

Observation of lowest order toroidal modes with the Kamioka laser strainmeters

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At frequencies below a few mHz, toroidal modes are more difficult to observe than spheroidal modes mainly because the sensitivity of the horizontal components of a seismometer are worse to be affected by tilts induced by atmospheric disturbances. In contrast, Kamioka laser strainmeters are in a deep tunnel about 1000m below surface and have high sensitivity of order of 10^{-13} strain and wide dynamical range of 10^{-13} - 10^{-6} . And these also work as strain seismometer with broad dynamic range. We can expect to determine parameters related to toroidal modes.

Here we show observations of the lowest order toroidal modes on Kamioka laser strainmeters of the 2004 Sumatra earthquake. One of the characteristic features of the 2004 Sumatra earthquake was that the low frequency normal modes were strongly excited. Unfortunately the strain resolutions were somewhat worse, order of 10^{-12} strain, on these days because of the laser malfunction. But we observe significant signals of toroidal modes and spheroidal modes. We estimate multiplet degenerate frequencies and Q-value for the fundamental modes and the overtones up to a few mHz.