The goal of observation is to invert the data, i.e. use the data to constrain interior models. Typically, this looks like:

\[ \text{measurements} \rightarrow \text{properties directly related to measurement} \rightarrow \text{properties inferred} \]

(e.g. gravity) (e.g. density anomalies) (e.g. temperature anomalies)

most precise → least precise
most unique → most degenerate

Some examples of measurements we make that constrain planetary interiors:

- gravity fields. These tell us:
  1. planet mass \(\leftarrow\) dominant effect
  2. planet rotation characteristics
  3. dynamic structure (e.g. convection, zonal flows) \(\leftarrow\) least dominant effect
- topography (with lasers or radar)
- orbital properties (rotation rate, obliquity, libration about a uniform rotation state)
- seismicity (sources of tectonic activity) & seismology (propagation)
characteristics of tectonic activity)
- heat flow, using instruments (as on Earth/Mars) or direct measurement of IR flux (as for distant giant planets)
- atmospheric properties
- petrology (i.e. stuff on the surface that comes from the inside)
- magnetic fields
- response to electromagnetic induction