

PLUMES - The Standard Model

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1. The asthenosphere (=upper=convecting= depleted mantle= MORB source= DM = primitive mantle - continental crust) represents the shallowest, sublithospheric mantle.
2. Enriched basalts must originate elsewhere.
3. The Continental Lithosphere (CL) is an ancient enriched reservoir where CFB originate or get contaminated by "plumes" coming from deeper. The CL is easily delaminated, replaced, displaced or depleted by plumes, extension or compression.
4. CL contaminates the So. Atlantic (Brazil) and Indian Oceans (India). Delaminated CL sits at the base of the upper mantle and provides OIB plumes.
5. The asthenosphere contains tongues, streaks, plums, schiellen, flow channels, plume heads, CL etc. of enriched mantle (EM) at ridges, fracture zones, propagating rifts etc.
6. Recycled material is responsible for some plumes - this passes through DM without contaminating it, either on descent or ascent. DM is the shallowest mantle (except for plume heads, streaks, tongues, channels etc.)
7. Plumes originate in the lower mantle which is [primitive, enriched, recycled] material.
8. Plumes originate in the non-convecting mantle.
9. Plumes originate in D", a chemically distinct layer, but they are mainly thermal.
10. Plumes are fixed relative to one another.
11. The sources of heat, basalt and trace elements/isotopes are all the same. If the energy source is deep the isotopic signatures are deep (except for CL contamination).
12. Plumes are secondary instabilities, separate from the main flow.
13. Midocean ridges are passive upwellings, caused by plate separation.
14. Plate tectonics is driven by plumes.
15. Plumes represent about 10% of the global heat and mass flow.
16. Higher than atmospheric $^3\text{He}/^4\text{He}$ (except for MORB) implies primitive, promordial, unfractionated, undegassed mantle.

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