AOB Seminar

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開催日時: 2015 年 2 月 17 日(火)　14:00 - 15:30
場　　所: 地震・噴火予知研究観測センター　別館第 1 会議室
講演題目＆要旨:

Time-Lapse Monitoring Stress-Induced Changes in Seismogenic Crust in Northern California

The time-varying stress state at seismogenic depth is arguably the single most important property controlling the sequencing and nucleation of seismic events. We show our two recent works exploring spatiotemporal variations in stress/deformation field by making use of the ambient noise waveforms and characteristically repeating earthquake (CRE) activities.

The first topic is an ambient noise-based monitoring of seismic velocity changes associated with the 24 August 2014 Mw 6.0 South Napa earthquake. We systematically analyze continuous waveforms collected at 10 seismic stations that locate near the epicenter of the 2014 South Napa earthquake to obtain the time history of velocity change (dv/v). Our result indicates the velocity reduction of about 0.06% immediately after the 2014 South Napa earthquake. By combining the static and dynamic stress estimates, the velocity reduction obtained is most likely due to an increase of opening cracks by ground shaking from the 2014 South Napa earthquake.

Following the 2014 South Napa earthquake, the time evolution of dv/v shows a postseismic healing process (i.e., increase of dv/v). This healing process, however, is interrupted about three months after the 2014 South Napa earthquake. In other words, we observe another temporal reduction of velocity. The onset of this velocity reduction seems to be correlated with the onset of intense rainfall. We speculate that an increase of fluid saturation by heavy rain is the primarily mechanism of this temporal velocity reduction.

The second topic is to document aseismic slip deformation along the northernmost creeping section of the San Andreas fault (SAF) near San Juan Bautista (SJB), California,

by systematically examining spatiotemporal behaviors of CREs. Using 28 years of seismic data (1984-2011), our analysis identifies a 15-km-long partially locked section near the 1998 Mw 5.1 SJB earthquake that is one of the largest earthquakes in the SJB region. The partially locked section identified could be capable of producing a Mw 6.22 earthquake every century, and such a large SAF rupture may have occurred in 1840 (M~6.5) or 1841 (M~6.0).

Substantial postseismic slip is observed through the CRE activity following the 1999 SJB earthquake and lasted for more than one year. The distribution of the postseismic slip shows an asymmetric pattern that would suggest a slow slip event triggered by the 1998 earthquake, rather than just afterslip relieving the static stress increase near the coseismic rupture. The moment of the triggered aseismic slip is equivalent to an Mw 5.22, which is a minimum estimate as additional creep likely occurred on sections of the fault lacking repeating earthquakes.