Geophysical Research Abstracts, Vol. 9, 10238, 2007
SRef-ID: 1607-7962/gra/EGU2007-A-10238

Overpressure induced by phase transformation strain under far-field hydrostatic loads and why eclogites are often boudins with isotropic texture in their cores?

M. Dabrowski, **Y.Y.Podladchikov**, D.W. Schmid
PGP, University of Oslo, Norway (marcind@fys.uio.no)

Tectonic forces and the overburden load can induce significant stress partitioning on virtually all scales in a mechanically heterogeneous rocks. The chemical potentials of mineral assemblages are affected by stress and its change results in an equilibrium shift. On the other hand, mineral reactions themselves generate local pressure variations and accompanying deviatoric stress build-up, thus in turn leading to deformation. In order to better understand this effect, a mechanical model of an idealized heterogeneity, subjected to external and internal loads, is investigated. We employed the solution derived by Eshelby (1957), describing elastic fields within and around an ellipsoidal inclusion with constant internal eigenstrain and external load. The cross-coupling between isotropic and deviatoric part of far field and induced perturbation stress is studied and quantified as a function of bulk and shear elastic modulus contrast, and the shape of inhomogeneity. In addition, the stress field in a vicinity of an inclusion is examined. The geological consequences of the studied model are discussed, as it offers a potential explanation to local pressure variations that are often revealed by geobarometric studies. As a next step, we examined a mechanical effect of a reaction-induced volume change (or generally any type of eigenstrain, like thermal expansion or plastic strain). We investigated its feedback on reaction itself, thus replacing idealized end-member isochoric or isobaric conditions by container of finite strength. In addition, common natural examples of boudinaged, eclogitic layers, encouraged us to examine the deformation of a competent layer driven by a difference in the volume change between the layer and the embedding matrix. The initial instability is followed by disassembling of the layer into a chain of quasi-isolated ellipsoidal bodies. We monitor the distribution of pressure and deviatoric stresses during each stage of this process.