

## Rotational Signals in the P Coda

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### ABSTRACT

The collocated observations of rotations around a vertical axis and translations obtained by a 4x4m ring laser and traditional broad-band seismometer recently in Germany opened opportunities to extract information that may not be contained in classical three-component recordings. By investigating the cross-correlation between transverse acceleration and rotation rate around a vertical axis we recognized that there are significant rotational motions in the P coda of seismic signals. Theoretically, in spherically symmetric isotropic media we should not observe a vertical component of rotation before the onset of SH waves.

Two possible explanations for this phenomenon are: (1) Tilt of the Earth's surface caused by P waves pollutes the ring laser measurements; (2) P-SH converted energy (because of 3D effects) close to the receiver. In this study, tilt in the P coda of seismic signals as well as its effects on the ring laser records have been calculated from available translation data. Seismograms (translations + rotations) at the surface of homogeneous and random media caused by a simple plane P wave were also simulated. These calculations indicate that P coda rotations are mainly due to P-SH scattering. The result may eventually provide a means to estimate near receiver P-SH scattering in a quantitative way, thereby separating out the SH contribution in the scattering field.

**Keywords:** cross correlation, transversal acceleration, rotation, tilt, scattering.