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Rotational Seismology Achievements from an Instrumentation Point of View – How precise is precise enough?

Abstract: Rotational seismology has become a strongly developing field of study of all aspects of rotational movements. Its development was pushed by the appearance of highly advanced sensors. The number of recordings connected with rotational seismology was growing and growing and it is still increasing. Classically, in seismology there were only translational motions registered, nevertheless, it turned out that an additional three rotational degrees of freedom can provide significant information both in seismological areas as well as in constructing engineering structures. The paper presents firstly the importance and attractiveness of rotational seismology. Then, it focuses on the instrumentation requirements. A review of the most advanced rotational sensors and their recording is also present. Finally, the Author's technological solution is presented. FOSREM-3D (Fiber Optic Seismograph for Rotational Events Monitoring) is an innovative, autonomous system for monitoring mining events and other seismic phenomena. It is based on the Fiber Optic Gyroscope technology and allows for to detection of rotation in three axes. The key innovation is the direct and autonomous monitoring of rotational vibrations. This system is used to study rotational movements occurring in basic sciences (seismology: broadband, weak and strong shocks, earthquake physics, seismotectonics, geodesy, gravity wave research) as well as in engineering and technical sciences (torsional strength: buildings, dams, wind farms, resistance of buildings to torsional vibrations, rock mass movements). Moreover, the data from two systems correlation tests are presented as well as recordings of artificial explosion.

Keywords: rotational seismology, detection, optical fiber sensor, processing, recording