Japan Geoscience Union Meeting 2011
(May 22-27 2011 at Makuhari, Chiba, Japan)

SSS030-P03 Room:Convention Hall Time:May 24 10:30-13:00

Responses to earth tide and atmospheric pressure of a laser strainmeter of 200m and 400m baseline lengths

Akio Katsumata[1*], Akio Kobayashi[1], Kazuhiro Kimura[1]

[1]Meteorological Research Institute

We have been observing crustal deformation with a laser strainmeter since December 2007 to detect slowly proceeding event such as long-term and short-term slow slip events. The laser strainmeter is oriented in north-south direction. The baseline length was 200m from Dec. 2007 to Dec. 2008, and it was extended up to 400m in March 2009. We compare responses to earth tide and atmospheric pressure between the 200m and 400m baseline.

Secular strain change is recognized. It was $-4.2*10^{-7}$strain/year for the 200m baseline, and $-2.2*10^{-7}$ for the 400m baseline. Both are greater than the value of $-5*10^{-8}$ strain/year obtained from GPS observation.

Coefficients of tidal response were estimated from detrended strain data with BATAP-G (Tamura et al., 1991). Variation of the response was obtained with moving window of forty days. The estimated values for the 200m and 400m baseline were almost coincided, and the amplitudes were about half of theoretically expected values. Difference was seen in variation of the coefficients, less than 2% for the 200m baseline and about 4% for the 400m baseline.

Response to atmospheric pressure was estimated with BAYTAP-G and adjusted by checking corrected strains. The response was $-1.8*10^{-10}$strain/hPa for 200m baseline and $-4*10^{-10}$strain/hPa for the 400m baseline. The difference is about double. Some temporal variation was seen, however the systematic difference between the 200m and 400m baseline was not recognized in the temporal variation. The difference in the response would indicate that the site material is less hard for the 400m baseline on the average.

Response to precipitation is recognized. Contractive response was observed in rainy season for 200m baseline, and it was several nano-strain. Extensive response of several nano-strain was seen after large precipitation for the 400m baseline. The polarity of preciitation response is reversed between the 200m and 400m baseline.

The smaller secular may indicate that the case of the 400m baseline is less influence by local deformation. However the responses to tide and atmospheric pressure show softer site rock for 400m baseline.

We are grateful to Dr. Araya for his kind guidance on interferometer system for crustal deformation observation.

Keywords: long baseline laser strainmeter, tidal response, atmospheric pressure response