Abstract

Plate tectonics supplies cold slabs to the mantle transition zone at 670km depth where they are stagnant ca.100-400 m.y. until the catastrophic gravitational collapse due to the endothermic nature of the phase transition. Cold plume thus formed flows down onto the outer core to refrigerate the metallic Fe-Ni liquid to initiate new downflow in the core. Super-upwelling of mantle flow appears as a passive response of cold plume which is of primary importance of the Earth's dynamics in a cold planetary environment of space. Supercontinents break up by a chain of super-upwelling of hot mantle, and the resultant fragmented tectospheres capped by pre-1.9 Ga continents are drifted, dispersed and scattered in the shrinked superocean with time. Cold plumes develop in the lower mantle at random at an earlier stage of continental dispersion. Once it is formed in the lower mantle, mantle convection patterns in the upper mantle tends to be strongly controlled by a sole superplume of downwelling in the lower mantle. Plate tectonics is a superficial phenomenon on the Earth less than 1/10 of Earth's radius, whereas columnar plume flows dominate in major parts of deeper mantle. -from Author

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