Investigating interiors of Earth and super-Earths using static and dynamic techniques

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Increasingly detailed models of Earth's interior demand more accurate measurements of density and sound velocity of earth materials at relevant conditions, whereas the fast-past discovery of super-Earths challenges experimentalist to expand the P-T range to probe material properties under extreme conditions. Here I present some recent density and sound velocity data on core materials by static and conventional dynamic compression techniques and use combination of static and dynamic compression data to constrain the composition of the core. Furthermore, I present density measurements of $MgSiO_3$ up to 1254 GPa and detection of melting $MgSiO_3$ at 500 GPa by direct shockwave loading of pre-synthesized dense $MgSiO_3$-bridgmanite using the Z Pulsed Power Facility. These results represent a significant advance in high-pressure mineral physics and have significant impact on deciphering the light elements in the core and understanding the internal structure of super-Earths.