C105-P005 **Room: Poster Session Hall** **Time: May 18**

Groundwater level fluctuations: random water-level drops in Haruno borehole

Kazuya Miyakawa[1]; Iwao Kawabe[1]; Takeo Ito[2]

[1] Department of Earth and Planetary Sci., Nagoya Univ.; [2] Environmental Studies, Nagoya Univ.

http://www.chibake.com

Introduction

We have monitored chemical compositions of gases associated with groundwater and groundwater-level changes at 500 m borehole, where we installed a micro-GC monitoring system in Haruno crustal movement Observation Site (HOS) of Research Center for Seismology, Volcanology and Disaster Mitigation, Nagoya University. We reported that frequent drops of groundwater level might have been due to artificial pumping in Annual Meeting of the Geochemical Society of Japan, 2008 (Miyakawa *et al*., 2008; abstract). After that, we confirmed that, based on monitoring data obtained by making the opening of the borehole wider than usual, those drops were due to an effect of calcite precipitate which covered the opening of borehole. In this presentation, we will report responses of groundwater level to the earth tides, and make some discussions on time-series behavior of groundwater level.

Monitoring method

The HOS is located in the Tenryu river basin. The bedrock of borehole is sandstone-shale alternation belonging to Akaishi Shimanto belt. By using two pressure gauges (Hobo U20 Water-Level Logger), we put the one gauge in the well and put another in the monitoring house. We calculate groundwater level as the pressure difference between two.

When groundwater overflows, relatively a large amount of calcite precipitates from the alkaline groundwater, which is due to the dissolution of water-cement used to fix strain meter at the bottom of the borehole. The opening of the borehole is likely to be covered with the precipitate. We suspected that the precipitated calcite might produce frequent small drops of water level. In this study, by extending the opening of borehole, we monitored groundwater level by making influence of the precipitate smaller. The monitoring period is from Oct 23, 2008 to Dec 11. Although we made the opening wider, it was covered with the precipitate again after about one month.

Analytical method

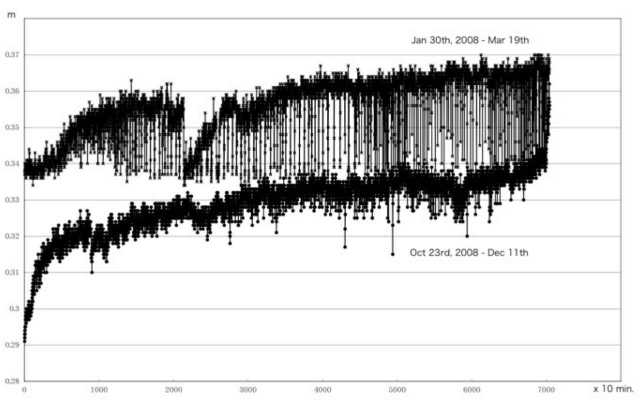
Unfortunately the strain meter had stopped monitoring in this period. Therefore we calculated the tidal response of groundwater level by comparing it with theoretical earth tide of strain. We calculated the theoretical values by using GOTIC2 (Matsumoto *et al*., 2001; J. Geod. Soc. Japan) and calculated tidal components from the observations by Fourier analysis.

Result and Discussion

In this observation, the random drops were not observed. Figure 1 shows the two observations of groundwater level obtained in this period and in the period from Jan 30, 2008 to Mar 19. In the right side of Fig. 1, the values dropped are in good agreement with that obtained in this time. Hence, we consider that the random drops are due to the cover of calcite precipitate.

From the spectrum of the groundwater level-data we recognize two peaks one of which has the amplitude of about 0.7 mm at around 24-hour period and another has the amplitude of about 0.3 mm at around 12-hour period. Although these values are a little smaller than guaranteed values of the pressure sensors, judging from the shape of the spectrum, we understand that these peaks are meaningful.

The comparison of the diurnal and semi-diurnal components of the groundwater data with theoretical ones show the phase observed is not in agreement with that predicted. We consider that the reason for inconsistency of the phases is due to the increasing influence of the precipitate with time. However, because of the accidental noise, the spectrum obtained from the groundwater level may not be the responses to the earth tides. We will make a retest on this matter.



Observation of groundwater level changes for the periods of Jan 30, 2008 - Mar 19 (above) and Oct 23, 2008 - Dec 11 (below).