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2009 年駿河湾地震 (M6.5) 前後のひずみの挙動
A strain behavior before and after the 2009 Suruga-Bay earthquake (M6.5)

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On 11 August 2009 the intraslab earthquake (M6.5) struck the Tokai area. The largest seismic intensity observed was VI- in JMA scale, and it was a felt earthquake in a wide area including the Kanto and Koshin'estu Regions. Tsunamis were observed at and around the Suruga Bay. In the Tokai area, the Japan Meteorological Agency (JMA) continuously monitors strain data by the real time automated processing in the Tokai network. According to JMA, it is unconnected to the anticipated Tokai Earthquake (M8) judging from the acceptable reasons. For instance, it is an intraslab earthquake in the Philippine Sea plate, while the anticipated earthquake is a plate boundary earthquake on the upper side of the Philippine Sea plate. We consider it as an appropriate earthquake for validation of the Tokai network, though the feature of earthquake is different from one of the anticipated earthquake. We here tried to investigate the strain behavior before and after the 2009 Suruga Bay earthquake occurred in the fault zone of the anticipated Tokai earthquake. In actual, the Tokai network of strainmeters has been monitoring the short-term slow slip events (SSE) synchronized with nearby low frequency earthquakes or tremors since 2005 (Kobayashi et al., 2006). However, the earth's surface is always under the continuous influence of a variety of natural forces such as earthquakes, wave, wind, tide, air pressure, precipitation and a variety of human induced sources, which create noise when monitoring geodetic strain. Eliminating these noise inputs from the raw strain data requires proper statistical modeling, for automatic processing of geodetic strain data. It is desirable to apply the state space method to noisy Tokai strain data in order to detect precursors of the anticipated Tokai earthquake. The method is based on the general state space method, recursive filtering and smoothing algorithms (Kitagawa and Matsumoto, 1996). The first attempt to apply this method to actual strain data was made using data from the 2003 Tokachi-oki earthquake (M8.0) recorded by the Sacks-Evertson strainmeter, which has been operating since 1982 at Urakawa Seismological Observatory (KMU) of Hokkaido University in the southern part of the Hidaka Mountains (Takanami et al., 2009). KMU is far 105 km NW of the epicenter of the 2003 Tokachi-oki earthquake. After the earthquake, the data showed a clear episode of contraction for 4 days followed by expansion for 23 days. These signals correlate with increased aftershock seismicity for events greater than M4. The strain changes, together with surface displacements detected by the GPS network, are indicative of propagation of slow slip at depth (e.g. Geographical Survey Institute, 2004). We here review the computational approach to state space method and the results of its application to the strain data from the 2009 earthquakes (M6.5) occurred off Sagami in the Tokai area. Interestingly, for the 2011 Tohoku Earthquake off the Pacific coast no pre-slip was detected by land-based observations even though its magnitude was M9. In order to detect the nucleation of such an earthquake occurring far offshore, high-precision strain data is necessary but was not available.

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