Effect of topography on piezomagnetic field caused by a pressure source in the crust

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The piezomagnetic field in association with several models of crustal deformation, such as a fault model and the Mogi model, has been studied by analytical or numerical methods. It seems, however, that the effect of topography on the piezomagnetic field is not fully understood.

The Mogi model, which is the ground deformation model in case of a hydrostatically-pumped small sphere buried within a homogenous semi-infinite elastic medium, has been used to interpret the ground deformation around the volcanoes, and an analytical solution for the piezomagnetic field with the Mogi model was obtained by Sasai(1991). However, since the piezomagnetic field tends to be easily affected by the stress field near the observation point, the topographical effect may be unable to disregard.

Recently we are estimating the features of ground deformation by using FEM(ANSYS Ver.5.7) on the following cases(Sakai et al.,2002; Fujiwara et al.,2003).

1) A pressure source exists at shallow depth under the ground.
2) A low velocity layer exists on the surface.
3) A conic shape volcano exists on the surface.
4) A columnar shape of pressure source exists under the ground.

From the distribution of three dimensional stress tensors derived from those results, the piezomagnetic field can be deduced by volume integration over the whole magnetized curst. We will introduce the calculated results and consider the effect of topography on the piezomagnetic field.