Geophysical Research Abstracts
Vol. 12, EGU2010-8756, 2010
EGU General Assembly 2010

Hydrous reactive flow and magmatic channelisation

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It is broadly accepted that the dominant mechanism of melt production in subduction zones is hydrous flux melting. This type of melting occurs when hydrous fluids, released by metamorphic reactions in the subducting slab, metasomatize the mantle wedge. As hydrous fluid rises off the subducting slab it encounters higher temperatures within the mantle. The volatile elements in the hydrous fluid (principally water) depress the solidus of the mantle and cause melting. This can be thought of as a reactive flow process whereby a chemically reactive liquid migrates through a soluble matrix, up a solubility gradient—with increasing temperature, the hydrous fluid becomes increasingly undersaturated in silicate rock components. The fluid is therefore corrosive and hydrous melting is understood as a dissolution process. Under these conditions, the flow can be affected by the Reactive Infiltration Instability, which leads to channelization. In this talk I introduce a themochemical/fluid dynamical model to investigate this scenario and show that for plausible conditions in the mantle wedge, channelized magmatic transport is expected.