

Temporal change in seismic velocity in the Nankai subduction zone from cross-correlation analysis of ambient noise

*Tatsunori Ikeda¹, Takeshi Tsuji¹

1. Kyushu University

To investigate the temporal variation of stress or strain in the Nankai subduction zone, we estimated the temporal variation of seismic velocity by using cross-correlations of ambient noise in the frequency range 0.7–2.0 Hz, which was dominated by ACR waves, recorded by the DONET offshore seismic network from 1 October 2014 to 30 November 2017. The 1 April 2016 Off-Mie earthquake (M_w 5.9) and its aftershocks occurred beneath the seismic network.

Our results document a clear decrease in seismic velocity at the time of the earthquake. These coseismic velocity drops were correlated with peak ground velocities at each station, suggesting that dynamic stress changes due to strong ground motions are a primary factor in coseismic velocity variations. Differences in the sensitivity of seismic velocity changes to peak ground velocity may reflect subsurface conditions at each station, such as geological structures and effective pressure conditions. We also observed a long-term increase in seismic velocities, independent of the 2016 earthquake, that may reflect tectonic strain accumulation around the Nankai subduction zone. After removing the long-term trend, we found that the coseismic velocity drops had not completely recovered by the end of the observation period, possibly indicating nonlinear effects of the 2016 earthquake. Our results suggest that ambient noise cross-correlation might be used to monitor the stress state in the Nankai accretionary prism in offshore environments, which would contribute to a better understanding of earthquake processes.

Keywords: Nankai Trough, 2016 Off-Mie earthquake, monitoring, ambient noise, seismic interferometry