



The potential for forecasting eruptions at Campi Flegrei, southern Italy.

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The Campi Flegrei caldera, in southern Italy, has undergone alternating periods of subsidence and uplift during the past 2000 years. The behaviour is consistent with a secular, background rate of subsidence, at about 17 mm a^{-1} , being interrupted by periods of net uplift during at least 1430-1538 and 1968-Present. The 1430-1538 period produced a net maximum uplift of 17 m at the port of Pozzuoli and, also, culminated in Campi Flegrei's only historic eruption, at Monte Nuovo, about 3 km WNW of Pozzuoli. In addition to ~ 100 years of caldera-wide uplift, this eruption was preceded by about 48 hours of elevated seismicity and ground deformation in the vicinity of the future vent. The period 1968-Present can be resolved into short episodes of rapid uplift (1968-1972 and 1982-1984, each of about 1.7-1.8 m), alternating with longer intervals of quasi-stationary conditions or slow subsidence. When the background rate of subsidence is subtracted from the recorded movements, uplift is seen to have produced a permanent deformation of some 33 m at Pozzuoli.

New ground-deformation studies suggest that the recent uplifts are consistent with the intrusion of magmatic sills to depths of 2.5-2.75 km. By analogy, the 1430-1538 uplift may be attributed to the intrusion of ~ 10 sills. The eruption in 1538 may therefore reflect the fact that the crust must be stretched beyond a critical stage before a dyke can propagate to the surface. Alternatively, each episode of short-term uplift has an associated probability of eruption and so the relation between the time of eruption and total uplift is stochastic. In the first case, it might be possible to forecast eruptions from the total amount of crustal deformation. In the second, it may not be possible to

forecast eruptions until the very short-term precursors have been detected.