Adiabatic Heat Flow in Mercury with a Fe-8.5wt%Si Core

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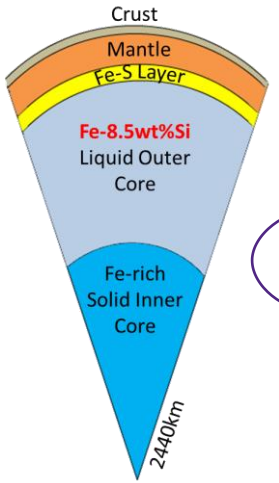
Background: Theoretical studies have tried to constrain Mercury's internal structure and composition using thermal evolution models.

- A thermally stratified layer of Fe-S
- $q_{CMB} < q_{ad}$



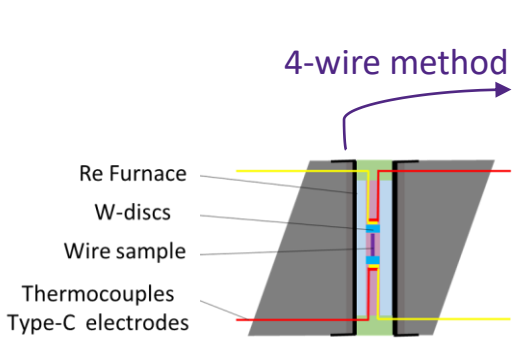
$$k_e = \frac{L_0 T}{\rho}$$

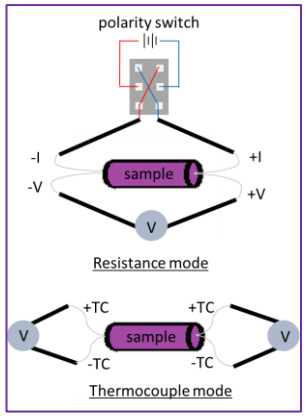
$$q_{ad} = -k_e \frac{\alpha g T}{C_p}$$

The exact amount of Si in outer core is unclear 5 < wt%Si < 25.
We consider Fe-8.5wt%Si

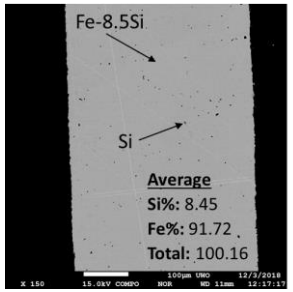
Objective: calculate q_{ad} using k, which is calculated using direct measurements of ρ.

4-wire method

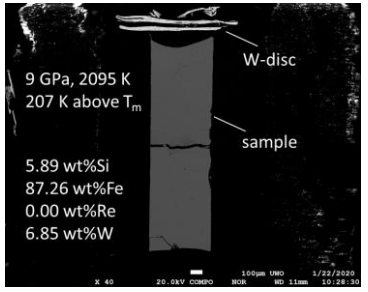


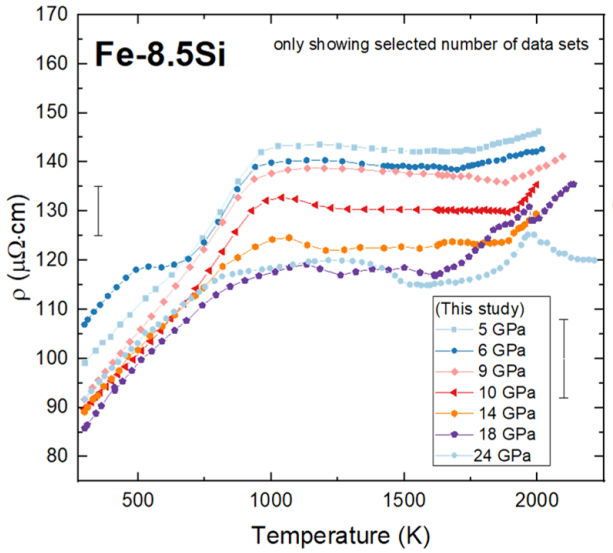


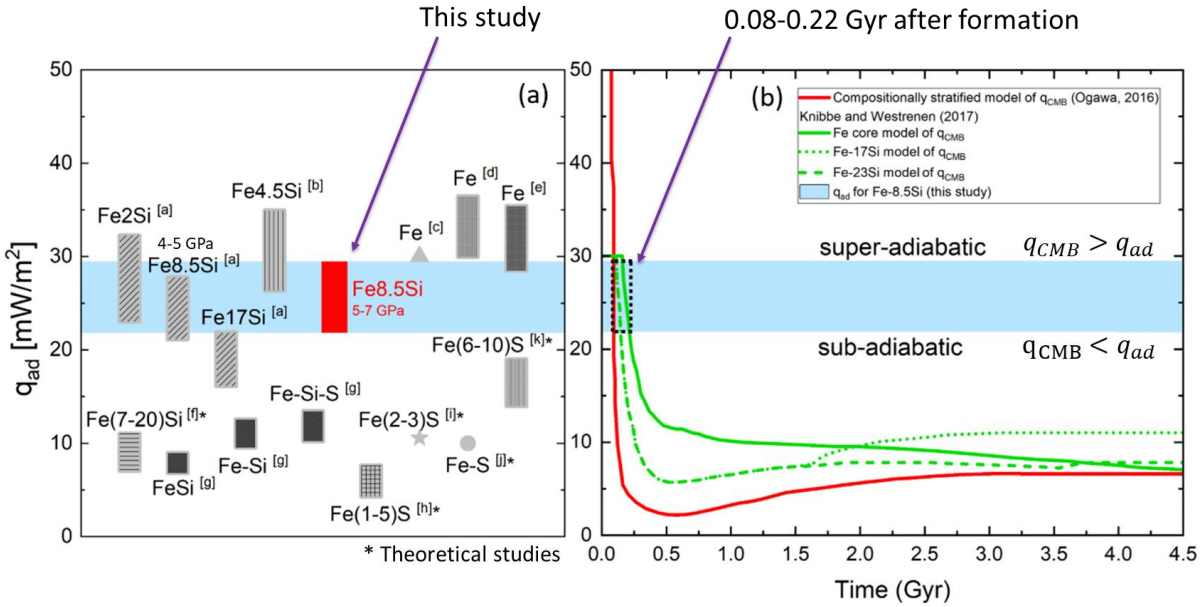
Pre-experiment



Post-experiment







Results: Thermally driven up to 0.08-0.22 Gyr, then driven by chemical convection arising from growth of an inner core. In agreement with studies suggesting presence of an IC within the first 0.1 Gyr. Onset of a chemically driven dynamo likely affected by presence of other light elements.