

Dispersive tsunami simulation and its application to the tsunami source estimation

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Long waves are often assumed to model tsunamis, but the wavelength of the initial water height distribution produced by a large submarine earthquake, particularly in the direction perpendicular to the fault strike, is sometimes not much greater than the water depth. The resulting tsunami may have a dispersive character that cannot be simulated based on a conventional long-wave approximation. The 2004 off Kii Peninsula earthquake (M 7.4) on the southern coast of Japan indeed produced a dispersive tsunami that was recorded at two stations located off Shikoku. For the foreshock (M 7.1), on the other hand, a dominant dispersive tsunami was not recognized at these stations. Because dispersive tsunami show strong directional dependence with respect to the fault strike, the above difference indicates that the strikes of the mainshock and the foreshock were different. Seismic waves, on the other hand, hardly resolve the two fault directions. We conducted a tsunami waveform inversion analysis based on the dispersive tsunami equations to estimate the initial water height distribution of the mainshock. The result indicates that the fault strike of the mainshock was perpendicular to the trough axis.