

Did the temporal crustal structure change cause the Oct. 2011 Kurobe Dam seismicity?

*Takanobu Sato¹, Ahyi KIM¹, Shiro Ohmi²

1.Graduate School of Nanobioscience, Yokohama City University, 2.Disaster Prevention Research Institute, Kyoto University

1. Introduction

After the March 2011 Tohoku-Oki earthquake, seismicity activation was observed wide range of beneath the Hida mountain area. However, another significant seismicity occurred around the Kurobe dam reservoir in October 2011. It was initiated by M3.9 earthquake followed by two magnitude larger than 5.0 quakes and the activity lasted for a couple of weeks. No active earthquake faults have been recognized, and no significant seismic activities or magnitude larger than 5 events have been observed previously except the one observed in 1960s right after the reservoir impounding. In the previous study, we discussed the fault zone around Kurobe and mechanism of seismic activity [Sato *et al.*, 2015]. This time, we discuss the crustal structure change around Kurobe.

2. Method

To investigate the temporal structural change in the study area, we calculated the autocorrelation function (ACF) and shear wave splitting analysis. For the both analyses, Kuroyon station (E.KYJ) located the north of Kurobe dam reservoir was used. ACF is calculated each day using the vertical component of the continuous waveform from 2010 to 2012. Shear wave splitting is calculated using the event that occurred within 50km from Kurobe in 2011 and incident angle less than 35°.

3. Results and Discussion

The obtained ACF showed that the relative seismic wave velocity reduction in 2011 compared to other periods. Especially, significant reduction was observed during the period of May to June 2011. It might be caused by the static and dynamic stress changes around the area. The noises observed in the ACF is consistent with dynamic stress increase. In addition, shear wave splitting analysis results showed the 90°-flips in shear wave polarizations. It indicates the presence of high pore-fluid pressure and suggests the penetration of water. In conclusion, the seismicity observed beneath the Kurobe dam October 2011 might be induced by the pore pressure increase due to the opening crack which is promoted by the successive seismicity followed by the M9.0 Tohoku earthquake.

Keywords: Hida Mountains, Ambient noise, Autocorrelation function, Shear wave splitting