Recent work has found evidence for an East-West asymmetry in the Earth's inner core which may reflect translation of the inner core with respect to the outer core. It has been shown that East-West asymmetry in the nucleation of the Earth's inner core can create a corresponding long-term asymmetry in the Earth's magnetic field. This raises the questions of whether Mercury's North-South magnetic field asymmetry could be caused by a North-South translating inner core, and if so, why its inner core translation is oriented North-South rather than East-West.

Conclusions

- Sustained inner core translation tends to increase the moment of inertia along the translation direction, causing translation to be equatorial.
- If the translation ever changes direction, true polar wander will tend to occur which will reorient the inner core to have axial translation.
- The deep inner core indicates that the Earth's translation only began recently, so it is unsurprising that this translation is equatorial.
- Mercury's magnetic field asymmetry may indicate that its inner core is also undergoing translation, in which case the North-South asymmetry is a temporary arrangement caused by a past change in its translation direction.

Future Work: Exploring the moment of inertia implications of inner core translation with more robust inner core density models. This would provide a more robust estimate of the probability of inner core TPW. In addition, mechanisms are needed to explain why translation would reverse direction. A candidate for this, which we did not investigate in detail, is a stably stratified layer caused by melting on one side of a rapidly translating inner core.