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Mid-crustal Partial Melting, Metamorphism and Lithospheric Structure of Hot Collisional Zones from a Numerical Perspective

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We performed numerical modelling of continental collision following oceanic subduction, where the subducting continental passive margin has a thick layer of highly radiogenic sediments. This geometry was considered because of the observation that high concentrations of zircon and monazite (rich in radiogenic elements) are found in sediments deposited at cratonic passive margins. After collision, the weak part of the crust is stacked to the upper plate margin and forms a thick crustal accretionary wedge that grows toward the incoming plate foreland as convergence continues. Crustal thickening and accretion of highly radiogenic sediments produce a partially molten mid-crustal level that propagates laterally and upward. Eventual extrusion at the surface of the partially molten material is enhanced by high erosion at the frontal mountain belt and results in the emplacement of an inverted metamorphic sequence. The results are in good agreement with geological, metamorphic, geochemical and geophysical observations from natural hot mountain belts (e.g. Himalaya) and previous numerical studies of similar geodynamical settings.