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Where's the heat? – Possible heat sources for thermal overprint in modern orogens: an old question and new data.

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Many modern orogens are displaying two-stages P-T paths where thermal overprint represents a clearly separated heating pulse following an isothermal or cooling decompression of the high-pressure stage. This evolution raises the old and still debated question of possible heat mechanisms responsible for thermal dome – Where's the heat (Jamieson et al., 1998)? Several explanations exist to elucidate high-temperature thermal overprint which has numerous mechanical consequences on their later evolution. The most crucial approaches are accumulation of material with especially high radioactive heat production, advective heat transfer by rising of hot high-pressure slices and/or by plutons and dykes, shear or viscous heating, conductive relaxation of isotherms due to decreasing plate convergence rates and up-welling of hot asthenosphere due to slab breakoff or to extension.

Despite that the Alps are not characteristic for HT evolution, the heaviness of presented data allows us o review and to re-interpret the models of heat source in modern orogens.

Remnants of the HT event are unevenly distributed throughout the Alps. They are localized in the Tauern window, the Lepontine Dome, and in Tuscany. A new temperature distribution around the Lepontine dome in the North clearly shows the progressive (in time and in space) thermal overprint of HP/LT metasediments form east to the west. Combined with structural data and analysis of microstructures, we interpret this

thermal event as a separate heating pulse,. This pulse has occurred after nappe stacking and a first nappe refolding stage but before and in the beginning stages of a second nappe-refolding event. The heat transfer has be done by conduction in this part of the orogen. These results are in contrast with the evolution in the south of the Lepontine dome, where the thermal overprint is intimately related to deformation events related to nappe stacking.

Although HT events in the Eastern and Central Alps are mainly due to large local accumulations of crustal material during continental collision, studies of the metamorphism in the Alps allow us to identify other heat sources and to clearly decipher between each of them.