極地における地殻・氷河の体積ひずみ観測

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Observation of Volumetric Strain Data of Crust and Glacier in Polar Region

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The earth's surface is 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. In Polar region, the unique noises such as blizzard, ice-quake, glacial action could affect the geodetic strain. Eliminating these noise inputs from the raw strain data requires proper statistical modeling, for automatic processing of geodetic strain data. In the area of the next anticipated Tokai earthquake, the Japan Meteorological Agency continuously monitors strain data by the real time automated processing. As an example, the network of strainmeters has been monitoring short-term slow slip events (SSE) synchronized with nearby low frequency earthquakes or tremors since 2005 (Kobayashi et al., 2006). It is desirable to apply the state space method to noisy the strain data in order to detect a high-precision geodetic movement in the crust and glacier in a polar region. 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 M≧4 events. 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. Based on the strengh of past achievements decribed in the above review, we here propose to start anew boreholed volumetric strain observation in polar region for surveying a high-precision crust & glacier movement. It may provide a valuable information for updating the knowledge of geodetic movement in the polar region.