Geophysical Research Abstracts
Vol. 12, EGU2010-12501, 2010
EGU General Assembly 2010


# Finite Element modelling of deformation induced by interacting volcanic sources

Karen Pascal, Jürgen Neuberg, and Eleonora Rivalta
School of Earth and Environment, The University of Leeds, Leeds, UK (ee07kp@leeds.ac.uk)

The displacement field due to magma movements in the subsurface is commonly modelled using the solutions for a point source (Mogi, 1958), a finite spherical source (McTigue, 1987), or a dislocation source (Okada, 1992) embedded in a homogeneous elastic half-space. When the magmatic system comprises more than one source, the assumption of homogeneity in the half-space is violated and several sources are combined, their respective deformation field being summed. We have investigated the effects of neglecting the interaction between sources on the surface deformation field. To do so, we calculated the vertical and horizontal displacements for models with adjacent sources and we tested them against the solutions of corresponding numerical 3D finite element models. We implemented several models combining spherical pressure sources and dislocation sources, varying their relative position. Furthermore we considered the impact of topography, loading, and magma compressibility. To quantify the discrepancies and compare the various models, we calculated the difference between analytical and numerical maximum horizontal or vertical surface displacements.We will demonstrate that for certain conditions combining analytical sources can cause an error of up to 20%.

References:

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