# Simulations of dike intrusion and ground deformation by DEM (2)

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The locations and volumetric changes of the source of ground deformation, Mogi-model (1958) and Okada-model (1985, 1992) have been widely used and these enable us to identify the source quickly, in some cases, automatically. However these models assume isotropic and homogeneous crust, it is necessary to evaluate the effect of anisotropy and heterogeneity of volcanic body, as well as the fractures due to dike intrusion. We will discuss multi-scale phenomena, i.e. microscopic fracture to macroscopic ground deformation, so we adapt the discrete element method (DEM). In this topic, we develop the dike intrusion simulation in 3D. DEM defines the spring and dash-pot coefficient between particles and introduces failure criterion. Our preliminary analysis (2D) simulates the rectangular magma (dike) expansion and the result shows some nearby fractures and ground deformation of inflation. (The DEM programs are originally coded by Takashi Matsushima, Tsukuba Univ.)