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Low-frequency seismic modes analysis after the M_w = 9 Sumatra earthquake using superconducting gravimeters

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The high resolution and low noise level of superconducting gravimeters (SGs) data at frequencies less than 1 mHz have allowed the high quality observation of the degree harmonic two seismic mode ${}_0S_2$, the so-called "football mode", and the first detection, by stacking, of the degree one seismic mode ${}_2S_1$ after the M_w = 8.4 Peru earthquake that occurred on 2001 June 23^{rd} (Rosat et al., 2003). The occurrence of the recent M_w = 9 Sumatra earthquake on 2004 December 26^{th} has strongly excited the low-frequency seismic modes and, in particular, the degree one ${}_2S_1$ mode is observed for the first time without any stacking. This mode corresponds to the first overtone of the sub-seismic mode ${}_1S_1$, the so-called Slichter triplet (Slichter, 1961). The core-sensitive mode ${}_3S_2$ and the fundamental radial mode ${}_0S_0$ were strongly excited. This means that the earthquake radiated energy preferentially towards the core, so there is great hope that this huge earthquake has triggered the translational motion of the inner core: that is a chance to detect the Slichter modes. We show the analysis results for the low-frequency seismic modes using time-varying gravity data recorded on the Earth's surface by the SGs installed at Canberra (Australia), Matsushiro (Japan), Strasbourg (France), Syowa (Antarctica) and Kamioka (Japan). These seismic normal modes of frequency less than 1 mHz, which are related to the whole Earth, are the only way to improve our knowledge of the density profile inside the Earth as their frequency split-

ting is directly linked to the 1D density structure (Widmer-Schnidrig, 2003). Moreover their splitting possesses high sensitivity to the 3D density structure in the Earth's mantle and core, so their observation can also help to constrain the Earth's lateral density structure.

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