An Event Database for Rotational Seismology

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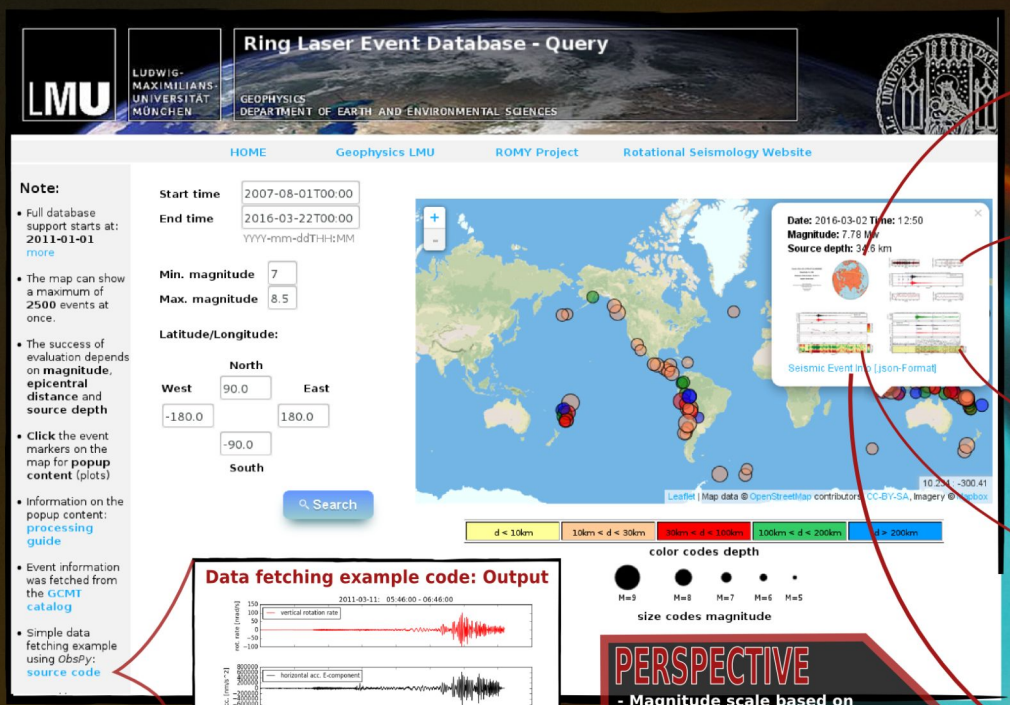
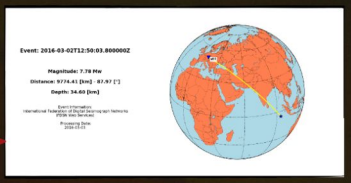
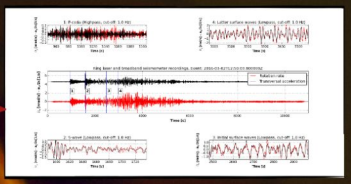
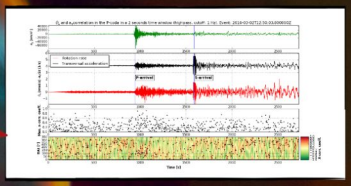
SCOPE

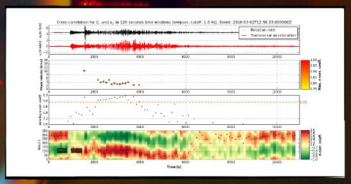
Ring laser sensors can record rotational ground motions, e.g. induced by earthquakes. This relatively recent observation yields an ample scope for new applications, including surface wave velocity models and a Love wave earthquake magnitude scale. The presented event database provides vivid plots of processed ring laser recordings compared to parallel recordings of a STS-2 Seismometer in Wettzell (SE Germany). Metadata is extracted and made publicly available for further processing.



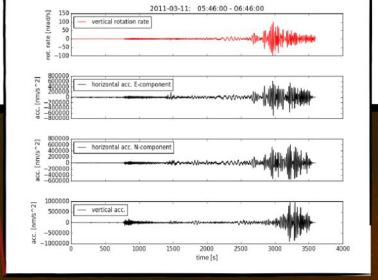








Data fetching example code: Output



PERSPECTIVE

- Magnitude scale based on rotational ground motions
- Inclusion of other ring lasers
- Statistical analysis of peak ground motions
- Analysis of azimuthal effects
- Local, one-station tomography

powered by ROMY ROtational Motions in seismology

Which Metadata is contained/accessible?

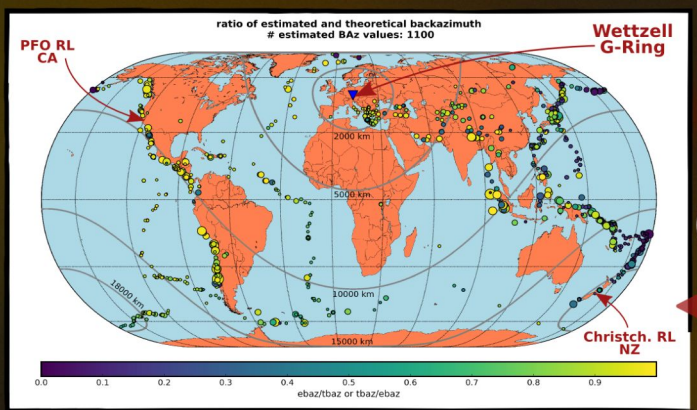
These json-dictionary-format files contain fetched and processed information about the event, such as:

> **Station specifics:** network, station, channel, location, data select source of ring laser and seismometer

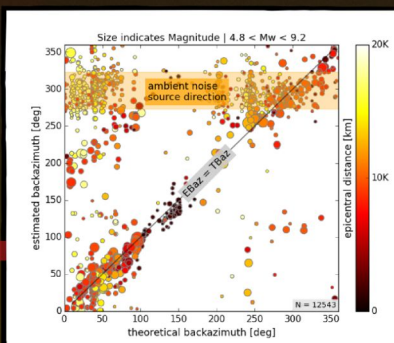
> **Event specifics**: event id, start and end time, magnitude, depth, epicentral distance, theoretical BAz

> **Calculated parameters**: estimated backazimuth, peak transverse acceleration, peak vertical rotation rate, frequency at peak rotation rate, peak correlation coefficient, signal-to-noise ratios (SNR), mean phase velocities

Applications and Tests



1

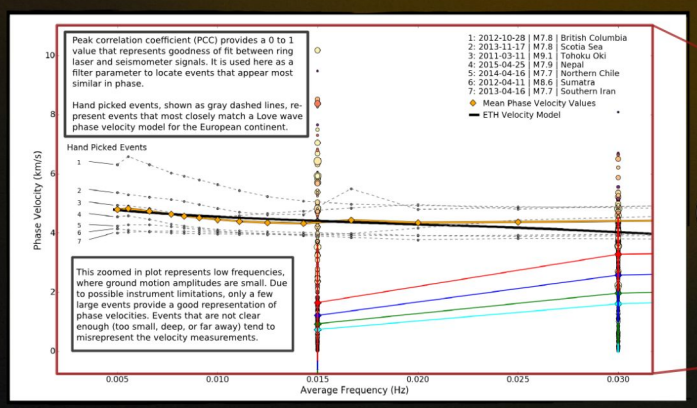


1 Back azimuth estimation

As a measure of signal quality and to cross-check the waveform-similarity, a back azimuth estimation is performed.

The best fitting BAz is determined by grid-search rotation of the horizontal acccelerometer components in comparison to the rotation rate measurements.

The rotation angle at maximum correlation between transverse acceleration and rotation rate yields the best estimated back azimuth.



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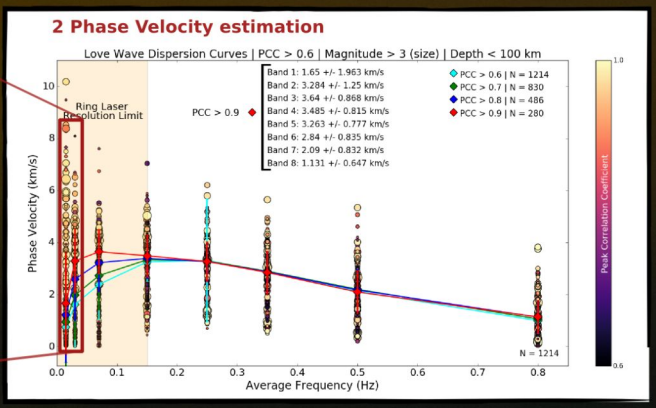

Related Publications:

Igel, H., A. Cochard, J. Wassermann, A. Flaws, U. Schreiber, A. Velikoseltsev, and N. Pham Dinh (2007). **Broad-band observations of earthquake-induced rotational ground motions**. Geophys. J. Int., 168(1), 182-197, doi: 10.1111/j.1365-246X.2006.03146.x.

Igel, H., U. Schreiber, A. Flaws, B. Schuberth, A. Velikoseltsev, and A. Cochard (2005). **Rotational motions induced by the M8.1 Tokachi-oki earthquake**, September 25, 2003, Geophys. Res. Lett., 32, L08309, doi:10.1029/2004GL022336

Hadziioannou, C., P. Gaebler, U. Schreiber, J. Wassermann, and H. Igel (2012), **Examining ambient noise using co-located measurements of rotational and translational motion**. J. Seismol., 16(4), doi:10.1007/s10950-012-9288-5.