Geophysical Research Abstracts
Vol. 20, EGU2018-17730, 2018
EGU General Assembly 2018

Fluid extraction from subduction zones by reacting porosity waves

Benjamin Malvoisin, Yury Y. Podladchikov, and Samuel Omlin
UniL Lausanne, Faculté des Géosciences, ISTE, Lausanne, Switzerland (benjamin.malvoisin@gmail.com)

At the depth at which the downgoing slab dehydrates in subduction zones, the permeability is thought to be small prevailing any large scale pervasive fluid flow. Recent observations of tremors migration along the slab interface suggest that other mechanisms are acting for an efficient and channelized fluid transport. Here, we developed a new generation of numerical models including the effect of volume change during metamorphic reactions on fluid flow and deformation. After predicting the mineralogical composition by using a combination of Gibbs energy minimization calculations and a new kinetic law for metamorphic reactions, the changes in porosity and fluid pressure are calculated in a poroviscoelastic rock. If a porosity anomaly is considered as an initial conditions, the fluid pressure deviates from the lithostatic pressure in opposite directions at the top and at the bottom of the anomaly. This triggers reactions of volatilization on one side and devolatilization on the other side of the anomaly leading to porosity clogging and opening, respectively. Numerical simulations indicate that the resulting porosity anomaly migration is an efficient fluid extraction mechanism. This mechanism reproduces tremor migration both upward and downward and the formation of metamorphic veins when complex reaction rates are introduced. Therefore, it could play a significant role in the volatiles transfer from the subducted oceanic lithosphere up to the surface.