

Absolute gravity signals at the Sakurajima volcano since 2009 through 2016

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In this paper, we present gravity signals based on continuous absolute gravity measurements since 2009 through 2016. During this period, several hundreds to a thousand eruptions/explosions were observed every year until July 2016. In particular, significant seismicity and crustal deformations were observed on Aug. 15, 2015, followed by unusual quiescence since August 2015.

Gravity signal after eliminating groundwater disturbance showed remarkable features during several major volcanic events, such as (1) vulcanian eruption from the Minamidake A crater on July 24, 2012, (2) formation of lava dome at the Showa crater in January to February 2015, and the dyke intrusion events on Aug. 15, 2015.

Correlation between the two time series of gravity change $Dg(t)$ and tilt/strain changes $De(t)$ is essential to discuss the volcanic process of these events. For example, time lag between $Dg(t)$ and $De(t)$ is negligibly small during the dyke intrusion (Aug., 2015) while $Dg(t)$ during the other period shows significant time lag (~ 1 day) to $De(t)$. In addition the amplitude ratio $|Dg/De|$ during the dyke intrusion event assumed a value expected from the dislocation theory, while it is 100 times larger than the expectation during the other events. 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.

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