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Dispersive tsunamis observed by ocean-bottom pressure gauges: the 2010 Chile earthquake tsunami

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Dispersive tsunami was clearly recognized in the tsunami records obtained by the ocean-bottom pressure gauges deployed offshore Japan for the 2010 Chile earthquake tsunami.
The 2010 Chile earthquake (M 8.8, Feb. 27, 06:34 UTC) generated tsunami, which propagated across the Pacific Ocean, and finally reached Japan 23 hours after the earthquake occurrence. The tsunami was recorded by ocean-bottom pressure gauges in the Pacific Ocean by DART system (NOAA), and offshore Japan with submarine cables. Furthermore, many Hi-net tiltmeters deployed inland Japan also detected the tsunami through the tilt caused by the tsunami load on the coastal areas. Those tsunami signals were successfully simulated by the non-dispersive tsunami equations more or less [Kimura et al. 2010; Satake et al. 2010]. Although it was very difficult to find the wave dispersion in the original tsunami records, we can clearly recognize the dispersion in the spectrograms of the tsunami records. For example, when we conducted a detailed spectral analysis on the record at VCM2 station in Sagami Bay deployed by NIED, we found that high frequency tsunami (the dominant period, t ~ 60 s) reached Japan 20 hours after the arrival of the main part or low frequency tsunami (t ~ 1000 s). This character was common in the records obtained by off Kushiro and off Muroto obtained by JAMSTEC. This dispersion is well explained when we consider the tsunami propagation from Chile to Japan supposing the average water depth of 4 km and the travel distance of 17,000 km.

Keywords: the 2010 Chile earthquake tsunami, dispersive tsunami