# Rotation Measurements in Seismological Observatories: Ojców (Poland), Książ (Poland), l'Aquila (Italy) and on Pasterze Glacier (Austria)

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## ABSTRACT

We present the rotation seismograph system and we demonstrate how to derive spin and twist rotation motions from its records. The twist motion represents rotational oscillations of the main shear axes including the changes of shear time rates magnitudes.

We present some examples of records obtained at observatories in Ojców and Książ (Poland) and l'Aquila (Italy) where we have installed the vertical rotation systems (vertical rotation system consists of horizontal pendulums) permitting to derive the spin and twist motion related to the vertical axis. From four sensors, two rotation components were calculated: the *spin* or rotation, and the *twist*.

The temporary measurements on the Hans Glacier (Spitsbergen) and Pasterze Glacier (Austria) were performed with the use of the horizontal rotation systems (vertical pendulums are much more stable for tilt glacier processes than horizontal ones). However, our system installed there permited only to derive some mixed components containing both the spin and twist motions.

For many examples we have calculated various indexes including ratios of rotation motion amplitudes and velocity of displacement amplitudes.

Our special attention was focused on the near-by earthquake recordings which might permit to study some source processes. Here, our studies were related to the two problems:

- searching of some anomalous behavior of rotation components in the microseism domain just before the emerging of an earthquake record; the theoretical consideration might suggest existence of some precursory rotation motions before fracturing;
- comparing the spin and twist motions in a short time range related to the beginning of the seismic event records; the co-action of spin and twist (shear motions) is assumed to play the main role in fracture processes and we may suppose that the shears which break the particle bonds may release the rebound spin motion being retarded by $\pi/2$ in phase.

We present some first attempts to support those hypotheses.