

COMPRES 2017

Title: The effect of water on seismic wave speeds of the Martian mantle

Authors: Joshua F. Martin, Wendy R. Panero

We calculate the distribution of water between mineral phases of the Martian mantle, and the effects of water on the seismic wave speeds along realistic thermal profiles and compositions. We address a range of potential compositions and thermal profiles of the Martian mantle to reflect uncertainty in core heat-flux and mantle composition. We determine the mantle mineralogy self-consistently along each potential profile and derive water partition coefficients for all phases from a suite of synthesis and mineralogical data to supplement *ab initio* calculations. Water contents for each mineral phase are then calculated along a 1D profile using the derived coefficients and a range of bulk water contents. We calculate seismic wave speeds and impedance contrasts at the wadsleyite-in and ringwoodite-out boundaries. Increasing water content results in lower seismic wave speeds, similar to increasing the temperature of a dry mantle, highlighting the importance of considering water content to appropriately model the Martian mantle. We present the change in seismic wave speeds and impedance contrasts due to water storage in the mantle for interpretation of seismic data returned by the NASA InSight Mission, set to land on Mars in November 2018.