

Sources of heat, pressure and fluids for crustal metamorphism

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Traditionally the heating and pressurization of crustal rock is attributed to burial along lithostatic pressure and temperature gradients. Consequently, fluids are produced by dehydration reactions and extracted by porous flow. Significant effort is devoted to extraction of pressure-temperature history (PTt) of geological processes from rocks returned to the surface. Even if PTt history is recovered correctly, significant final interpretation errors are often due to non-critical usage of the simplifying assumptions on pressure, temperature and permeability gradients in the Earth's interior. Conversely, PTt data recorded by metamorphic reactions can be used to constrain the magnitude of deviations from lithostatic values and plate tectonic time scales during active phases of orogenic cycles. These deviations may help to explain shorter than expected duration of the metamorphic and fluid extraction events, depth and heat source for the metamorphism, and mechanisms for crustal nappes formation and deep earthquakes.