



Volcano-tectonic controls on shallow magma intrusion at Campi Flegrei, southern Italy

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Campi Flegrei is a volcanic field immediately west of Naples, southern Italy. It lies within the Campanian Plain, a NW-SE trending graben about 65 km long and bounded by regional faults. During the Holocene, the region has been subject to a NE-SW shearing, at a mean rate of $\sim 10^{-8}$ - 10^{-7} a⁻¹. Since 1968, Campi Flegrei has undergone two episodes of unrest (1968-72, 1982-84) that have produced a net maximum uplift of 3 m near the port of Pozzuoli. Previous analyses have reproduced the pattern of vertical deformation assuming pressure sources at depths of 5 km or less. However, none has accounted for observed patterns of horizontal deformation. The vertical and horizontal data for 1982-83 are here re-analysed assuming a penny-shaped sill. The patterns are consistent with the intrusion of a sill with a volume of 0.03 km³ at a depth of 2.75 km, together with a broadly E-W viscoelastic relaxation of the lower crust (Young's modulus = 85 GPa, viscosity $\sim 10^{19}$ Pa s), at a strain rate of 3×10^{-5} a⁻¹, around a feeding magma reservoir at a depth of 10 km. The E-W relaxation suggests a N-S orientation for the feeding dyke which, in turn, is consistent with the NE-SW shearing across the Campanian Plain. Tectonic movements and crustal rheology are therefore significant controls on the pattern of magma transfer between the deep reservoir and shallow sills.