

Gravity vs Strain/Tilt Changes at Sakurajima Volcano from the Dyke Intrusion Event in August 2015 through Resumption of Frequent Explosions in February 2016

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In this paper, we deal with short-term gravity signals based on continuous absolute gravity measurements from July 2015 through February 2015. During this period, significant seismicity and crustal deformations were observed on Aug. 15, 2015, followed by unusual quiescence from late September 2015 through early February 2016.

We compared gravity $g(t)$ with strain or tilt record $e(t)$ on Sakurajima volcano. Two aspects are noteworthy to point out. That is,

(1) The ratio $|g(t) / e(t)|$ during the dyke intrusion (Aug. 15, 2015) is 100 times smaller than that during the other explosion period.

(2) Time lag between $g(t)$ and $e(t)$ is negligibly small during the dyke intrusion (Aug. 15, 2015) while $g(t)$ during the other period shows significant time lag (~1 day) to $e(t)$.

These characteristics are well explained in terms of the conduit status (open/closed). When the conduit is closed as in the case of the dyke intrusion event, both strain/tilt and gravity are principally governed by instantaneous elastic deformation, which implies absence of time lag. On the other hand, when the conduit is open as in the explosion period other than the dyke intrusion event, inflation/deflation of magma chamber does not cause effective elastic deformation, which means larger $|g(t) / e(t)|$ compared to the case of closed conduit and significant time lag of $g(t)$ to $e(t)$ because magma migration in a conduit requires certain amount of time.

Keywords: Gravity, Sakurajima, Magma Head, Crustal Deformation, Open Conduit, Vulcanian Eruption

