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Subsurface Rn measurements to monitor crustal activity at Boso Peninsula, Japan

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We developed the new instrument to measure subsoil Rn concentration. The system is based on alpha detector with ZeS scintillator. The purpose of the development is to monitor Rn variation with high sampling and stableness for the earthquake precursor study. That is, the Ionospheric anomaly is one of the most promising precursory phenomena for large earthquakes. Lithosphere-Atmosphere-Ionosphere Coupling (LAIC) model has been proposed to explain these phenomena. To examine the possibility of the chemical channel of LAIC model through the monitoring of atmospheric electricity parameters, we perform the adequate observation in Boso Peninsula, Japan, where is one of the most seismically active area after the 2011 Tohoku earthquake. We have installed sensors for the atmospheric electric field (AEF), atmospheric ion concentration (AIC), radon concentration, subsurface radon concentration, and weather elements.

To identify signals related to the local crustal activities such as earthquake and the slow slip event, changes caused by non-tectonic activities should be removed. In this aim, we performed Multi-channel Singular Spectrum Analysis (MSSA) to the observed time series of the subsurface radon content and climatic parameters and investigated the correlation. In this computation we use 5 min values. Then, we can discriminate radon variation influenced by climatic effects and estimate the Rn flux from the crust. The analyzed period is from February 13, 2018 to December 5, 2018 (296 days). During the period, an M5.3 earthquake with depth 50 km occurred at 7 km distance from the Asahi station on May 17, 2018,, which is the largest event within 50 km distance from the station. And, from around June 3, a slow slip event is started at the boundary of Philippine Sea plate and the North America Plate off the Boso Peninsula. Detailed results will be reported in our presentation.