Atmospheric Pressure Effects on Crustal Strain Observation with a Kamioka 100m Laser Strainmeter System

Toshiki Ohnishi[1]; Shuzo Takemoto[2]; Akito Araya[3]; Wataru Morii[4]; Hideaki Hayakawa[1]; Junpei Akamatsu[5]; Masatake Ohashi[6]; Yoichi Fukuda[1]

[1] Geophysics, Kyoto Univ.; [2] Earth and Planetary Sci., Kyoto Univ; [3] ERI, Univ. Tokyo; [4] RCEP, DPRI, Kyoto-Univ.; [5] Disas. Prev. Res. Inst., Kyoto Univ.; [6] ICRR, Tokyo univ.

The laser strainmeter system was installed in Kamioka mine, Gifu Prefecture (Locate 36.43N, 137.31E; 358m height) in June, 2003. The system is consisting of two 100m-extensometers oriented in NS and EW directions. The observation tunnel is about 1km below the ground-surface. We use the iodine-stabilized Nd:YAG laser(lambda=532nm) as the laser source having the stability of the wavelength is 2∗10ˆ-13.in our linear strainmeter(EW) and differential strainmeter(NS-EW). Considering the stability of the laser source, it is possible to detect crustal strain changes in high sensitivity of 10ˆ-13.

It is well known that the strain observation is affected by atmospheric pressure change. The atmospheric pressure effect on the strain observation has been theoretically calculated by assuming the surface of the elastic half space to be deformed elastically due to the loading effect of atmospheric pressure. The typhoon No.0310 passed through the Honshu Island from 8th to 10th in August, 2003. Around 12 o'clock on August 9, it passed almost right above the Kamioka mine. At that time, we observed the barometric depression of 30hPa. Momose et al. (2004) previously reported the effect of the pressure change on the strain observation using the same data. They obtained the maximum strain value of 1.4∗10ˆ-8 for both in NS and EW directions from calculation based on the elastic half-space model. We now assume that the influence of the atmospheric pressure change does not reach at the sea bottom, and we treat the depression as a negative loading which has an affect only on the surface of the land area. We calculated the strain components by using mass loading Green's function. We report the result of comparison between observed strain changes and calculated ones based on different models.