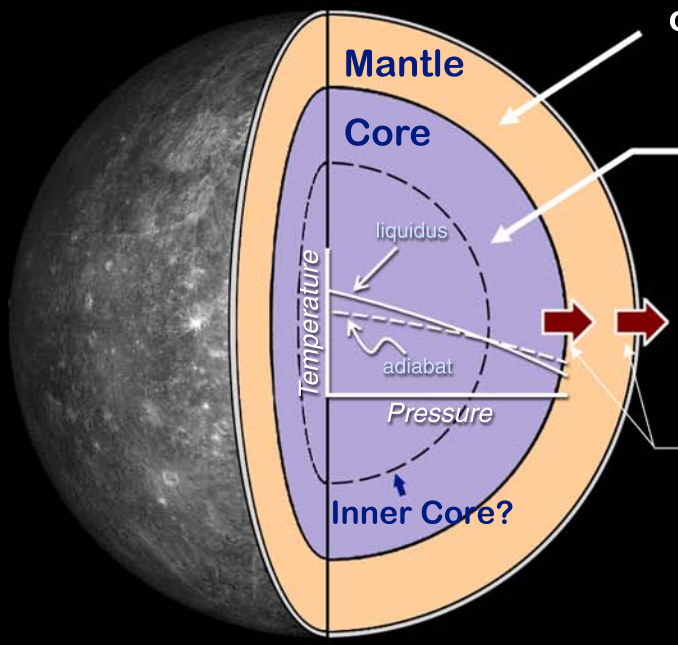
Thermal Evolution



Temperature of mantle = Radiogenic heat + Heat conducted from core - Heat conducted from mantle

Temperature of core = Latent heat + Gravitational Energy - Heat conducted from core

- Heat conducted across the core-mantle boundary (CMB) and the lithosphere (rigid upper boundary of the mantle)
- Liquid iron-rich core convects
- Mantle interior convects (solid state convection) with a temperature-dependent viscosity
- Core cooling determined by mantle's ability to remove heat (vigor of convection)

Core: Pressure and temperature with depth

- Pressure and temperature increase with depth
- *Adiabat* - the change in temperature with depth (pressure)
- *Liquidus* - temperature below which liquid begins to freeze
- Inner-core location depends on liquidus and adiabtic curves
  - where adiabat is lower than liquidus, solid iron forming (freezing)
- If solid core forming then additional heating from latent heat and gravitational energy
- Existence and size of inner core unknown but a freezing core provides additional energy to power a dynamo