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Joint inversion of geodetic data in a layered medium: preliminary results for the Campi Flegrei caldera (Italy)

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We invert deformation and gravity data collected at Campi Flegrei caldera (Italy) during the 1980-1984 inflation. The source is modelled as a point spheroid embedded in a layered half space. Source parameters (location, aspect ratio, volume change, intrusion mass) are optimized using two different global minimization techniques (Adaptive Simulated Annealing, Ingber 1993, and Neighbourhood Algorithm, Sambridge 1999). Forward modelling (generation of expected measurement values given a set of model parameters) is performed by means of a set of Green's functions, generated using PSGRN (Wang et al. 2006) for what relates to a massless expanding source and GRAVW4 (Fernandez et al., 1997) for what relates to a point mass intrusion. Because Green's functions depend on layering but not on source parameters, their use makes the inversion code faster and allows real-time applications.

Preliminary results give a substantial increase of the source depth with respect to inversions performed in a homogeneous half space (focussing effect). The intrusion mass shows a weak dependence on the source aspect ratio, suggesting the presence of high-density intruding material.