Seminario di approfondimento

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Time-space seismic-energy evolution of a super-volcanic unrest: unraveling where it came from and what will produce the next

Abstract:

Time-dependent seismological imaging is probably the most important tool to monitor changes in volcanological structures. When using unrest data at supercalderas, however, these techniques are generally considered difficult to upscale to eruptive events and insufficient for reliable interpretations of volcano dynamics. Here, we combine recent developments in seismic attenuation and rupture imaging with geochemical, geomorphological, and rock-physics interpretational tools and resolve in time and space the deepest paths of magmatic fluids and gases producing Campi Flegrei largest monitored unrest (1982-1984). This is the first 4D seismological evidence of how the volcano built up and released stress via day-long supercritical fluid injections, whose deeper SE-to-NW striking source is located at the offshore boundary between subsiding and resurgent portions of the caldera. The consequent repeated degassing under the caprock makes the volcano more prone to deform until the peak of the seismic crisis, corresponding to an intense earthquake followed by aseismic slip. The drastic change in permeability activates deep fluid circulation to local geothermal areas via known structural paths and enhances today-present accumulation in the low-gravity subsiding offshore portion of the caldera. The end-of-crisis stress-release and subsidence mechanisms are similar to those dating back to the fifth century and preceding historical volcanic eruptions. The results clarify the mechanisms behind the frequent unrests at the volcano and hold promise of forecasting future deep paths of eruptive materials.

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