

Earthquake Rotational Effects – Historical Review

Jan T. Kozák

Geophysical Institute, Academy of Sciences of the Czech Republic in Prague
kozak@ig.cas.cz

ABSTRACT

It is demonstrated in the Poster that they are two classes of rotational seismic models:

--Firstly the two older ones (models Rot1 and Rot2, see below) defined in mid-19th century, which are more-or-less based on „technical conditions” of fixing rotated bodies to their underlying or on local configuration of reflecting boundaries. It seems that these *technical* types of rotational effects explain well great deal of the observed surface rotational effects.

--Secondly, in the recent decades advanced theoretical studies (e.g., micromorphic continuum and asymmetric theories of continuum) and progress in non-linear physics together with studies based on modern high-level seismic registration techniques revealed that three other types of rotational effects can be theoretically derived and even seismically verified, which are based on detailed analyses of the above mentioned categories: inner focal zone and structured medium. Since the research on these new disciplines is still not completed, new achievements in this field seem not to be eliminated.

The Poster includes the following:

I. Some early recordings and depictions (“D”)

- The 1783 Calabrian earthquake (rotated obelisk at St. Bruno monastery), “D”.
- The 1839 Comrie/UK e. (rotations discussed by Milne 1842 and by Musson 1991), “D”.
- Rotational effects due to “subordination waves” (Mallet 1849-50).
- The 1857 Basilicata e. (Mallet 1862), “D”.
- The 1872 Central German e. (v. Seebach 1872), “D”.
- The 1894 Schoenai/Japan e. (Sieberg 1904), “D”.
- The 1906 San Francisco e. (Lawson et al. 1908 and Jeništa 1906-07), “D”.

Principal contribution by R. Mallet for understanding rotational types Rot1 and Rot2 (see below), are pointed out.

II. Present five type-models Rot1 – Rot5 of seismic horizontal rotational effects.

A) Rotations due to *impact of standard body waves* (no specific rotational component being considered). R. Mallet in 1849-50 and 1862 proposed two variants of this type of displacement:

- when the rotated body is fixed to its underlying out of its centre of gravity (model Rot1), “D”,
- when the rotated body is subjected to gradual wave-impacts coming from different horizontal directions (model Rot2), “D”.

B) Rotation due to *physical processes*

- associated with source and/or with propagation in structured medium (model Rot 3).
- associated with source properties and considered through both linear and non-linear physics (models Rot4 and Rot5), “D”.