

GPS Imaging of Mantle Flow and Flexural Uplift of the Apennines, Italy

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We use a newly updated GPS dataset and the GPS Imaging analysis technique to show that the dynamic relief of the Apennines Mountain chain in Italy is currently increasing along its entire length by ~ 1 mm/yr. Active uplift is positive along the entire length of the Apennine crest including the northern Apennines, Calabria and northern Sicily. The maximum uplift rate is geographically aligned with the highest elevations, the topographic drainage divide, and the zone of active crustal extension and seismicity. Relief is increasing in a ~ 120 km wide zone with a profile similar to the long wavelength topography, but not similar to the shorter wavelength topography generated by active faulting and erosion. A zone of minor active uplift is aligned with the restive volcanic fields and area of high geothermal potential (e.g., Campi Flegrei, Alban Hills, and Lago Bolsena) west of the Apennines. However, the primary axis of uplift aligns with the highest topography and extension that currently accommodates east-northeast translation of the Adriatic microplate relative to the Tyrrhenian Basin. Uplift occurs despite that the expected consequence of extension is crustal thinning and subsidence. Anomalies in free-air gravity and ~ 100 km deep seismic wavespeed may suggest that elevation gain is related to processes in the upper mantle. For example, the uplift signal is consistent with asthenospheric mantle flow in the

space above a sinking and fully detached Adriatic slab, and/or extensional flank flexure that drives uplift across the axis of the Apennine rift.

