



Reaction at a lithological interface in Alpine Corsica: oxygen fugacity gradient or fluid overpressure?

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The changes in mineralogy at lithological contacts are generally interpreted as resulting from a diffusion process under chemical potential gradients imposed by strong composition variations. Chemical potentials are also functions of temperature and pressure and local changes of these parameters may also be involved in the formation of the mineralogical assemblage. In Alpine Corsica, a lithological contact between serpentine and marble is composed of three mineralogical zones having chemical compositions evolving from one rock end-member to another. At the marble contact, wollastonite and carbonaceous matter are found instead of calcite and quartz in the marble, suggesting decarbonation. Thermodynamic calculations for this reaction and the respective increase in density of 25 % and 7 % in the bulk rock and in the garnet minerals are interpreted as records of a pressure gradient during reaction zone formation. The reaction between the H₂O-bearing serpentinite and the CO₂-bearing marble to form a volatile-free sub-zone released fluids at the contact. The impact of such a release on the formation of a pressure gradient was modelled by considering the effects of both the rock compaction and the transport of fluid by hydraulic diffusion. Modelling results indicates that > 0.5 GPa fluid overpressure can be generated at the contact if devolatilization rates are of the order of the one experimentally measured (> 10⁻⁵ kg of fluid/m³ of rock/s). The resulting pressure gradient is sufficient to form the reaction zone at equilibrium by counter-balancing the effect on chemical potential of the chemical composition variations across the contact. Finally, after the reaction has run to completion, the model predicts that fluid rapidly diffuses away from the interface which thus stops reacting and is preserved through exhumation.