# The global range of subduction zone thermal structures from exhumed blueschists and eclogites: Rocks are hotter than models

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The maximum-pressure *P-T* conditions ($P_{max}$-$T$) of exhumed subduction-related metamorphic rocks are compared to predictions of *P-T* conditions from computational thermal models of subduction systems. While the range of proposed models encompasses most estimated $P_{max}$-$T$ conditions, models are on average too cold. In general, discrepancies are greatest for $P_{max}$ < 2 GPa where only a few of the highest-$T$ modeled paths overlap typical petrologic observations and model averages are 100-300 °C colder than average conditions recorded by rocks. Both petrologic estimates and models have inherent biases that are critically evaluated. Petrologic analysis may overestimate temperatures at $P_{max}$ in circumstances where overprinting occurs during exhumation. Model simplifications may underestimate temperatures at depth by neglecting shear heating, hydration reactions and fluid and rock advection. Our compilation and comparison suggests that exhumation processes in subduction zones require closer petrologic scrutiny, whereas models should more comprehensively incorporate all sources of heat. Understanding the thermal structure of subduction zones is crucial to understanding global geochemical cycles, and we briefly explore the implications for geochemical cycling of volatile elements.