

Slow-slip and Seismicity Change beneath Lake Hamana in the Tokai Region

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A slow-slip progressing on the plate interface beneath Lake Hamana near the Tokai potentially seismogenic zone was detected since later 2000. Simultaneously, a delicate change of seismicity was commonly detected in the following three zones, all of which is located in the Tokai locked zone. In the upper layer above the plate interface, a seismic quiescence was found to commence in 1997. In the lower layer, the similar quiescence started in 1999, and the similar one beneath Lake Hamana in 1997. It seems natural that a slow slip on the plate interface influences on the neighboring stress distribution, and re-distributed stress should be reflected on the seismicity pattern. The problem is whether we can provide a rationalized model to explain the total phenomena.

We tried this study on the phenomena progressing beneath Lake Hamana, because the relationship between the slow-slip and the seismicity change seems more definitive especially in this region. At 2003 fall meeting of the Japan Seismological Society, Yamamoto et al. gave a presentation that the tilt-meter at the Mikkabi station located near Lake Hamana recorded signals corresponding to current slow-slip event, and also the previous one in 1998-1990. The seismic activity beneath Lake Hamana (30km deep) presented simultaneous quiescence at the epochs of both events. In this case, the evidence that there are found temporal coincidence and spatial proximity between the slow-slip and the seismicity change necessarily implies possibility of a mechanical relationship between both phenomena.

We can find a characteristic pattern in the sequential projection of the seismicity beneath Lake Hamana. There exist three seismic clusters (A, B, and C, marked from the east to west), which have a common hypocentral alignment along NW-SE direction, standing side by side with an interval of 6-7km between each other. I consider that these clusters are generated due to shearing caused around the western edge of the locked subduction. It is found that the activity of each cluster transfers at every epoch above introduced. For example, in 1988, B becomes active while A inactive. In 2000, C becomes active while B inactive. It is considered that the seismic quiescence found at each epoch might be an apparent phenomenon accompanying with transferring of active clusters. We can find the similar epochs besides the above two. It seems that in most cases, the active cluster is transferred from east toward west simultaneously with progression of the slow-slip beneath Lake Hamana. In order to interpret this, it is necessary to show a mechanical model where stress concentration at the place of each cluster moves from east toward west when slow-slip is given beneath Lake Hamana. Utilizing the MICAP-G program provided from the Meteorological Research Institute, we tried to make such a model. The results are follows. The maximum shear indicates a perturbation increasing from east toward west. However, we cannot yet find any delta-CFF distribution suitable for interpretation. Anyway, the idea of taking the seismic activity change into the account will present a valid constraint on the analysis of the crustal deformation.