

Continuous gravity measurements at Crystal (CO₂) Geyser, Utah

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We made continuous gravity measurements using a CG5 gravimeter at Crystal Geyser, Utah in December 2011. Crystal Geyser is a gassy cold geyser which is activated primarily by the evolution of carbon dioxide. We have two purposes regarding the measurements. (1) Natural analogs for gravity measurement provide a potential way to obtain information for one important potential mode of CO₂ leakage from wells. (2) Trial of a similar continuous gravity measurement which is being planned for gravity monitoring for geo-sequestration at a field, where formation is similar but deeper than at Crystal Geyser.

Observed geyser activity was different from the activity based on the 76 days observation (Gouveia and Friedmann, 2005). The previous observation revealed a striking bimodal distribution in eruption duration. About two thirds of the eruptions were short (7-32 min), and about one third were long (98-113 min). However, our observation revealed that eruption duration were 60-90 seconds, much shorter than the shorter eruptions in 2005.

A microprocessor-based automated gravimeter, Scintrex CG5 can be operated in cycling mode, when data acquisition is triggered at a pre-defined sampling rate. It has a capability of raw data acquisition, which enables us to store the unprocessed 6 Hz data (gravity, tilt-x, tilt-y, and internal temperature) in memory. We detected a particular signal not in gravity but in tilt at Crystal Geyser. We have ever made similar measurements at Hirogawara CO₂ geyser, Japan and geothermal geysers in New Zealand. Continuous gravity record at each site constrains the volume and/or the depth of the reservoir which is supposed to supply fluid for each geyser activity. This result is of particular interest in field surveys of temporal gravity changes related to some environmental or geodynamical processes, where gravity variations are expected to occur in hours or shorter period.

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