



Gravity monitoring of Tatun Volcanic Group activities and inference for underground fluid circulations

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The Tatun Volcano Group (TVG), located on the northern coast of Taiwan adjacent to the city of Taipei, experiences active hydrothermalism but has no historical record of volcanic eruption. Yet recent studies suggest that TVG is dormant-active rather than extinct. To monitor mass transfers and to gain further understanding of this volcanic area, gravity variations have been recorded continuously since 2012 using a superconducting gravimeter, and once every few months since 2005 using absolute gravimeters. We analyze the continuous gravity time series and propose a model that best explain the gravity variations due to local groundwater redistribution. By correcting these variations, we identify gravity changes as large as $35 \mu\text{Gal}$ that occurred concomitantly to fluid pressure-induced earthquakes and changes in the gas composition at Dayoukeng, one of TVG's fumaroles, over 2005-2007. We examine several fluid movements that can match the gravity observations, yet too few additional constraints exist to favor any of them. In particular, no significant ground displacements are observed when these gravity variations occurred. On the other hand, the model of gravity changes due to local groundwater redistribution can be routinely computed and removed from the ongoing time gravity measurements in order to quickly identify any unusual mass transfer occurring beneath TVG.