

## Research of UHP metamorphism and implication to Orogeny, Mantle dynamics, and thermal material evolution of Earth

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The most important research results of UHP metamorphism and belts are as follows; 1) Continental crust can subduct down to 100-200km depth at least, suggesting the concept that only density controls the survival of TTG crust on the surface through time forever is wrong, which is thought to be common sense geologically. Theory of continental crust subduction leads the three layers model of continents on the Earth (Kawai et al., 2008). 2) UHP-HP belts is a thin unit less than 2km which is sandwiched by a paired faults at the top and bottom, indicating the tectonic intrusion of regional metamorphic belt caused by wedge extrusion due to slab breakoff or ridge subduction. This led the orogenic model by continent-continent collision. 3) Barrovian metamorphism is not a progressive metamorphism but retrogressed hydration product during the exhumation to the surface at mid-crustal level. Role of water is to control the material circulation within the Earth from the surface to the bottom of upper mantle. 4) UHP-HP belts appear on the surface of the Earth only after 630Ma. It indicates rapid change of subduction geotherm at the onset of Phanerozoic, which initiated the return-flow of seawater into mantle. This was a trigger of emergence of huge landmass to deliver huge amount of nutrients to the continental margin and created the paradise on continental shelf for metazoans and sea plants because the sunlight was shining down to the bottom of continental shelf. 5) Specifically, the spatial limit of equilibrium domain contributed to understand the species and amounts of light elements in the core, and material circulation of the Earth's interior.