# Fracturing of the Crust — Geological and Geophysical View

© S. Milanovskiy, V. Nikolaevskiy, 2010

Institute of Physics of the Earth, RAS, Moscow, Russia
svetmil@mail.ru

In suggested analysis of a status and development of the Earth crust rupture experiments under high *P-T* conditions of rock samples are used in their comparison to geophysical studies, namely to available information about deep-seated fractures and faults in the crust and the upper mantle. Using scaling approach (transmission of data about a finite status of rock cores on scales of the earth crust) in comparison to results of deep seismic sounding, magnetotelluric, petrophysic and geochemistry data.

Initial representations are that. If rock massifs on strength properties are close to the properties to granite, brittle failure (including cataclastic) is possible up to Moho boundary and, therefore, a crust as a whole hydraulically permeable for water and gases. The quantitative deviations in strength (amphibolites, peridotites, serpentinites, basalts, etc. from granite) result in to wide gamma of alternatives of a constitution of the crust responding an observable geologic variety. (Including to differences continental and oceanic)

Including water as geologic factor ensures difference of crustal and mantle rocks, changes dynamics of destruction, and installing units of self-organisation during lithosphere evolution. Presence of water at destruction in the lower crust result in faults in amphibolites, to melting of granite, canceling Kennedy — Ito limitation on phase boundaries "basalt — eclogite" and provides appropriate kinetics of transformation events demanded in common theories modifications of material on Moho and its transmission and accumulation in lithosphere column. Known peculiarities in metamorphism and metasomatism also are connected with presence and absence of water.

In the earth crust there are in essence relevant differences in brittle destruction. They depend on a geotherm with depth and a concurrence of vertical and horizontal stresses that explains existence of waveguides by a flattening of deep-seated faults in middle crust. Modifications of seismic rates now it is stipulated not only petrology of the rocks, but also by level of their fracturing. Voidage of system of cracks is responsive to field distortions of the stresses manifested both at earthquakes, and at quasi-stationary development of tectonic events.

# Boundary element method applied to plume dynamics

© G. Morra[1], D. Yuen[2], F. Cammarano[3], 2010

[1]Dept. of Geological Sciences, University of Sydney, Sydney, Australia
[2]University of Minnesota, Minneapolis, Minnesota, USA
[3]Institute of Earth Sciences, E.T.H., Zürich, Switzerland
gabrielemorra@gmail.com

We apply the fast multipole formulation of the boundary element method (FMM-BEM) to the temporal evolution of a rising mantle plume interacting with a mid mantle density/viscosity discontinuity. Detailed monitoring of the possible evolutions in time how the plumes may have a steady, a pulsating or a stalled behaviour. We map out the density and viscosity conditions controlling the three patterns and show that realistic radial mantle Earth profiles allow them to happen. We evaluate therefore possible scenarios for the dynamical evolution of the lower mantle convection and propose which ones are compatible with the surface geological observation of island plumes.