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## Temporal Variations in the Depth Estimate of Mass Density Changes at Mt Etna Volcano

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Continuous gravity measurements at Mt. Etna, Sicily demonstrate spatio-temporal variations that can be related to volcanic processes. Two iGrav superconducting gravimeters (SGs) were installed in 2014 and 2016 at Serra La Nave Astrophysical Observatory (SLN; 1,730 m elevation; ~6.5 km from the summit craters) and La Montagnola hut (MNT; 2,600 m asl; ~3.5 km SE of the summit crater). Since their installation both stations have been continuously recording, resulting in high-resolution (1 Hz sampling rate) time series. The persistent activity of Etna is maintained by a regular supply of magma to the shallower levels of the plumbing system. The bulk mass redistributions induced by the newly injected material result in minor variations in the local gravity field that are recorded by the two stations. By assuming that the observed gravity changes are due exclusively to mass changes in an almost spherical-shaped source, located beneath the craters, the amplitude ratio between the two signals can be used to estimate the depth to potential mass changes beneath the surface.

This study reports on the time-dependent nature of mass changes located beneath the craters of the volcano during 2019. Results highlight distinct periods of stability at different depths, as well as potential periods of transitory activity, where the predominant mass source switches between storage zones at different depth. These events are correlated to phases of strombolian and effusive activity, highlighting the potential of continuous gravimetry for the detection of eruption precursors.