Geophysical Research Abstracts
Vol. 20, EGU2018-3645, 2018
EGU General Assembly 2018

Pressure and stress calculation in geodynamic models and application to metamorphic systems

Stefan Markus Schmalholz
University of Lausanne, Institut de sciences de la Terre, Lausanne, Switzerland (stefan.schmalholz@unil.ch)

Metamorphism and rock deformation often occur together. Understanding the coupling between metamorphism and rock deformation is essential to quantify and reconstruct tectonic processes, such as orogeny, because mineral transformations can modify the strength of the rock and the metamorphic rock record provides a fundamental data set to constrain the burial and exhumation history of rock units. However, the coupling of metamorphism and rock deformation is still incompletely understood. It is currently debated whether and how the stresses causing rock deformation affect metamorphic reactions occurring in the deforming or stressed rock. In this contribution, the stress and pressure calculation in typical geodynamic models is shortly reviewed. Particularly, the relation between mean stress in an incompressible viscous fluid and pressure in a viscous fluid with bulk elastic compressibility is discussed. Furthermore, field examples are presented which indicate significantly different metamorphic pressures in coherent rock units. It is shown that the observed metamorphic pressure variations are very unlikely the result of homogeneous lithostatic pressure, retrogression and slow kinetics. Alternative models are presented which explain the metamorphic pressure variations as a result of tectonic stress and pressure variations in mechanically heterogeneous rock units. The importance of relating metamorphic pressure to tectonic stresses for understanding the Alpine orogeny is discussed.