

# Microseismicity associating tectonic tremor bursts in the northern Japan Trench

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In many subduction zones, slow earthquakes are observed in the shallow and deep sides of the megathrust seismogenic zone, whereas in the Japan Trench subduction zone, tectonic tremors (hereinafter referred to as tremors), a type of slow earthquakes, and ordinary earthquakes are distributed in the same depth range, and in close proximity. It is expected that the detailed characterization of the spatial distribution of tremors and earthquakes will lead to the elucidation of environmental factors controlling the generation of slow- and fast- earthquakes. In this study, we investigate the details of the spatio-temporal relationship between tremors and earthquakes in the northern Japan Trench, where Takahashi et al. [2021] pointed out the close proximity of them, by relocating the epicenters of very small earthquakes and by identifying small repeating earthquakes among them.

We used P and S arrival times to relocate hypocenters of earthquakes, identified as events with duration shorter than 20 s by an envelope correlation method by Takahashi et al. [2021] using seismograms of 47 short period OBSs in the area from October 2007 to June 2008. The number of relocated earthquakes was 3409 and the smallest event size was M -0.4. It was confirmed that most of the tremor swarms, identified by Takahashi et al. [2021] during the observation period, were accompanied by ordinary earthquakes in their vicinities.

Among the tremor-earthquake aggregates, we discovered an interesting interplay of tremors and earthquakes, in which an earthquake swarm activity concentrated at a small area separating two tremor swarms. The activity started with sudden activation of tremors, followed by an increase of seismicity including a couple of pairs of small repeating earthquakes of M 0.8 ~ 1.0 in sizes. The M-T change during the seismicity suggests that this activity is more like a swarm type than a mainshock-aftershock type. These characteristics suggest that an aseismic slip may be involved in this tremor-earthquake activity. In the southern Japan Trench, it has been reported that ordinary earthquakes occurred along the trajectories of the preceding tremor migrations [Obana et al. 2021]. In the northern part of the Japan Trench, we found that the spatio-temporal evolution of the tremor and ordinary earthquake activity follows similar pattern to those in the southern part, suggesting a common feature of slow earthquakes behaviors along the Japan Trench.

Keywords: tectonic tremor, repeating earthquake, OBS