Japan Geoscience Union Meeting 2013
(May 19-24 2013 at Makuhari, Chiba, Japan)

SCG60-P01 Room:Convention Hall Time:May 21 18:15-19:30

Groundwater change by seimic ground motion of the 1999 Chi-Chi earthquake

Mayumi Higa[1*], Mamoru Nakamura[1], Naoji Koizumi[2]

[1]Faculty of Science, University of the Ryukyus, [2]Advanced Industrial Science and Technology

The water level change during and after earthquake has been reported. The volumetric strain change, vertical displacement, dynamic volumetric strain change, and seismic ground motion were proposed for the cause of the change. For example in the 1999 Chi-Chi earthquake (Mw7.6), Taiwan, decrease in water level was observed in the mountainous region around a fault, and water revel increase of 10m was observed in the coastal plain away from the fault. Wang et al. (2001) showed that the decrease in water-pressure which was caused by increase in pore pressure at the basement induced the decrease in water level height, whereas the liquefaction caused the increase in water level in the coastal plain. According to the past study, positive correlation was observed between the amplitude of peak ground acceleration (the peak ground velocity amplitude) and groundwater level change of amount. However, there are many questions that this relation execute to which earthquake. Since dominant frequencies of seismic ground motion differ for each an earthquake, we must think the maximum amplitude of seismic ground motion as well as it for each frequency. However, the groundwater level change for seismic motion of various frequencies has not been reported. The sensitivity of the well against the volumetric strain (10-100 nanostrain) of Earth' tide differs for each well. The sensitive well against the Earth' tide would also be sensitive for strain change by seismic motion, but it has never been compared. I compared the spectral response of ground motion and groundwater level change, inspected whether in what frequency of seismic ground motion infect the groundwater level change.

Taiwan area is good for the investigation of coseismic water level change of well and degree of seismic ground motion because dense well network for water resource and the network of seismometers are distributed. We investigated the relation between co-seismic water level change of well and seismic ground motion of the 1999 Chi-Chi earthquake(Mw7.7). I used the data that the wave form record of strong-motion seismograph is managed by Central Weather Bureau and water level in the well is managed by Water Resources Agency around the middle part of Taiwan (from January 1. 1994 to December 31. 2000).

I computed the tide components including in groundwater level data with Baytap-G (Tamura, 1995), and selected the observation wells which show the earth tide response. The wells with the earth tide response are 20, the wells without the earth tide response are 163 of them among 183. Second, I measured the degree of coseismic groundwater level change. The observation well in which the groundwater level change was observed is 162 of them among 183 . Then we compared the water level change of amount with peak ground velocity of seismic ground motion every frequency and response sector. First, slightly high correlation was observed between the water level change and peak ground velocity or spectral response. For example correlation coefficient between it and vertical motion peak ground velocity in 0.1-0.2Hz is 0.68, correlation coefficient between it and vertical motion spectral velocity in 0.1Hz is 0.65. The sensitive wells for the Earth' tide can respond strongly to strain than the wells without response for Earth's tide. This suggests that the wells can record water pressure change since wellbore storage effect was so small. Second, the correlations are higher in a low frequency ground motions than a high frequency ones. Since the displacement response spectra is larger at low frequency (>1Hz) in Chi-Chi earthquake, water pressure in the aquifer would be increased by large amplitude of low frequency ground motion.

Keywords: the 1999 Chi-Chi earthquake, groundwater change, seismic ground motion, liquefaction

SCG60-P02 Room:Convention Hall Time:May 21 18:15-19:30

Groundwater pressure changes induced by the 2011 off the Pacific coast of Tohoku Earthquake in Tono area,Japan

Koji Tsuyuguchi[1*], Tomoyuki Karino[1], ONOE, Hironori[1], TAKEUCHI, Ryuji[1]

[1]Japan Atomic Energy Agenc

In the 2011 off the Pacific coast of Tohoku Earthquake, groundwater pressure changes were observed around the Mizunami Underground Research Laboratory (MIU) in Tono area. It was confirmed that the tendency of the pressure change due to the earthquake is different according to relationship with the location of borehole and geological feature structure. This report shows the water pressure change observed in boreholes after the earthquake.

Keywords: Tohoku Earthquake, Groundwater pressure, Postseismic change, Tono area

Japan Geoscience Union Meeting 2013
(May 19-24 2013 at Makuhari, Chiba, Japan)

SCG60-P03 Room:Convention Hall Time:May 21 18:15-19:30

Long-term Groundwater Pressure Monitoring in Mizunami Underground Research Laboratory Project (Phase II)

Tomoyuki Karino[1*], Tsuyuguchi Koji[1], Onoe Hironori[1], Takeuchi Ryuji[1]

[1]Japan Atomic Energy Agency

Japan Atomic Energy Agency (JAEA) has been conducting Mizunami Underground Research Laboratory (MIU) Project. The MIU Project has three overlapping phases: Surface-based Investigation phase (Phase I), Construction phase (Phase II), and Operation phase (Phase III), with a total duration of 20 years. Currently, the project is being carried out under the Phase II. One of the Phase II goals is set to develop and revise models of the geological environment using the investigation results obtained during excavation, and determine and assess the changes in the geological environment in response to excavation. The long term hydro-pressure monitoring has been continued to achieve the Phase II goals.

In this paper, Hydraulic Pressure Response due to the construction of Underground Research Laboratory in Phase II of MIU project were introduced.

Keywords: Long-term groundwater pressure monitoring, Groundwater pressure change, MIU (Mizunami Underground Research Laboratory)

SCG60-P04 Room:Convention Hall Time:May 21 18:15-19:30

Hydrogeochemical investigation of colloid and trace elements by using quality-controlled sample at Mizunami Underground

Teruki Iwatsuki[1*], Ohmori Kazuaki[1], Shingu Shinya[1]

[1]Japan Atomic Energy Agency

Colloid particles and their relationship with REE in deep groundwater were identified by ultrafiltration method at Mizunami underground research laboratory. Colloid particle consists of iron hydroxide, organics, carbonates and silicate minerals such as clay mineral. REE mainly involved the colloid particle with size of 0.2 micron meter -50 kDa, smaller than 10 kDa.

Keywords: Mizunami Underground Research Laboratory, Deep groundwater, Colloid, REE