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A test for detecting slow deformation around Japan based on seismicity data and statistical model

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Slow slips that occur at much slower slip rates than ordinary earthquake have been mainly detected by geodetic techniques such as GNSS. However, where there is no observation point in the vicinity of the source region or before dense GPS observation began, it is difficult to detect slow slips by the geodetic techniques. In this study, therefore, we apply the ETAS model (a type of statistical model) to the data of a seismic catalog, for detecting slow slips around Japan. Specifically, I focus on increase of values of a parameter called background seismicity rate after removing the effects of aftershocks. Results of the parameter estimation for known slow slip events showed that we can detect slow slips occurring over several days to weeks. Moreover, the results suggested that slow slip events around the north Izu-Ogasawara Trench and Kikai Island occurred, and slow deformation by a dike intrusion occurred around Mt. Fuji immediately after the 2011 Tohoku earthquake. In addition, around Okushiri island, Kikai island, Tanegashima island, and off Tohoku area, we possibly detect seismic quiescence or temporal attenuation of afterslip after large earthquakes.

Keywords: slow slip, ETAS model, earthquake activity, background seismicity rate