

Global Observation of Rotational Ground Motions: Towards a Unified Data Portal and “Real-Time” Analysis

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Abstract

During the last years, several ring lasers were installed at different sites over the globe (Wettzell - Germany, Canterbury – New Zealand, Pinon Flat - USA, Hendrix collage, Arkansas - USA). While the original intention for installation was mainly observation changes in earth rotation, several research groups had already shown that using ring laser technology facilitate the observation of seismological induced rotational ground motions. This in turn gives new or additional insights into seismic wave propagation, source mechanisms and the subsurface structure.

Non standardized data access procedures, however, as well as diversity in data formats and analysis techniques makes exchange and usability of this new quantity rather sluggish and closed for the international seismological community. In this context, we present technical solutions for these problems, which are mostly adapted from seismological data centers. As data exchange format we propose standard SEED format, heavily used by international seismological data centers (IRIS, ORFEUS), while the raw data itself are distributed and stored as miniSEED records in order to standardize the data transfer. We demonstrate the data distribution of one specific ring laser (Wettzell, Germany) using a software known as ArcLink (GFZ-Potsdam, ORFEUS). The ArcLink protocol as well as the data transfer protocol SeedLink (GFZ, ORFEUS) facilitate a de-centralized data archive, reducing the technical requirements for such data centers.

Using the data from Wettzell ring laser, we further demonstrate the advantage of using standard seismological recording systems together with Seedlink protocol resulting in a tremendous resolution increase through digital rather analog demodulation and in automatic processing (preprocessing of the data). Altogether these techniques form first steps for easy accessible event data, ready to be used in seismological standard analysis.