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# Shallow low-frequency tremor activity in the Hyuga-nada, revealed by ocean bottom seismographic observation

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In order to reveal the detail of microseismicity from the shallower part of the plate boundary to seismogenic zone in the Hyuga-nada region, we have conducted Ocean Bottom Seismographic observation from May 19 until July 6, 2013. We used 12 Ocean Bottom Seismometers (OBSs) with a three-component short-period seismometer. During this observation, we observed many low-frequency tremors (SLFT) which mainly occurred from end of May to end of July 2013 [*Yamashita et al*., 2013 AGU fall meeting]. We report the detail of SLFT activity in the Hyuga-nada region based on the semi-automatically analysis using envelope correlation method (ECM)[*Obara*, 2002].

The differential arrival times between OBS stations using ECM were obtained from the lag times with maximum cross-correlation coefficient between the pair of the root mean square (RMS) envelopes which were converted from composite horizontal components waveform with applying a 2-8 Hz bandpass filter. RMS envelopes were smoothed by using 5 s window and performed down-sampling with a 20Hz. The length of RMS envelops for calculating of cross-correlation coefficients was set for 150 s. If the maximum cross-correlation coefficient for a pair was larger than 0.85, and more than or equal to 6 pairs, we searched minimum RMS residual position by a grid search algorism. These processing were performed automatically for the continuous RMS envelope records every 75 s (i.e., overlapping two moving window for 75 s). After the calculation, we carefully examined the candidate tremor events to distinguish "regular" earthquakes, T-phase signals, or background noise.

Based on the result of SLFT location by ECM, we identify two migration episode of the SLFT: 1st episode started in east off Tanegashima Island from end of May, 2013, migrated northward along strike of subducting plate, veered away to the north-west in the around S08 station, then reached under the S06 station on July 12 - 14. 2nd episode started in the south of S08 station on July 17, migrated northward and veered away to the north-west in the around S08 station, reached around the S07 station, veered away to the east, reached around the S09 station.

These migration episodes suggest that undetected short-term slow-slip event may have occurred at the same time in the shallow part of the Hyuga-nada region. Around the focal area of SLFT, the Kyushu-Palau ridge is subcudting: the SLFT activity was only found on the south side (i.e., Ryukyu arc side). In particular, the depth of plate boundary around the S08 station is southwestward deepening down to 10 km depth [*Park et al*., 2009]. Therefore, the episodic slow-slip extended to northward with SLFT activity, and shifted to northwest-ward caused by the Kyushu-Palau ridge which act a segment boundary to controle the interplate slip phenomena.

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Keywords: Shallow low-frequency tremor, Ocean Bottom Seismographic observation, Hyuga-nada