Thermodynamics of Earth-forming materials based on high-pressure experimental data

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Thermodynamic modelling of Earth-forming materials based on experimental data is important as it provides (1)consistency test between different types of measurements and (2)unmeasurable parameters. (1) It is often difficult to test consistency between different types of measurements such as melting temperature vs. equation of state of a phase. However, if we were unable to construct an internally consistent thermodynamic model based on those data, that indicates one (or both) of them is wrong. (2) Some physical parameters are very difficult/impossible to experimentally constrain such as the entropy jump upon melting of iron at the inner core boundary (330 GPa) which is important for the energy balance of Earth's core. However, we can derive it from a thermodynamic potential such as the Gibbs free energy as a function of pressure and temperature.

I will demonstrate how those issues are addressed with an example of Earth's core-forming systems. First I will show a set of experimental measurements for an internally consistent thermodynamic model. Then, I will discuss resulting implications for Earth's core.