

Gravity change with crustal deformation observed at Tokachi-dake volcano, Hokkaido, Japan

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Tokachi-dake volcano, located at central Hokkaido with 2077m height, is one of active volcanoes in Kuril-Japan trench junction, and erupted in 1926, 1962 and 1988-89. Anomalous activation in geothermal activity and seismicity prior to above three eruptions had been observed. Re-activation in geothermal activity near active craters had started and increased from 1995 to 2000, but its activity gradually decreased till 2006. Localized crustal deformation, however, has been detected by GPS in 2007 and accelerated in 2008 to 2009. It has still continued in 2011.

Repeating GPS observation network in and near active crater was constructed in 1998. This network is designed to observable both crustal deformation by GPS and gravity change by gravity meter. Data from simultaneous observation enable us to distinguish the source of deformation, deeper magmatic or shallow geothermal. We started GPS and gravity hybrid observation in 1998 by SCINTREX CG-3M gravity meter. More than one time measurements at a bench mark has been done to reduce measurement errors during a round-trip observation. Gravity meter has changed to SCINTREC CG-5 till 2010.

Figure indicated gravity changes since 1998. Reference benchmark is located at 3.4km northwest from active crater. No significant gravity changes were observed from reference to 3km distant. Gravity difference less than 0.2mGal in there indicated no gravity change during a decade. On the other hand, clear gravity decreasing with 0.12-0.14mGal, which indicating uplifting, was appeared at near crater benchmarks. GPS observation also indicated 0.3m uplifting at same benchmarks, and its free-air correction with 0.3086mGal/m give 0.1mGal reduction of gravity. These facts strongly implied gravity change was due to localized uplifting of ground surface, not due to magmatic activity.

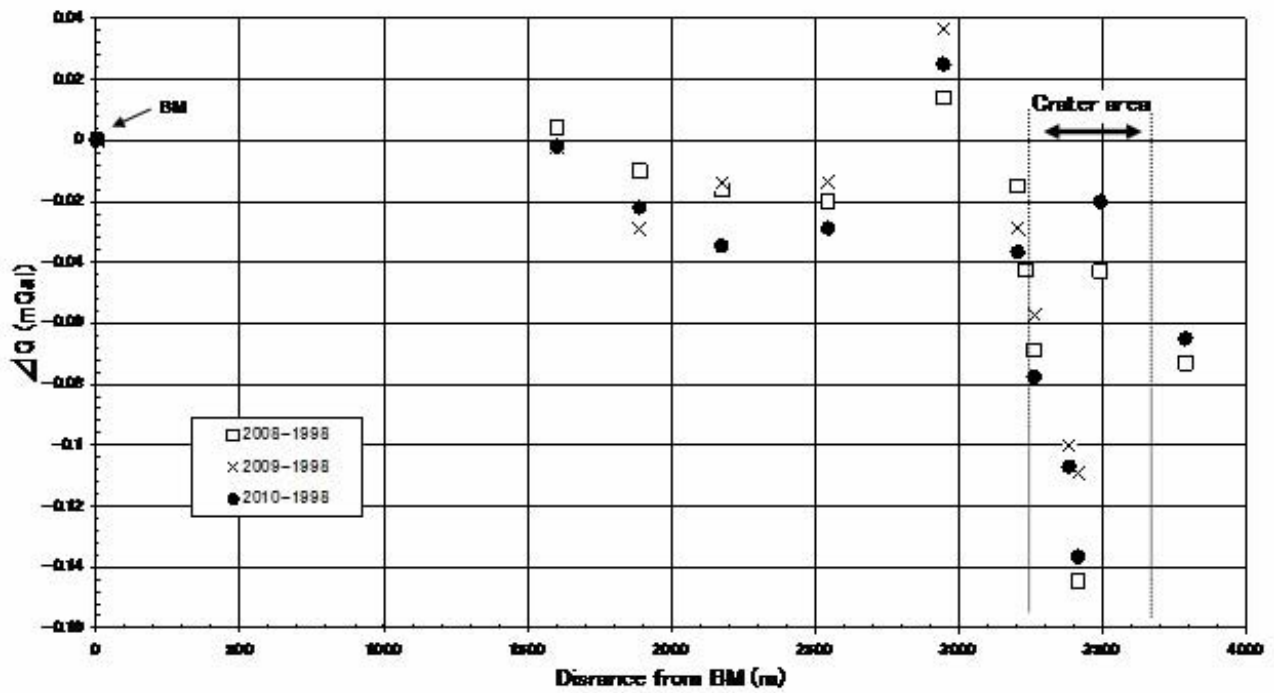


Figure caption. Gravity changes at Tokachi-dake volcano since 1998. Reference benchmark is situated 3.4km northwest of active crater. Clear gravity decreasing were observed at bench marks in crater area.