

IIAP Course Exercises Exercise 2. Calculate the rising and sinking velocity

inside the mantle of an Earth-mass planet of the following objects.

(a) A plume head of temperature excess $300^\circ C$ and radius 500 km in a mantle of shear viscosity $10^{22} \text{ Pa}\cdot\text{s}$. How long would it take the plume to traverse the Earth's mantle?

(b) A 'drop' of iron of radius 50 km and average density excess $5 \times 10^6 \text{ g}/\text{m}^3$ in a hot mantle with an average shear viscosity $10^{20} \text{ Pa}\cdot\text{s}$. This should give you some quantitative feel for the idea that during the formation of the Earth, liquid iron would gather into large pools and sink to the core.