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Gravity Monitoring at Takigami Geothermal Area, Oita Prefecture, Japan

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The gravity monitoring at Takigami geothermal area has been applied since November 1996 (Oka et al., 2011). In this area, the nearest geothermal manifestations are about 1-2 km to north and east of Takigami (Furuya et al., 2000). So, there are no geothermal manifestations at the surface. The geothermal power plant was built at Takigami in August 1991. It was reported that its power plant output was changed from 25,000 kW to 27,500 kW in June 2010 (Kyushu Electric Power Co., Inc., 2010)

We analyzed the gravity data from August 2008 until August 2013. We found that the gravity changes at the northern zone, the western zone, and the southwestern zone of this area are quite stable historically. This result indicates that the recovery state for these zones is almost done. However, the data at the eastern zone shows gravity increasing. It was assumed that the subsurface fluid at Takigami area flows from south, which is the direction Kuju Mountain area. Then, we noted that the fluid from south is filling the faults in eastern area in the beginning before going through to northern area (due to its high permeability (Jalilinasrabady et al., 2011)), thus the recovery state in the eastern zone has not been done.

By using theorem of Gauss, we calculated the mass changes based on the gravity changes from August 2009 to August 2012. This calculation is excluding the northern area as it has different water system, and removed the effects of precipitation and evapotranspiration by Gwater-e program (Kazama, 2011). And, we found that the mass increases as much as 10.12 Mt in the Takigami geothermal area. This mass change is associated with the production and reinjection process of geothermal fluids.

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