

Title: Water Partitioning between bridgmanite and postperovskite in the lowermost mantle
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The lowermost mantle appears to contain geochemically primitive reservoirs of volatile components, including water, as evidenced by certain ocean island basalts. To determine how water is incorporated and partitions between nominally anhydrous minerals in the D'' region, we used *ab-initio* lattice dynamics to calculate quasi-harmonic free energies, and the water partition coefficient, of hydrated bridgmanite and postperovskite. In the aluminum-free system, hydrogen was incorporated into both phases by a simple substitution of $\text{Mg}^{2+} \Leftrightarrow 2\text{H}^+$, which favors bridgmanite over postperovskite by a factor of about 5:1 at conditions where an average mantle geotherm intersects the phase boundary. In the Al-bearing system, hydrogen and aluminum were coupled as $\text{Si}^{4+} \Leftrightarrow \text{Al}^{3+} + \text{H}^+$ defects into both phases. In contrast to the Al-free system, water favors postperovskite over bridgmanite at the phase boundary in the Al-bearing system by a factor of about 3:1 at ambient mantle conditions, and by about 8:1 at colder slab conditions. Our results indicate that postperovskite is a potential host for primordial water in the lowermost region of the mantle. The strong partitioning of water into aluminous postperovskite over bridgmanite provides a potential mechanism for dehydration melting that could be feeding ocean island basalts in regions of upwelling across the phase boundary.