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Modèles thermiques simples de la croûte terrestre: un regard sur les Alpes

Simple thermal modelling of Earth crust: a look at the Alps

When studying a regional metamorphic history, the order of magnitude must be known in order to achieve a realistic model of rock Pressure (depth) - Temperature - time evolution (P-T-t). In other words, the necessary time and depth for a rock to reach a given temperature must be calculated. The first part of this paper is dedicated to the simplest analytical solution of the heat conduction equations applied to geology. The order magnitude of conduvtivity, diffusivity etc. are also presented. Simple models demonstrate the importance of the exhumation processes and radioactive heat production.

The exhumation rate of hot rocks involved in a collision chain like the Alps deeply affects the thermal state of a collision chain. 1D finite difference simulation is compatible with the P-T-t path of the Alps. Nevertheless, the heat flow density of the Alps is low compared to the one expected. This implies a convincing cooling of the chain by water circulation induced by high hydraulic head.