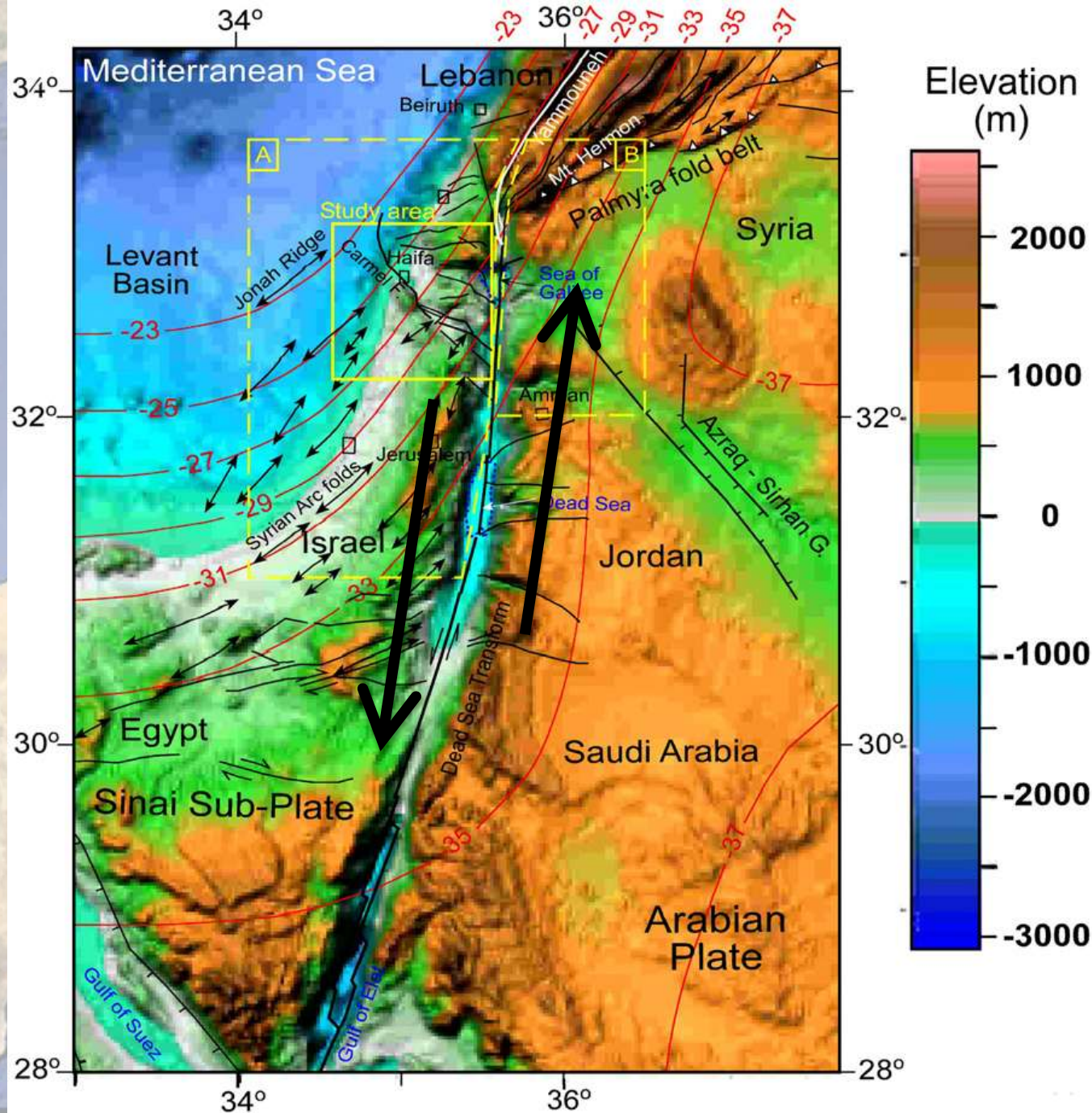
Rome

May 18, 2016

Data SIO, NOAA, U.S. Navy, NGA, GEBCO
Image Landsat

Google earth

Geological Settings



Presentation Outline

1. The Israeli Seismic Network - current stage
2. Future plans - upgrading the system and adding
EEWS capabilities
3. Antelope users in Israel
4. Antelope uses in Research in Israel

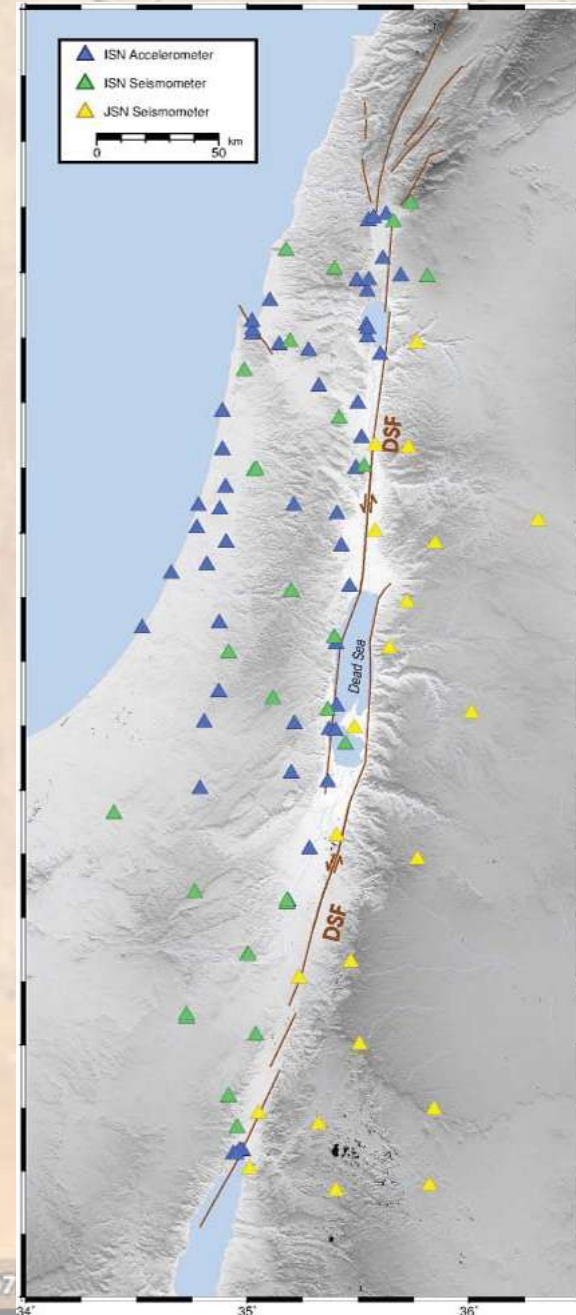
Data SIO, NOAA, U.S. Navy, NGA, GEBCO
Image Landsat

Google earth

1. The Israeli Seismic Network – Current Stage

- Short Period Analog stations – 10 stations, S-13 / L4-C
- Broadband Digital stations:
 - ISN – 11 stations, Trillium Compact 120s, Trident, VSAT
 - CTBTO – 2 3Ch stations, STS-2 / CMG-3T + Array of 16 vertical stations, CMG-3ESP, EuropeT, VSAT / Cellular / Optic

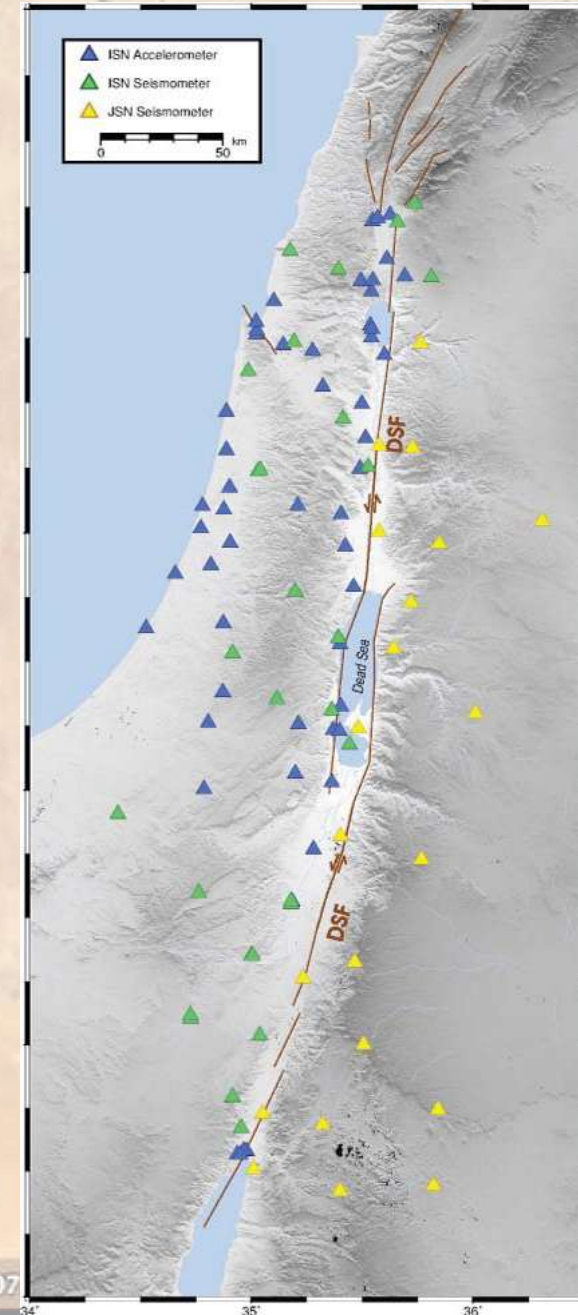
Data SIO, NOAA, U.S. Navy, NGA, GEBCO
Image Landsat



32°56'58.53" N 32°03'07"

1. The Israeli Seismic Network – Current Stage

- Broadband Digital stations:
 - CNF — 6 stations, STS-2, EuropeT, Cellular
 - GE — 2 stations, STS-2 / Trillium 240, Q330HR, VSAT / Cellular
- Accelerometer Network — 51 triggered stations, A800, and others



Data SIO, NOAA, U.S. Navy, NGA, GEBCO
Image Landsat

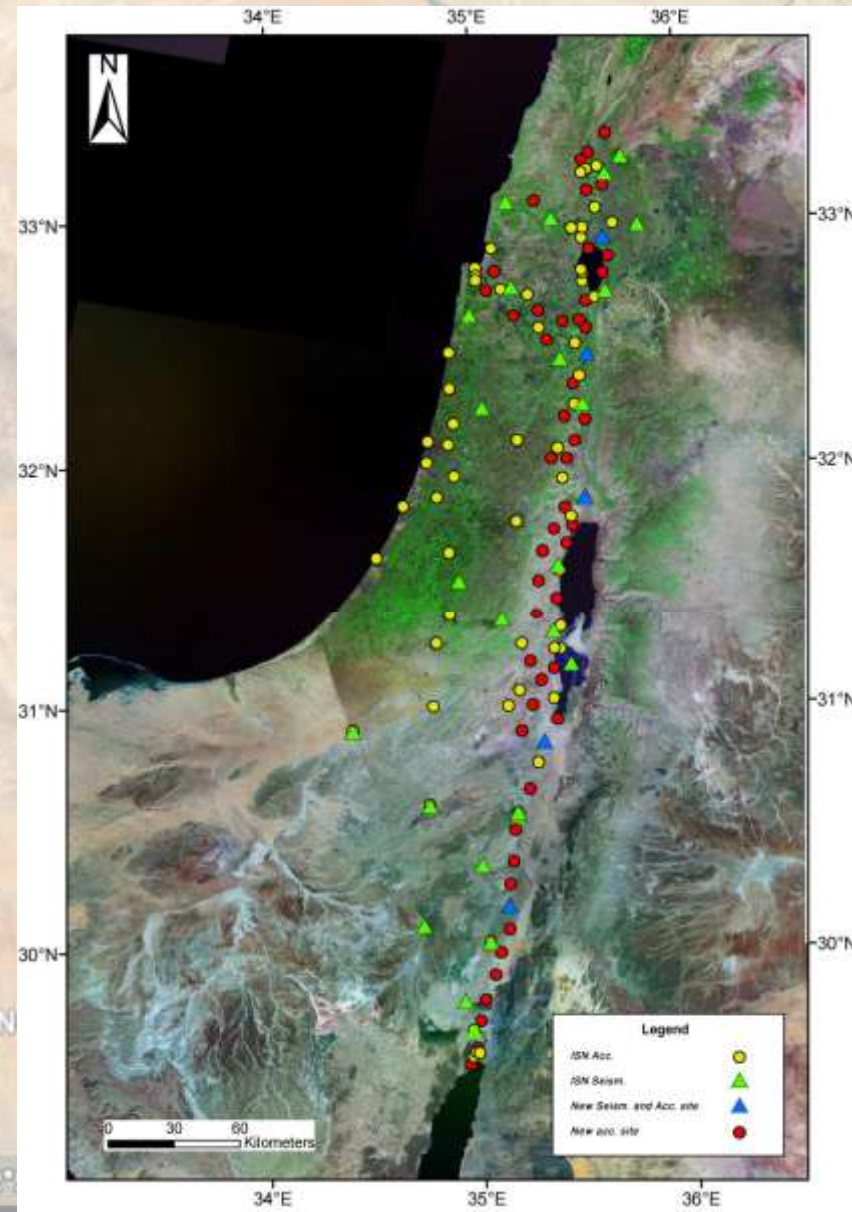
2. Future plans - upgrading the system and adding EEWS capabilities

Upgrading the network to full real-time seismic network

- EEWS International Committee

Recommendations

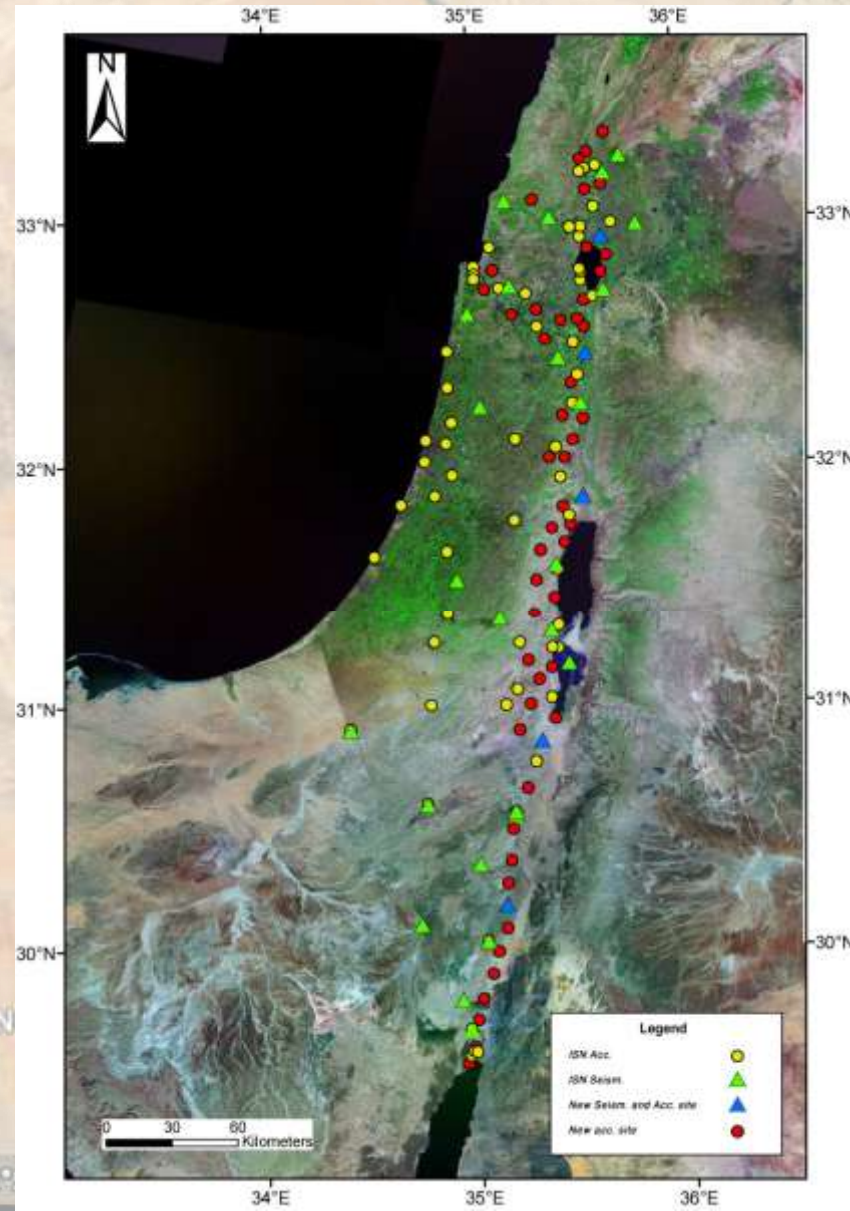
- 132 stations
- 35 stations with both, broadband seismometer and strong motion accelerometer
- 97 stations with strong motion accelerometers



2. Future plans - upgrading the system and adding EEWS capabilities

Upgrading the network to full real-time seismic network

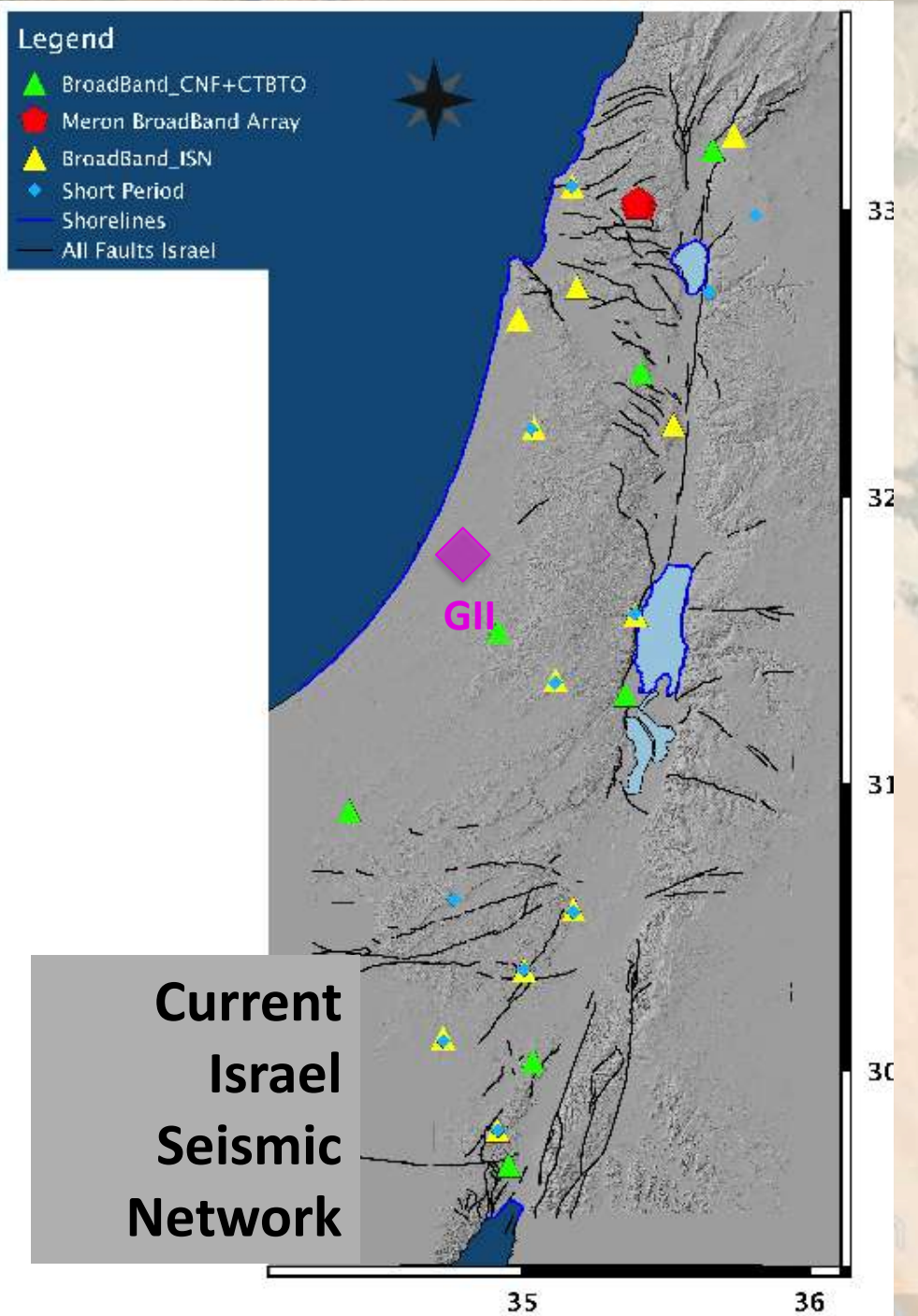
The stations are distributed through the country, with extra clustering of stations as a seismic fence along the two main fault systems : Dead Sea Fault (DSF) and Carmel Fault System (CFS).



Data SIO, NOAA, U.S. Navy, N Image Landsat

Upgrading the Real-time Network

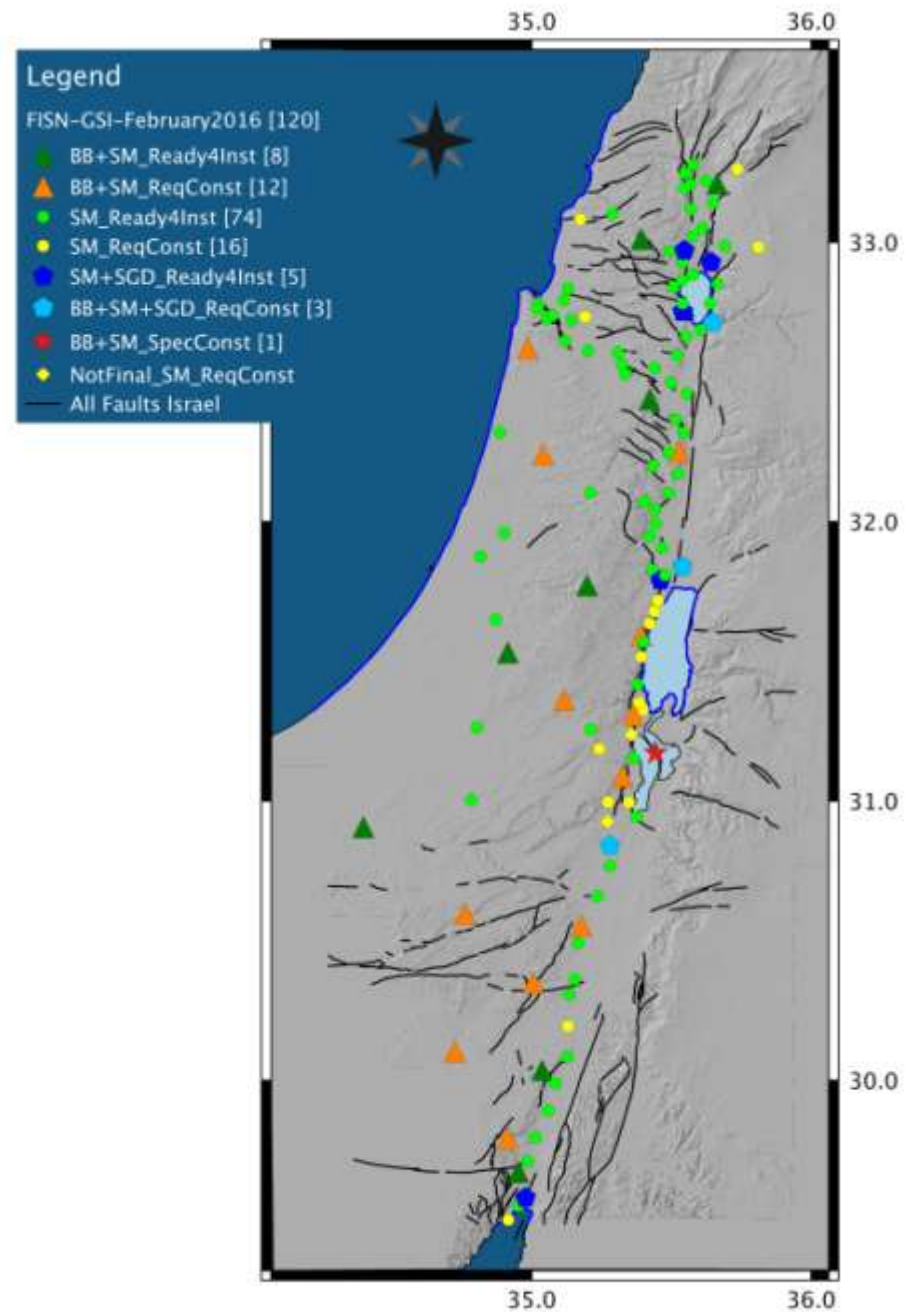
- **Low station coverage**
- **Accelerometer network is mainly triggered**
- **Large packet size (3-6s)**
- **Low sampling rate (40sps) at most stations**
- **In-house acquisition and processing software**



Station Distribution

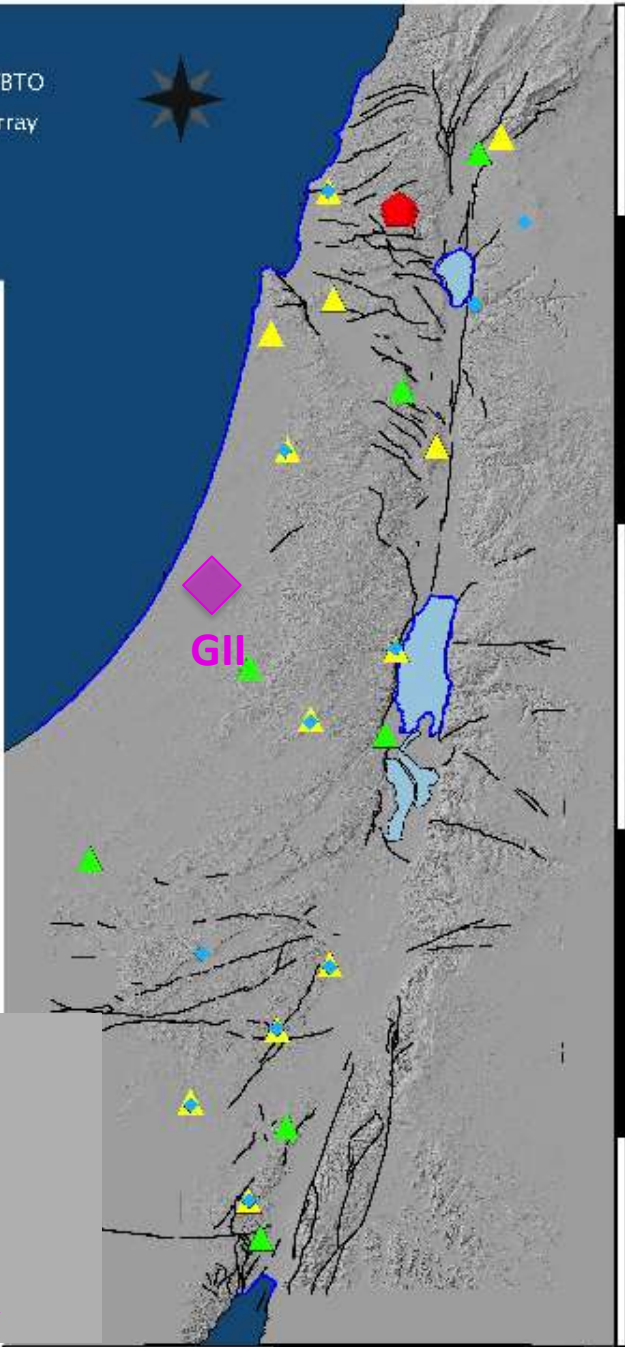
☐ 120 stations

- 79 Strong Motion stations in existing ready-for-installation facilities
- 8 BroadBand + Strong Motion stations in existing ready-for-installation
- 17 SM new stations require construction
- 15 BB+SM new buried stations
- 1 BB+SM special Construction in a 50m



Legend

- ▲ BroadBand_CNF+CTBTO
- Meron BroadBand Array
- ▲ BroadBand_ISN
- ◆ Short Period
- Shorelines
- All Faults Israel

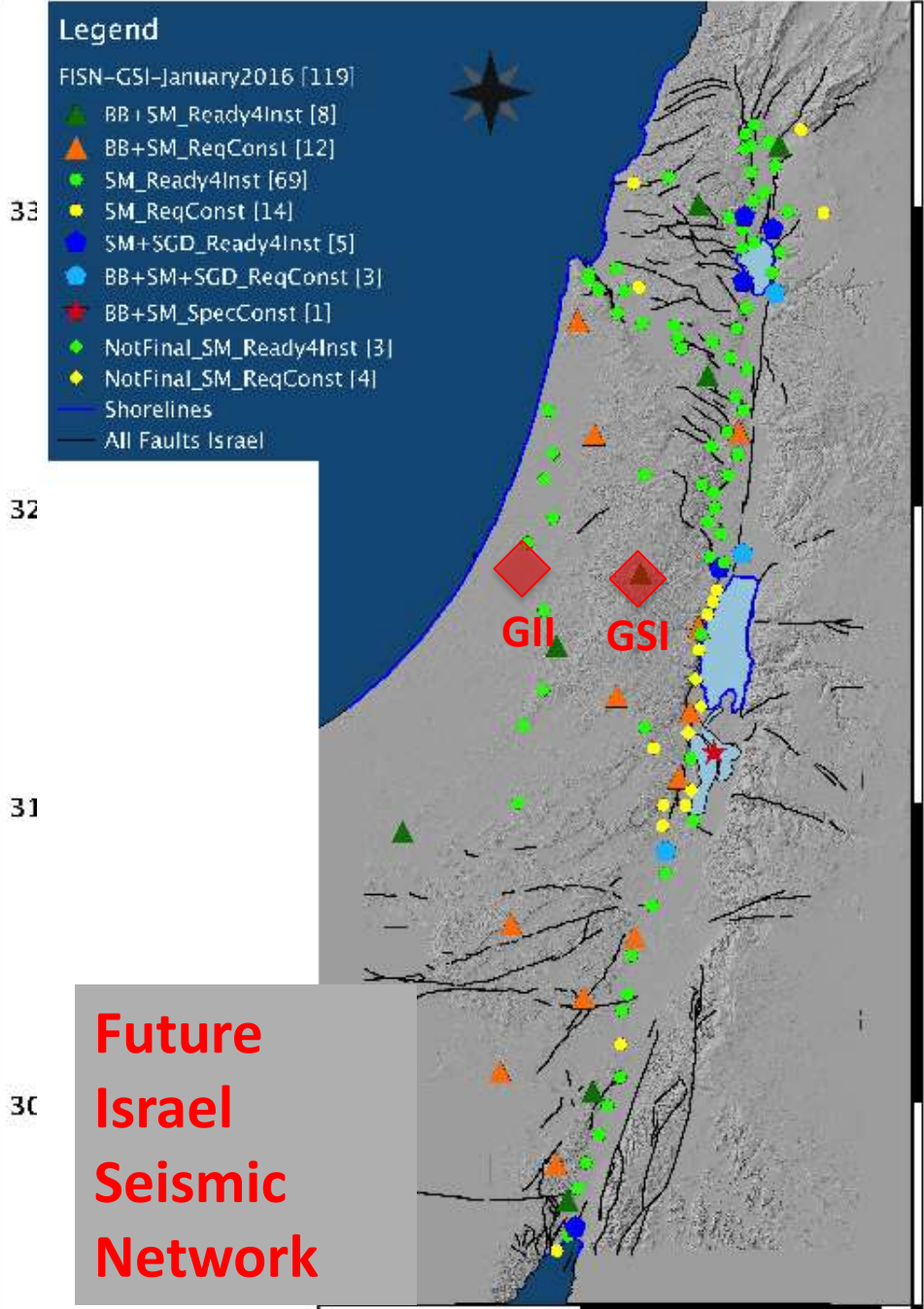


**Current
Israel
Seismic
Network**

35 36

Legend

- FISN-GSI-January2016 [119]
- ▲ BB+SM_Ready4Inst [8]
 - ▲ BB+SM_ReqConst [12]
 - SM_Ready4Inst [69]
 - SM_ReqConst [14]
 - SM+SGD_Ready4Inst [5]
 - BB+SM+SGD_ReqConst [3]
 - BB+SM_SpecConst [1]
 - ◆ NotFinal_SM_Ready4Inst [3]
 - ◆ NotFinal_SM_ReqConst [4]
 - Shorelines
 - All Faults Israel



**Future
Israel
Seismic
Network**

30 31 32 33 35 36

2. Future plans - upgrading the system and adding EEWS capabilities

Adding EEWS capabilities

- International committee (2012)
- Published a request for information (2014)
- Working on a tender for a turnkey solution (published December 2015, and should be submitted in ~3 weeks)
- Applying noise measurements at the potential sites (2013-2015)
- Sending a postdoc scholar to Berkeley to study the EEWS algorithms and systems (2014-2016)
- Transferring the Division of Seismology at the Geophysical Institute to a new department at the Geological Survey (????-????)

Data SIO, NOAA, U.S. Navy, NGA, GEBCO

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3. Antelope users in Israel

March 2015



Google earth

3. Antelope users in Israel May 2016

Gary Soleiman

Oshri Bashari

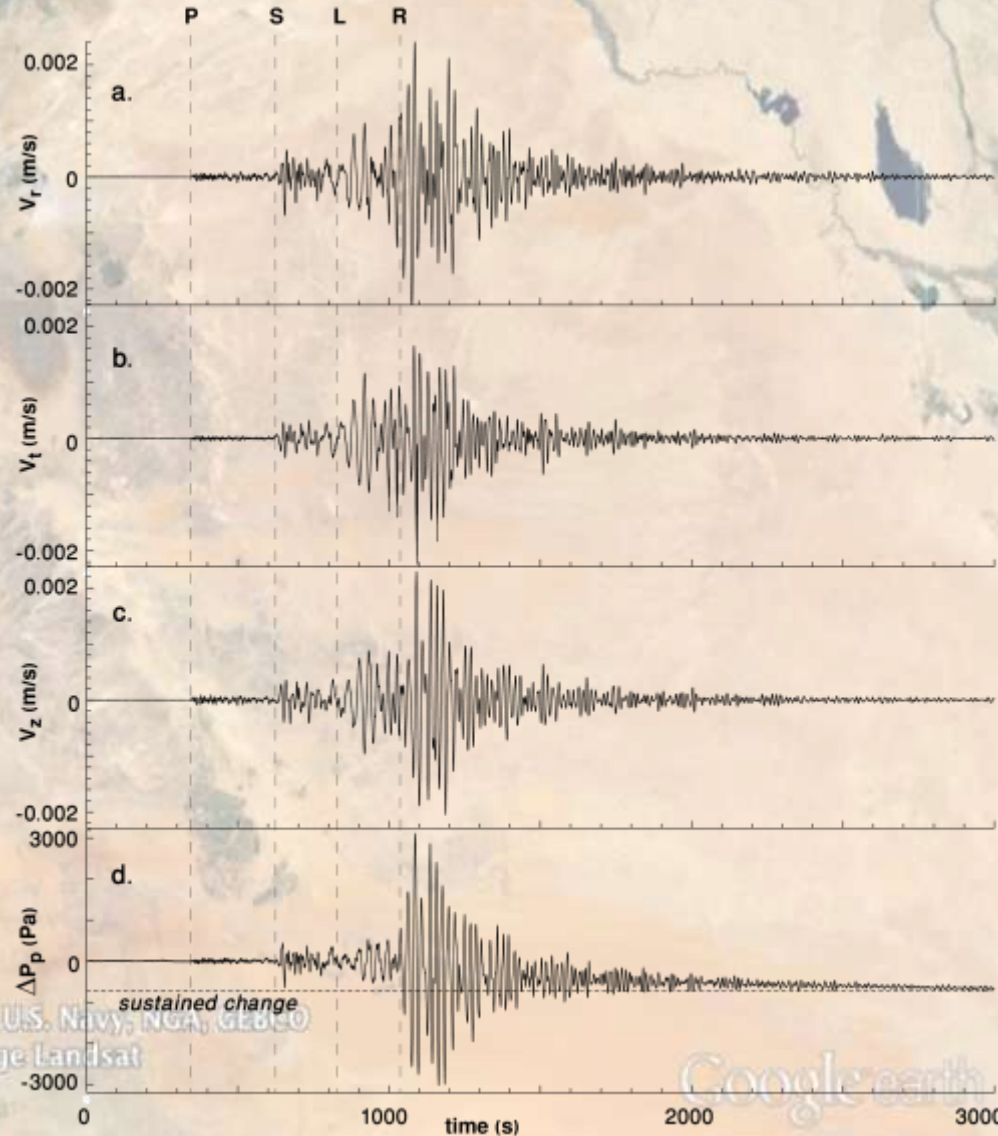


4. Antelope uses in Research in Israel

March 2015

Hydroseismology –

- Joined Database of both seismic and hydrological measures
- Signal processing using Antelope and the Matlab toolbox.
- With Dr. Eyal Shalev



Data SIO, NOAA, U.S. Navy, NGA, GEBCO
Image Landsat

Google earth

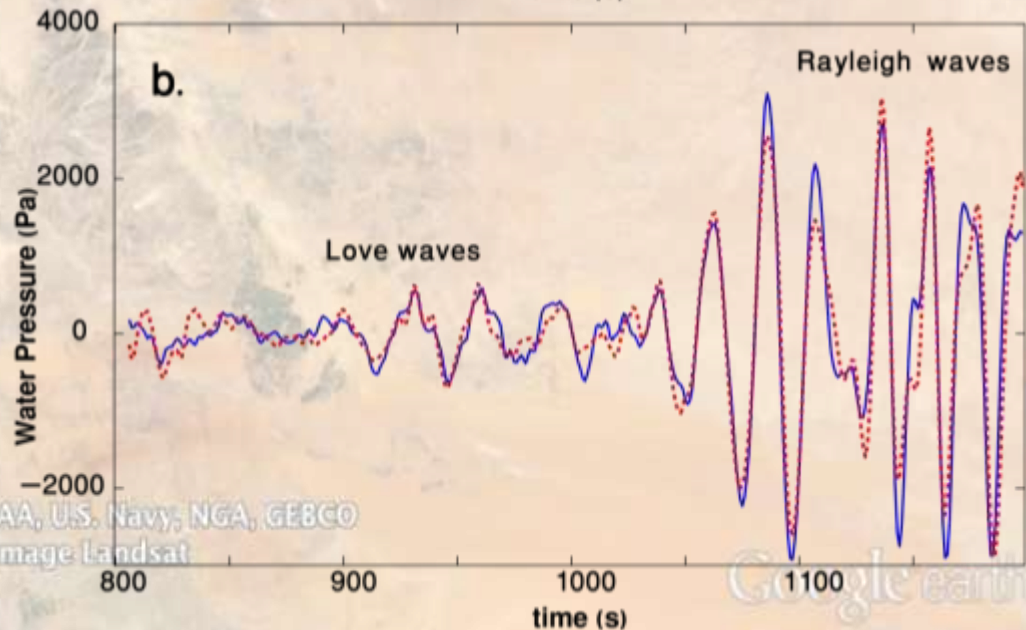
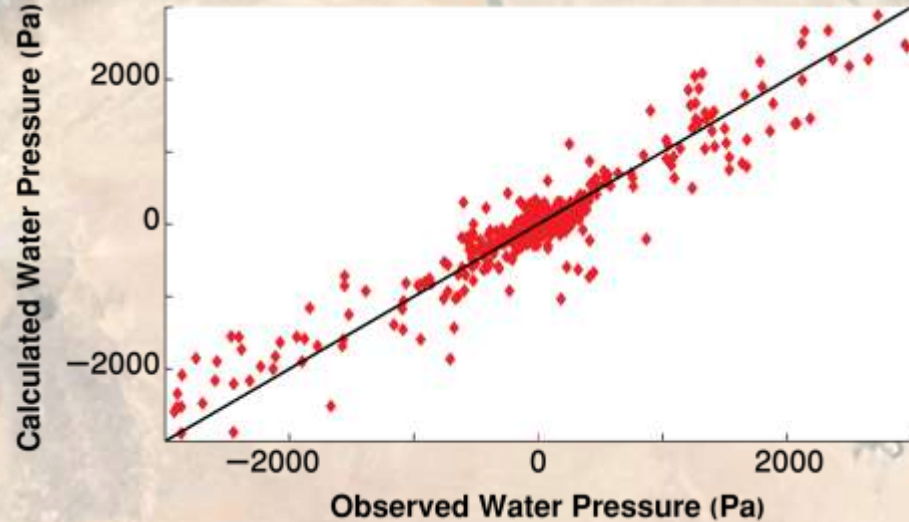
4. Antelope uses in Research in Israel

May 2016

Hydroseismology –

Shalev et al. 2016. Water Level Oscillations Caused by Volumetric and Deviatoric Dynamic Strains. *Geophys. J. Int.*, 204, pp. 841-851.

Shalev et al. submitted to GJI. Sustained Water Level Changes Caused by Damage and Compaction Induced by Teleseismic Earthquakes.



Data SIO, NOAA, U.S. Navy, NGA, GEBCO
Image Landsat

Google earth

4. Antelope uses in Research in Israel

March 2015

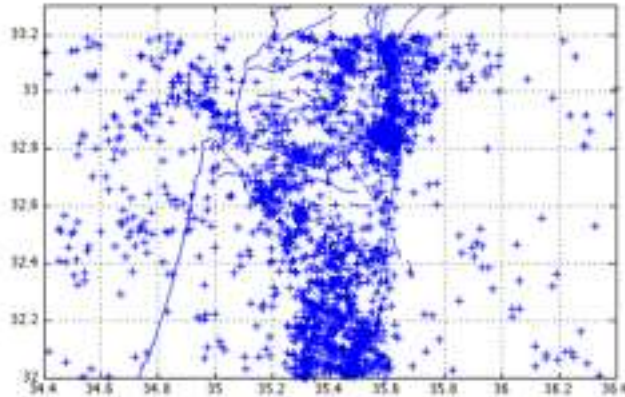
Re-Processing of the Israeli Seismic Catalogue

(1985 – 2015) –

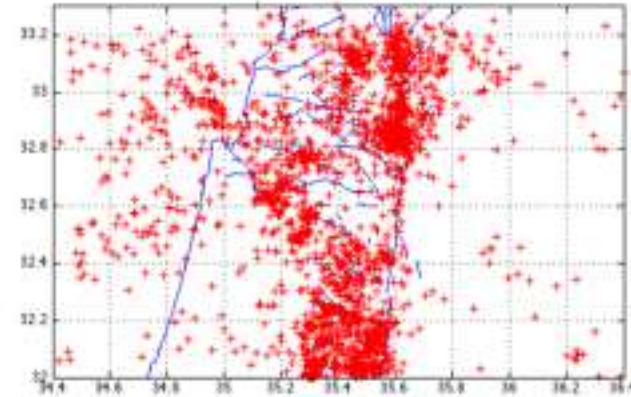
Galilee Subset

- 1985-2015
- 2500 events
- $1 < M < 3.5$
- $4 < \text{Phases} < 40$

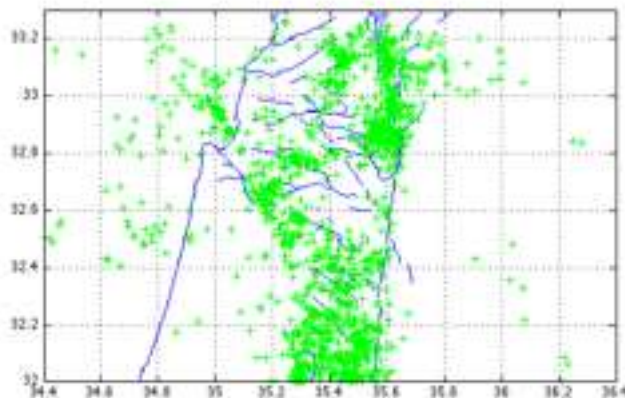
With Dr. Nadav Wetzler



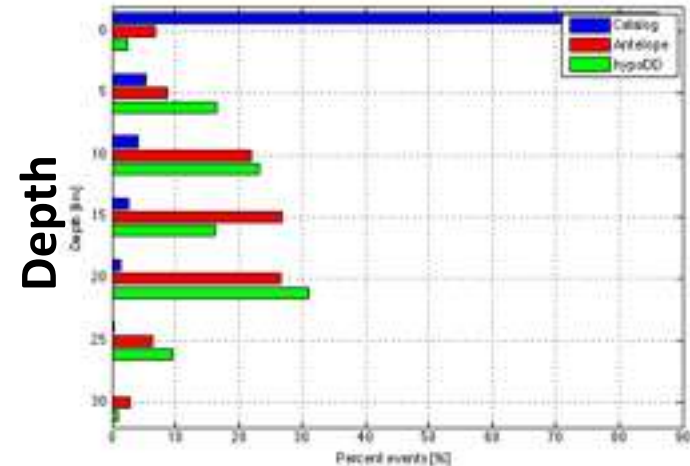
Original GII



Antelope



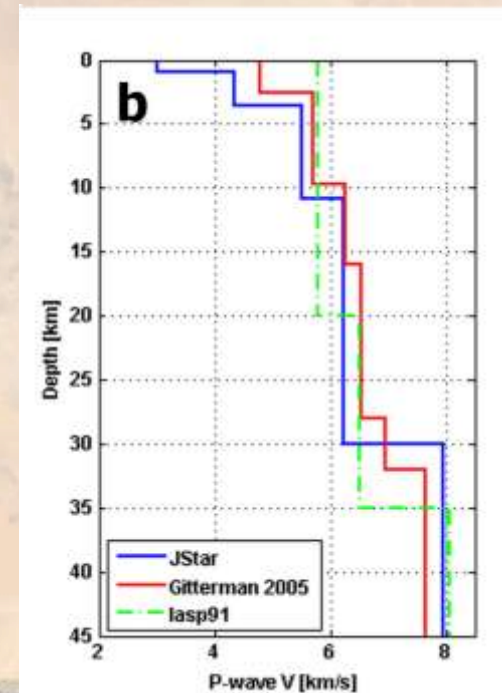
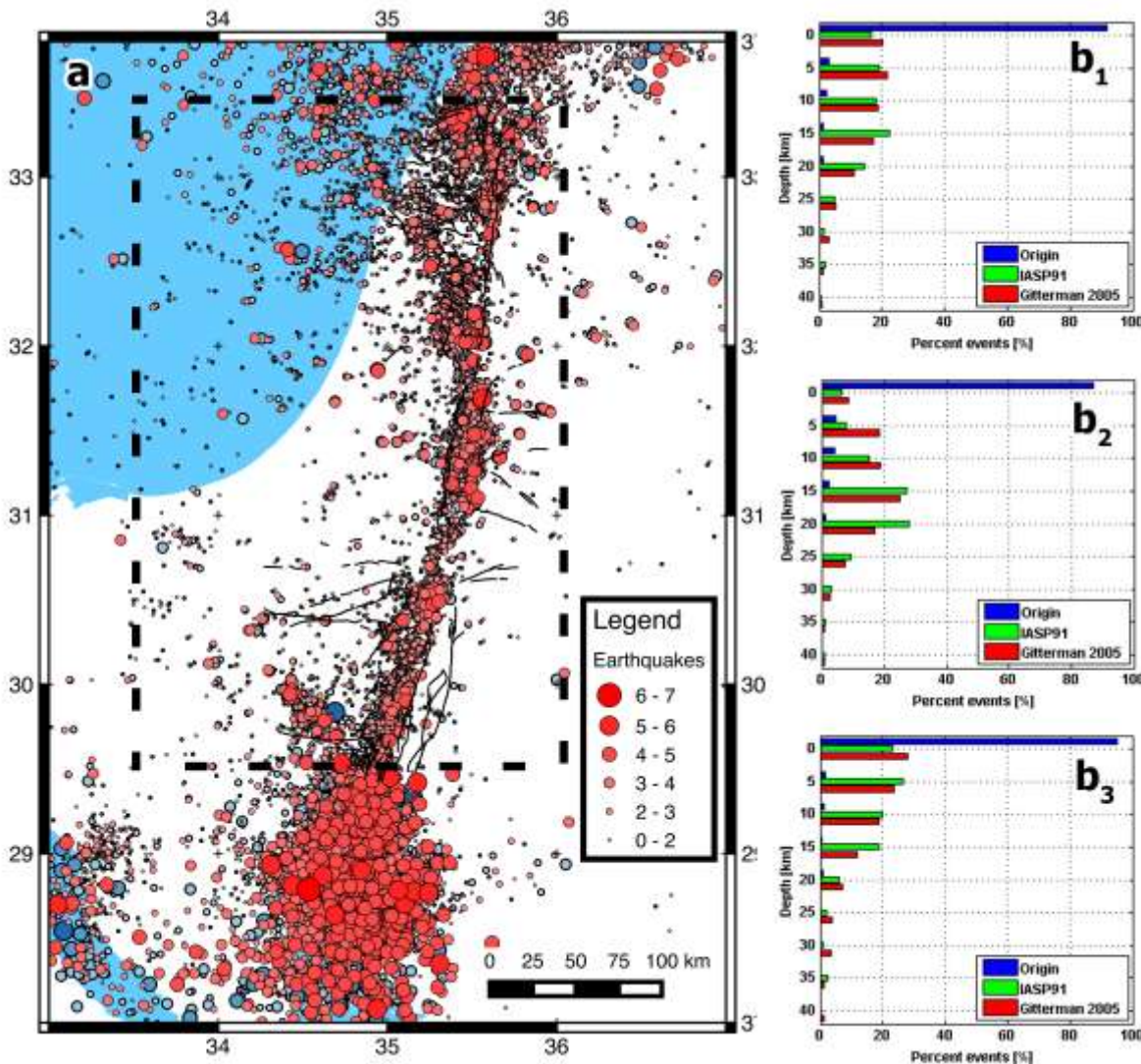
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4. Antelope uses in Research in Israel

May 2016

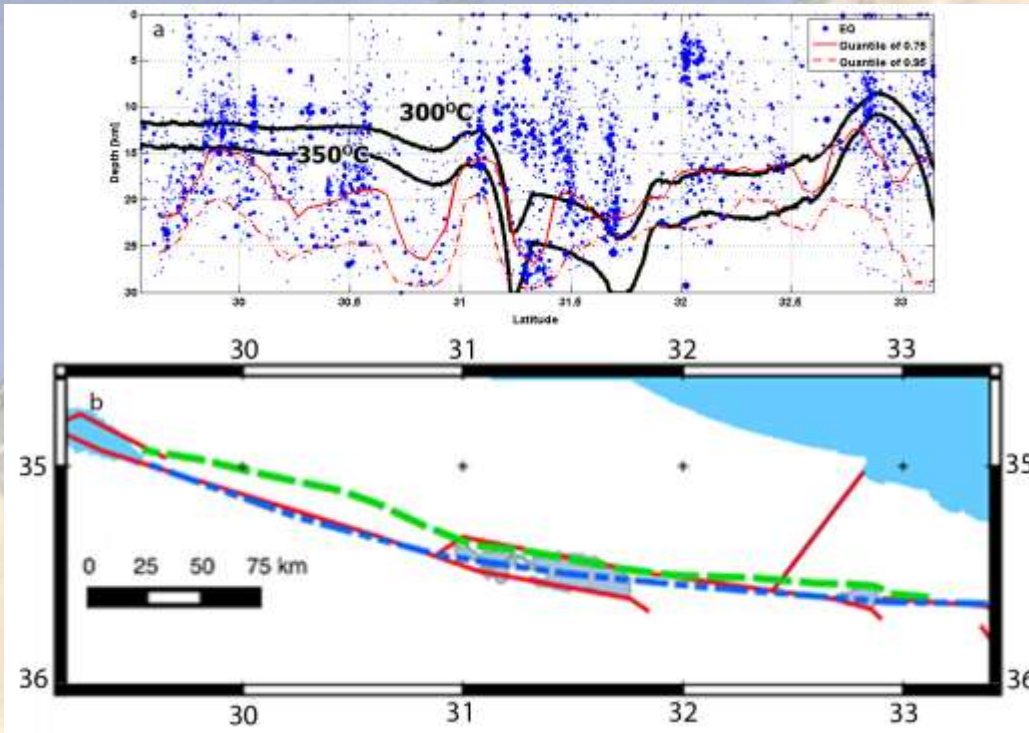
Relocations of the seismicity in the region 1985-2015



4. Antelope uses in Research in Israel

May 2016

Relocations of the seismicity in the region 1985-2015



Wetzler and Kurzon, 2016. The Earthquake Activity of Israel – Revisiting 30 years of Local and Regional Seismic Record along the Dead Sea Fault. *Seismol. Res. Lett.*, 87(1), pp. 47-58.

Wetzler et al. submitted to *Tectonophysics*, The relation between stress distribution and recorded seismicity in Northern Israel and its surroundings.

Google earth

4. Antelope uses in Research in Israel

March 2015

Exploring a seismic swarm in the Sea of Galilee in

October 2013

- Re-processing the waveforms, beginning with the detection level to increase the catalogue
- Deploying a portable network around the cluster area with a magnitude range of $M > -2$, and analyzing the seismicity for 6 months.

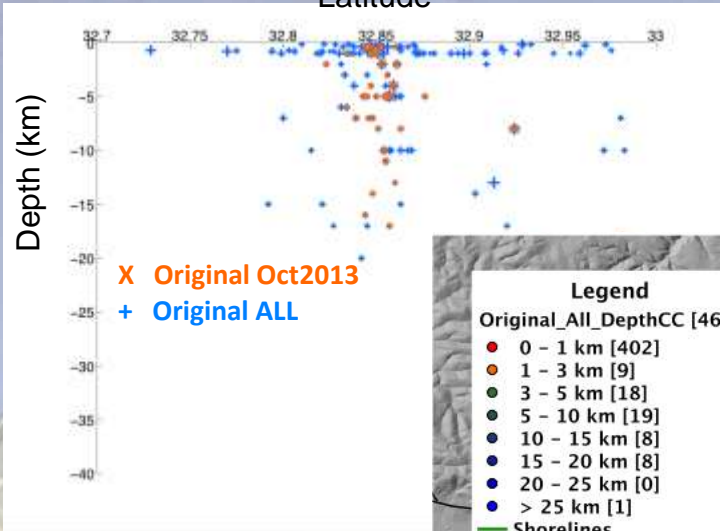


4. Antelope uses in Research in Israel

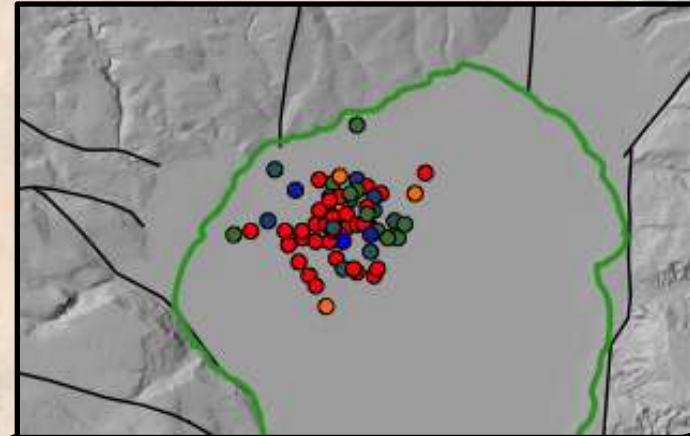
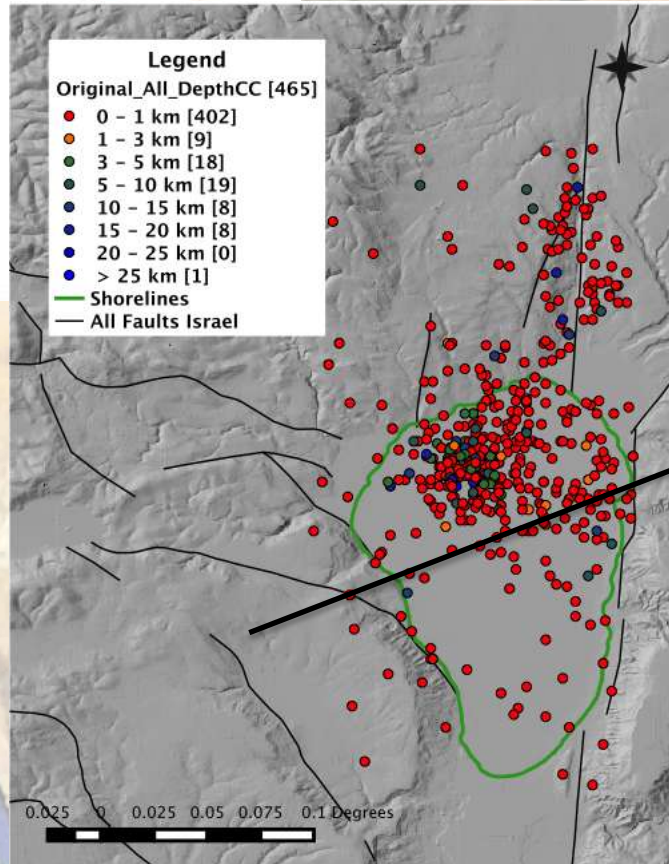
May 2016

Relocations of the events in the region in the past 30 years

Latitude



Original Catalogue



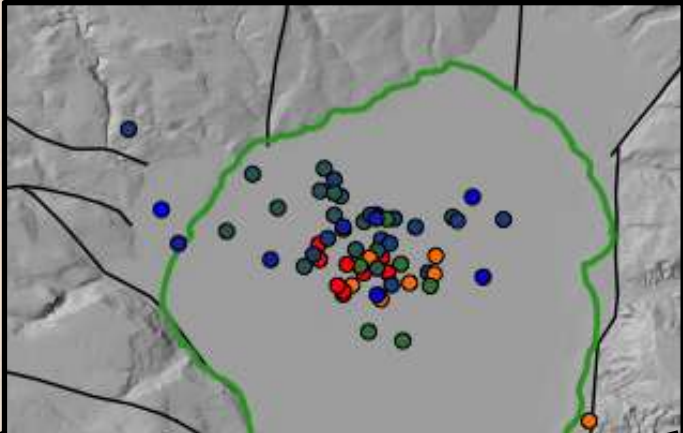
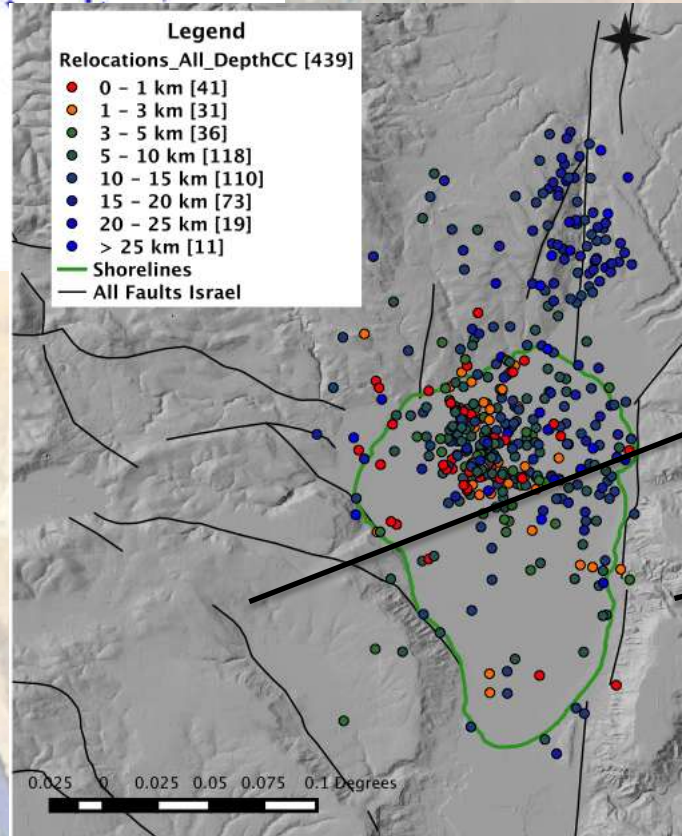
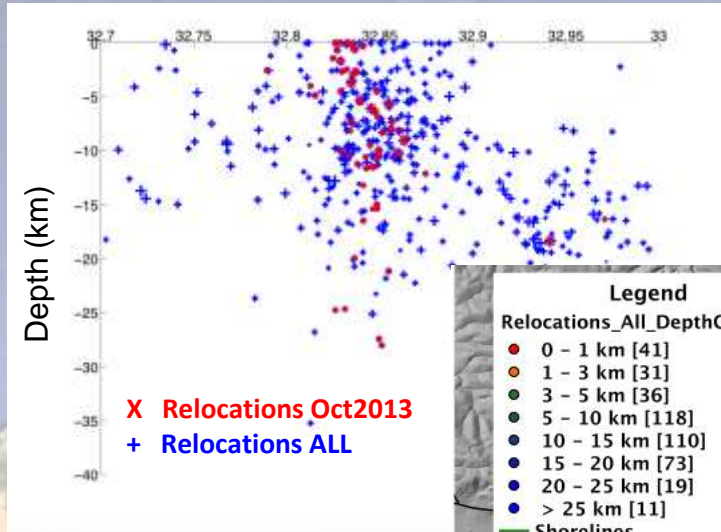
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4. Antelope uses in Research in Israel

May 2016

Relocations of the events in the region in the past 30 years

Relocated Catalogue



Google earth



Gary Soleiman

Oshri Bashari

Re-processing the waveforms:

- Manual Re-processing - increasing the seismic catalogue of the October 2013 seismic swarm
- Tuning Detectors in the station level

Metadata and Instrumentation:

- Metadata generation and handling of the existing network stations
- Metadata generation of the new research network we are deploying in the region

DAA, U.S. Navy, NGA, GEBCO
Image Landsat

Google earth



Deploying a portable network around the cluster area with a magnitude range of $M > -2$.

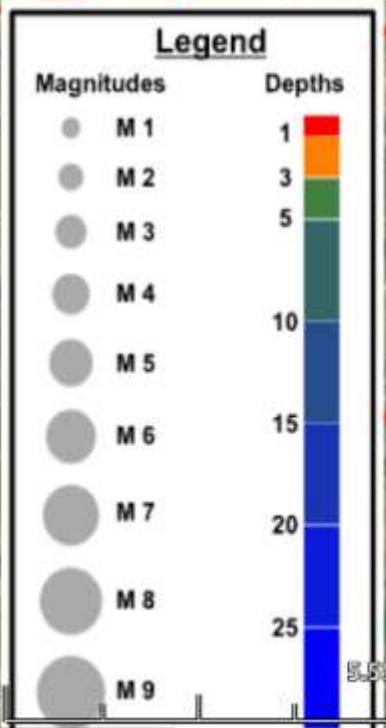
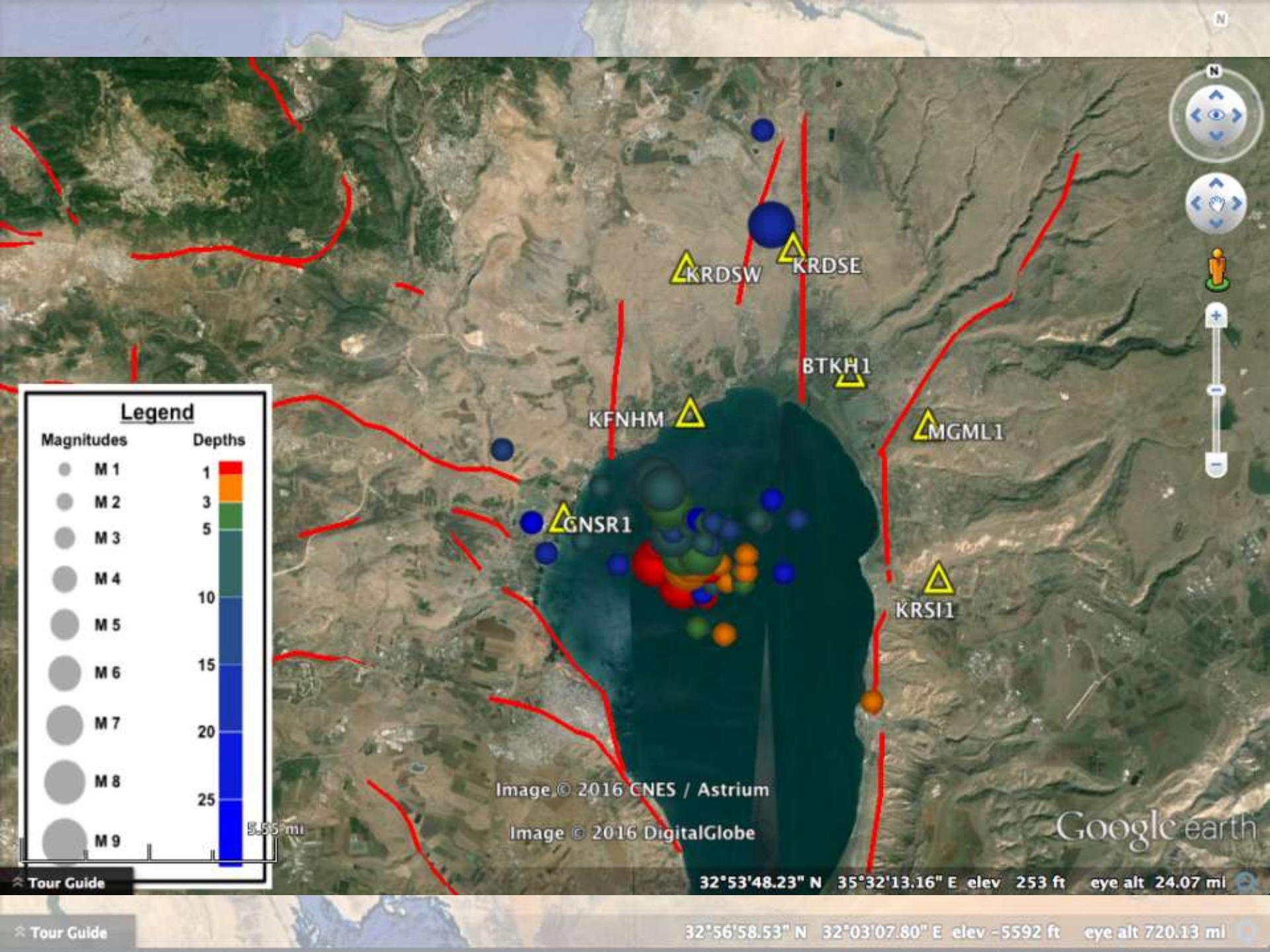


Image © 2016 CNES / Astrium

Image © 2016 DigitalGlobe

Google earth

32°53'48.23" N 35°32'13.16" E elev 253 ft eye alt 24.07 mi

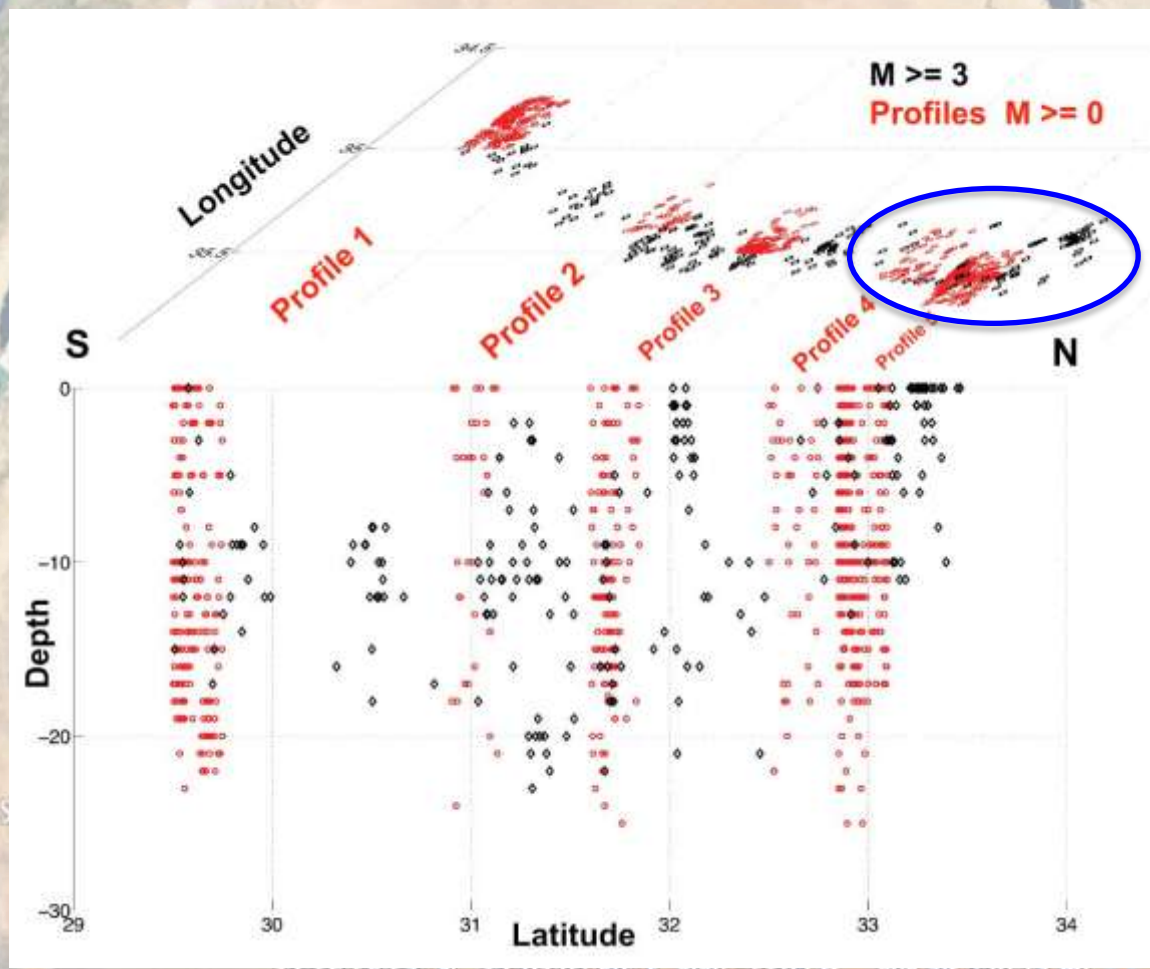
32°56'58.53" N 32°03'07.80" E elev -5592 ft eye alt 720.13 mi

Tour Guide

Tour Guide

Integrating the seismic observations with geodetic observations done along 5 profiles

Focusing on the 2 northern
Geodetic profiles and
collaborating with Dr. Yariv
Hamiel as part of a Israel
Science Foundation project



A satellite map of Israel and the surrounding Middle East region. The Mediterranean Sea is visible on the left, and the Red Sea is at the bottom. The land is mostly arid and brownish. The text is overlaid on the map.

4. Antelope uses in Research in Israel

March 2015

**Possibly will be part of the turnkey solution for the
new real-time seismic network ???**

Data SIO, NOAA, U.S. Navy, NGA, GEBCO
Image Landsat

Google earth

A satellite map of Israel and the surrounding Middle East region, showing the Mediterranean Sea to the west, the Red Sea to the south, and the Jordan River to the east. The terrain is a mix of coastal plains, hills, and desert.

4. Antelope uses in Research in Israel
May 2016

**Possibly will be part of the turnkey solution for the
new real-time seismic network ???**

Thank you

Data SIO, NOAA, U.S. Navy, NGA, GEBCO
Image Landsat

Google earth



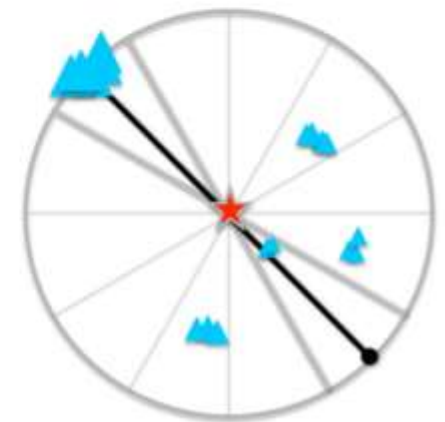
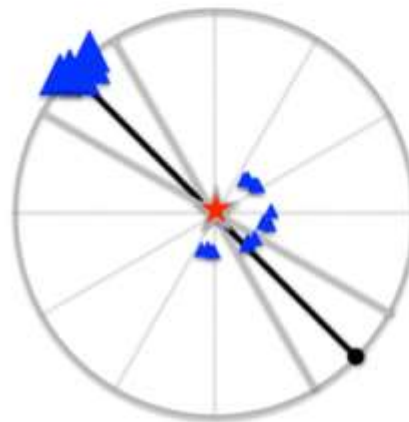
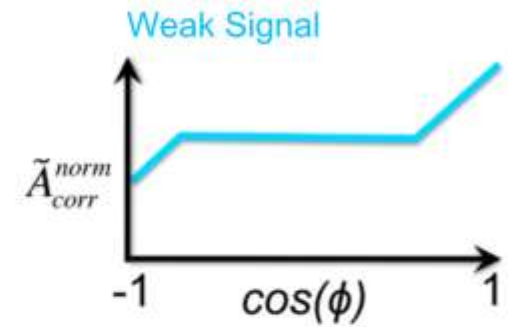
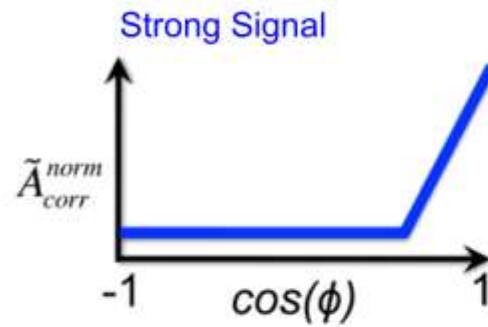
Data SIO, NOAA, U.S. Navy, NGA, GEBCO
Image Landsat

Google earth

4. Antelope uses in Research in

Directivity analysis of small earthquakes using peak amplitudes –

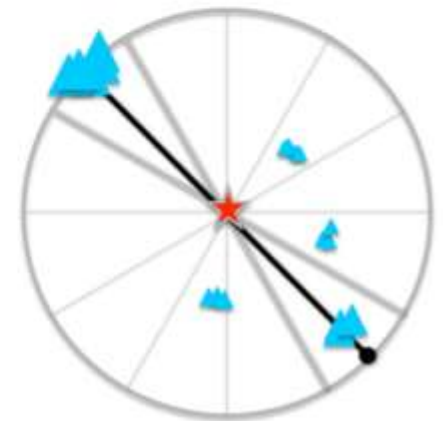
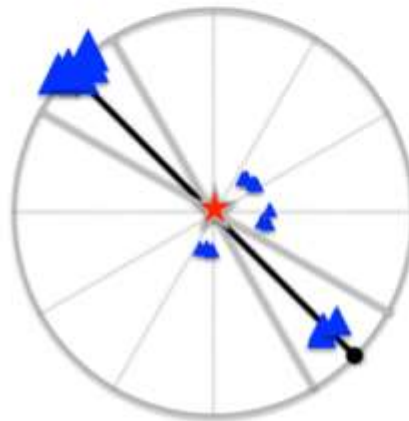
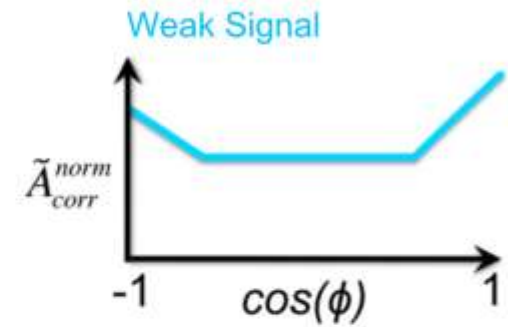
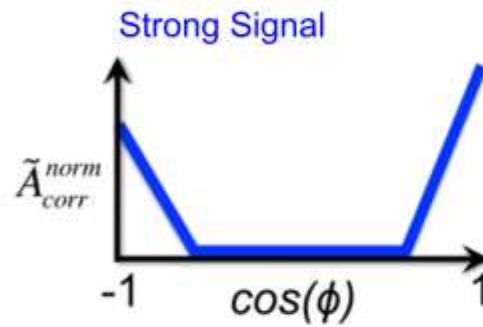
a) Unilateral Rupture



4. Antelope uses in Research in

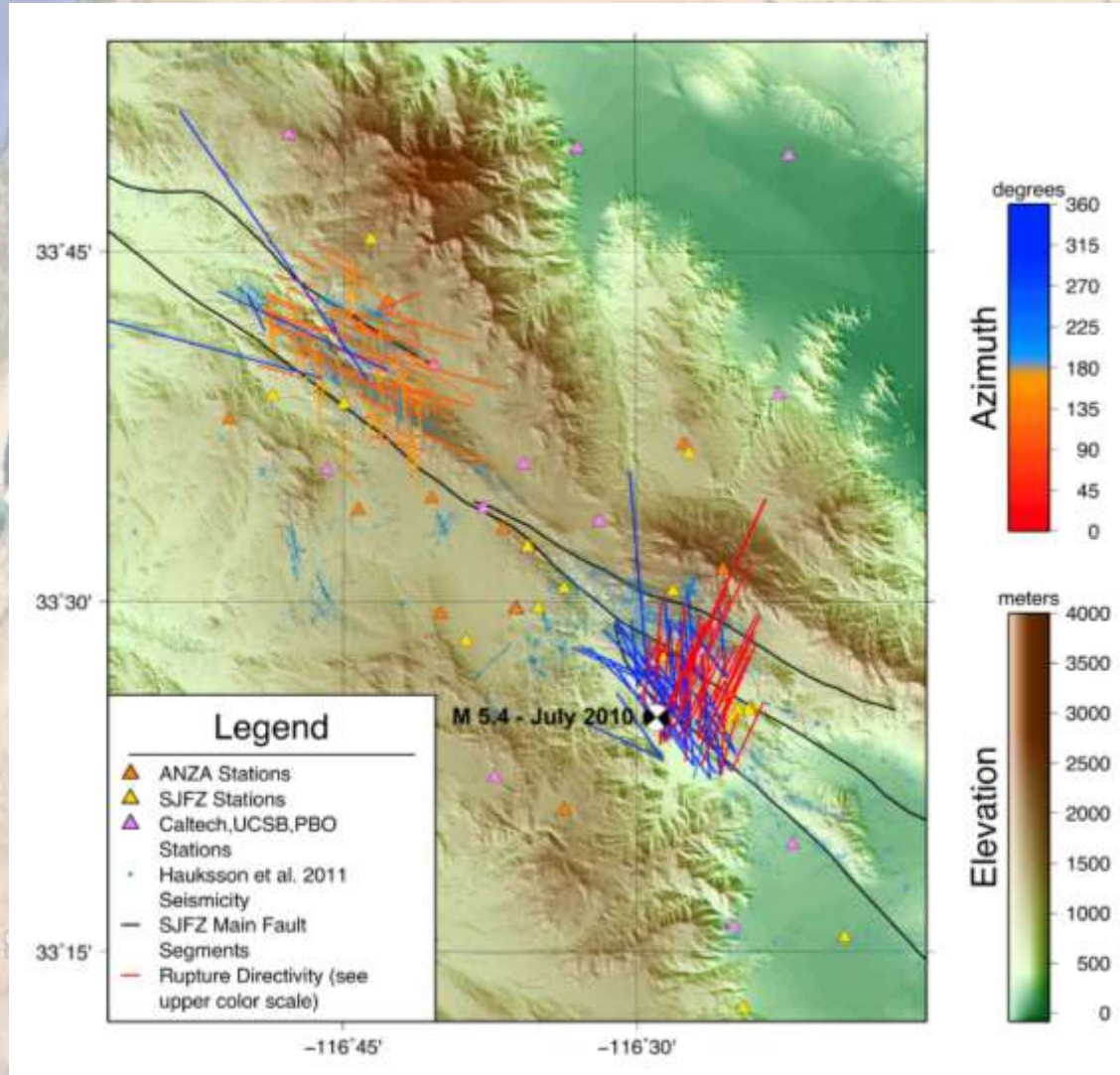
Directivity analysis of small earthquakes using peak amplitudes –

b) Bilateral Rupture



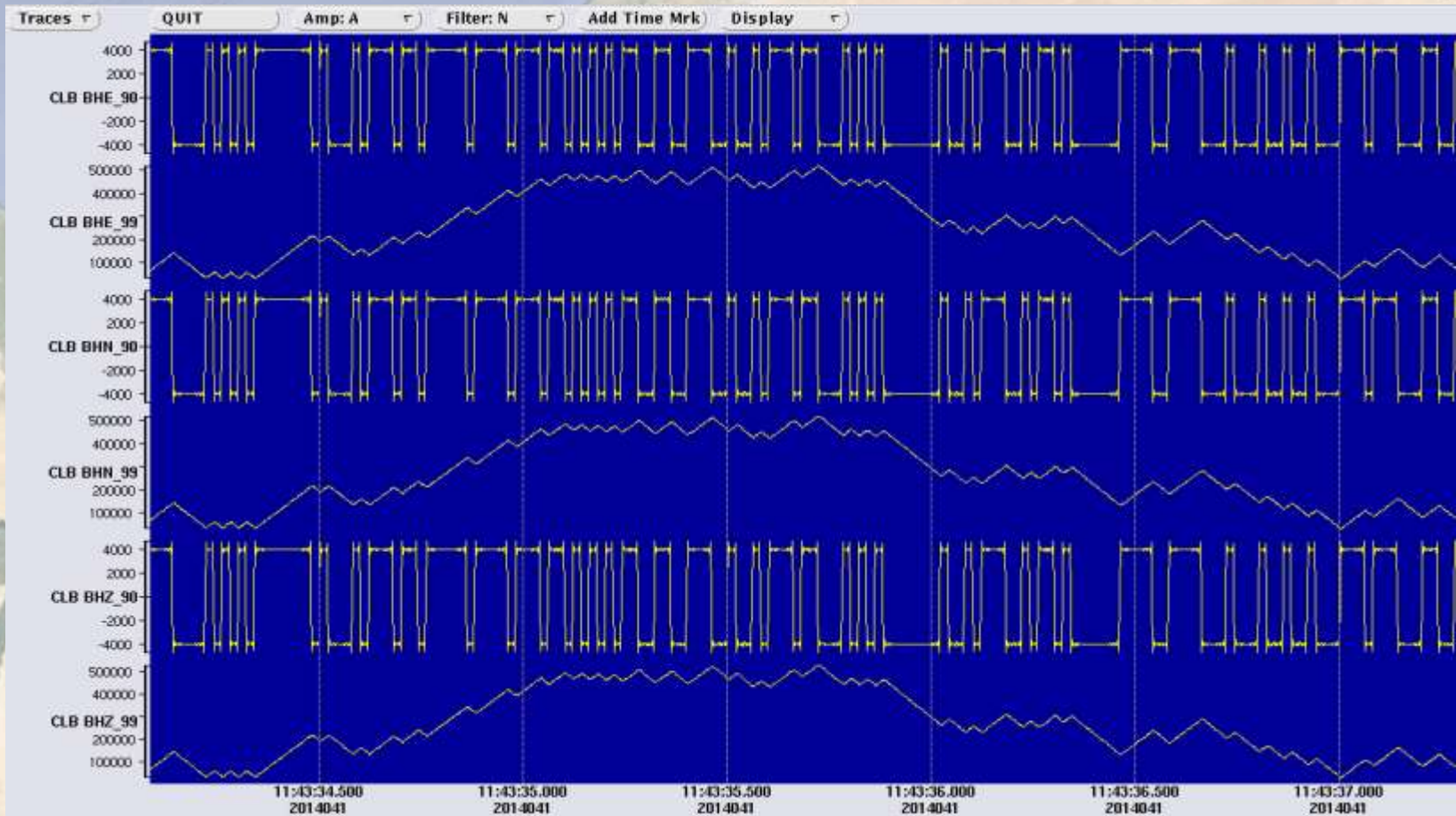
4. Antelope uses in Research in

Directivity analysis of small earthquakes using peak amplitudes –



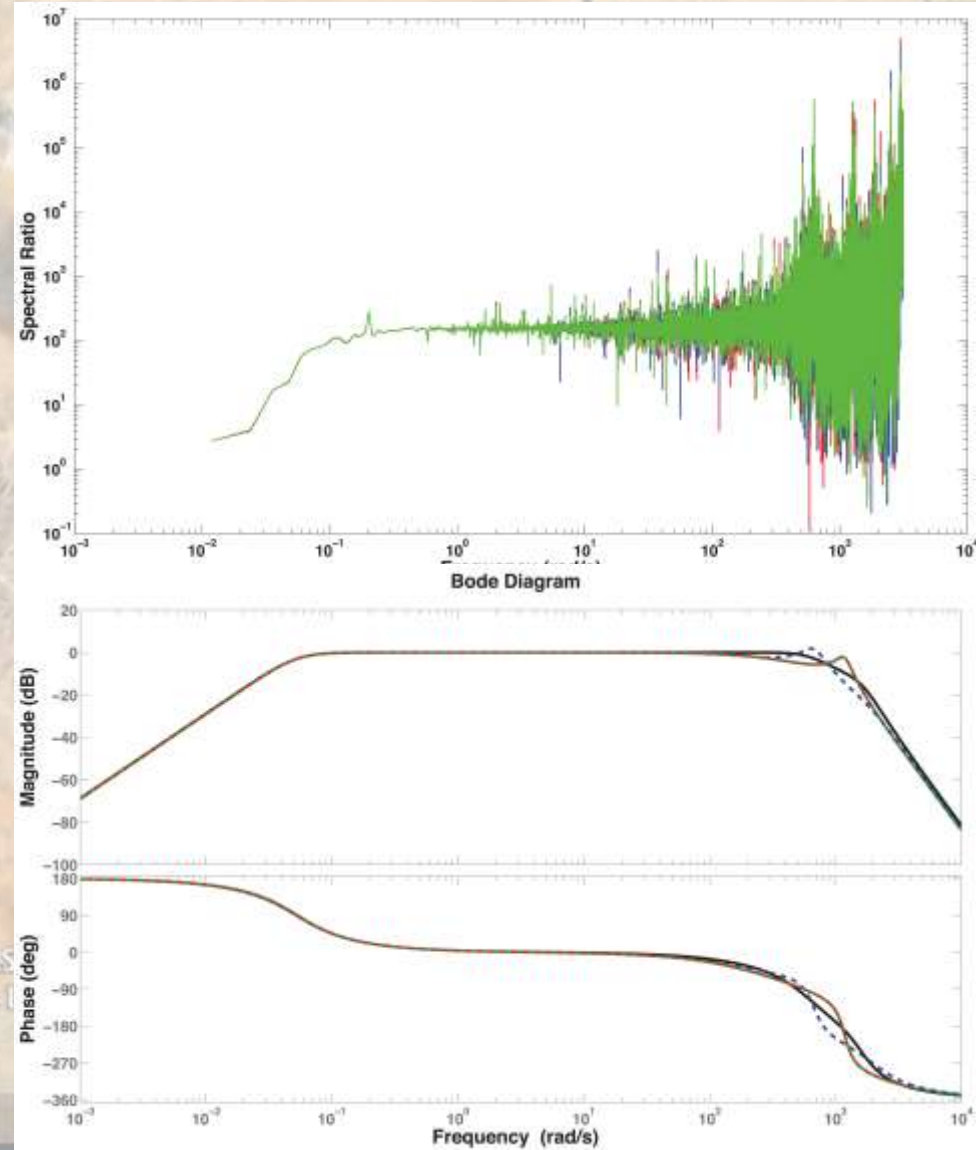
4. Antelope uses in Research in Israel

Calibration of seismic station –



4. Antelope uses in Research in Israel

Calibration of seismic station –



Data SIO, NOAA, US
Image I

4. Antelope uses in Research in Israel

Re-Processing of the Israeli Seismic Catalogue

(1985 – 2015) –

Clustering of events -

