HOT TECTONIC CHANNEL: A KEY FOR THE ORIGIN OF ULTRAHIGH-PRESSURE ROCKS

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On the basis of well known P-T-t paths and using two-dimensional numerical modeling of incipient continental collision associated with subduction of the lithospheric mantle, the formation and exhumation of coesite- and diamond-bearing rocks metamorphosed at T > 700 °C in presence of the dense supercritical silicate fluid and / or melts is explained by a "hot channel effect" This process involves the transient formation of a hot tectonic channel in crustal and mantle rocks at the beginning of collision. The channel formed along the plate interface and could penetrate toward the bottom of the lithosphere of the overriding plate (150 - 200 km) within the range of 700 °C and 1000 °C. Anomalously high temperature is caused by intense viscous and radiogenic heating produced in the channel by deeply subducted radiogenic upper-crustal rocks (e.g., sediments of passive margin origin). Heating is also associated with intense aqueous fluid flow released in the course of rapid dehydration (deserpentinization) of the mantle lithosphere of the overriding plate that has been hydrated during previous subduction stages. Lower effective viscosity of rocks subjected to increased temperature, partial melting, and fluid infiltration promotes the mélange of hydrated mantle and crustal rocks within the hot channel. This channel may exist only at the earliest stages of collision and producing rapidly large amounts of UHP-HT rocks. Further collision closes the channel through squeezing rheologically weak (partially molten) buoyant rocks between the rigid lithospheric mantle and two colliding plates. An assemblage of complicated P-T paths with repetitive loops characterizes the exhumation of UHP rocks in the hot channel. Combined effects of tectonic overpressure and shear heating are investigated numerically for the P-T paths of UHP rocks.