Vertical Ground Deformation Detected by the Leveling and Tidal Observation in the Tokai Region, Central Japan in 1980-2003

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I investigate the spatial and temporal vertical ground deformation in the Tokai region for a 23-year period revealed by leveling data and tide gauge records. The Tokai region is a part of the Eurasian plate. It overrides the Philippine Sea plate at the Suruga trough and Nankai trough. In this study, I first derive vertical crustal motion from the precise leveling data relative to the temporary fixed point. The deformation has a conspicuous feature indicating the Interseismic elastic loading by the Philippine Sea plate slab at the Suruga trough, characterized by the subsidence of the southeastward studied area. Their amplitudes are the largest at the southeast coast near Cape Omaezaki and decay toward the northwest. So as to add the absolute uplift to the leveling data, I determine the sea level changes from tide gauge records. The analysis is based on monthly mean sea levels, from which barometric pressure, seasonal effects and common-mode oceanographic variation are removed. I join corrected tidal gauge records to leveling routes in order to derive spatial distribution of absolute vertical ground deformation. The estimated ground deformation during the past 23 years indicates that the deformation owing to the Philippine Sea plate motion is episodic in the long term. The unsteady episodic motion observed by the leveling during 2001-2003 is consistent with the observation by the Global Positioning System and the spatial distribution of vertical ground deformation during 1988-1989 is the same as the 2001-2003 event. I suggest that the episodic events have repeated around the Tokai region.