Geophysical Research Abstracts
Vol. 14, EGU2012-8980, 2012
EGU General Assembly 2012

Earth's normal mode spectrum below 1mHz observed with a superconducting gravimeter

A. Raja-Halli, H. Virtanen, and H. Ruotsalainen
Finnish Geodetic Institute, Geodesy and Geodynamics, Masala, Finland (arttu.raja-halli@fgi.fi)

We present new observations of the normal modes 0S2, 0T2, 2S1 and 0S3 observed with the GWR T020 superconducting gravimeter at Metsähovi, Finland.

Superconducting gravimeter is well suited for observing the normal mode spectrum of the Earth, primarily due to the low noise levels at seismic bands. Especially in the frequencies below 1mHz, superconducting gravimeters can provide valuable information on the behavior of the modes and further about the Earth's internal structure.

The superconducting gravimeter GWR no.T020 has been operating continuously at Metsähovi, since August 1994. We have studied the gravimeter data after larger than magnitude M=8.0 earthquakes, which have occurred between August 1994 and December 2011. A total of 20 M>8.0 earthquakes occurred during this time. In this study we will show the observational threshold level of the GWR T020 gravimeter for the modes 0S2, 2S1, 0S3 and 0T2, and examine the behaviour of these modes. The properties of these gravest normal modes are of great interest as they are a direct result of the Earth's density profile and hence help to constrain the Earth models.

The mode 0S2 can be observed in all studied spectra. However, the amplitude of the mode is only slightly above the noise level of 0.01nm/s^2 after the weakest earthquakes studied. After earthquakes with magnitudes M>8.4 the splitting of the mode 0S2 into five separate peaks can be clearly seen in the 240 hour spectrum as well as the splitting of the mode 0S3. Modes 2S1 and 0T2 are detected just above the noise level after M>8.8 earthquakes. The toroidal mode 0T2 is observable with gravimeters only due to coupling effects created by rotating Earth and hence is observable only after the most powerful earthquakes studied. In addition we will present a comparison of the observed normal mode frequencies to the theoretical frequencies of the Earth's models PREM and 1066A. The comparison shows slight differences between the theoretical and observed frequency.