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3D model of ground deformation at Campi Flegrei (Italy): role of horizontal displacement

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Campi Flegrei caldera (Italy) was formed by highly explosive eruptions that occured in the last tens ka. At present its activity is characterized by a slow sequence of ground uplifts and subsidences. In the period 1970-1984 more than three meters of uplift were cumulated, of which only one has been recovered up to now. Giving the large population density, the volcanic hazard of the area is high. In the last seven years a great effort was developed to perform extended seismic surveys to shed light on the shallow structure of the caldera and on the location and nature of the source of the uplifts. Starting from the results of these surveys we developed a 3D elastic finite element model of the caldera fixing the structure and some geometric parameter of the source of ground deformation, and that takes into account the asymmetry of the caldera and of the source. We left as free parameters the location and orientation of the source, its tilt and a not uniform overpressure applied on its walls. By comparison with measured surface displacement during the period 1982-1984 we assess the relative importance of these factor in influencing ground deformation. In particular we find that horizontal displacement field changes significantly when parameters are changed, at difference of vertical one. Our results may be useful both for further modeling and for calibrating survelliance networks.