

# Dispersive deformation of tsunamis caused by the megathrust earthquakes in the Nankai Trough

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In general, tsunami hazard maps do not include wave dispersion because the wavelength of earthquake-induced tsunamis is longer than the water depth, and the dispersion effect is considered small. However, dispersive effects may increase the maximum tsunami height of outer-rise earthquakes (Baba et al., 2021). This study compared the Nankai Trough tsunami simulation results with and without dispersion effects. We calculated tsunamis at the coast of eastern Shikoku and Wakayama by the nonlinear long-wave and dispersive equations for the Nankai Trough megathrust earthquake scenarios proposed by the Cabinet Office. Four Cabinet Office models, Case 1, 2, 7, and 10 cases, were tested. The initial water level distributions were estimated from the crustal movements obtained by the fault motions, tsunami excitation by horizontal slope displacement, and Kajiura filter. The tsunami simulation time was two hours after the earthquake with a rise time of 60 seconds and a time step width of 0.025 seconds. Two-layer nesting of 30-second and 10-second angles was used for the topographic data. As virtual observations, six points were set along the coast, and one point was set offshore. Any increase in tsunami height due to dispersion did not appear in the waveforms at all virtual observation points. In comparing the maximum tsunami heights without and with dispersive effects along the coast, the increase in tsunami height due to dispersive effects was only about 1%. We conclude that there was no significant increase in the maximum tsunami height due to dispersive effects in this study. Therefore, it is unnecessary to consider the dispersive nature of water waves in predicting the tsunamis caused by the megathrust earthquakes in the Nankai region. We calculated the tsunami heights by assuming large outer-rise earthquakes in the Nankai Trough region for comparison. The maximum tsunami heights from the outer-rise earthquakes increased by about 7% due to the dispersion.

Keywords: dispersion, Nankai Trough tsunami simulation, outer-rise earthquakes