

Water in the mantle transition zone

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Mantle transition zone (MTZ; ~410 to ~660 km depth) can store a large amount of water (hydrogen) up to ~ten times of the current ocean mass. Consequently, this layer plays an important role in the circulation of water in Earth. Although almost no samples are available from MTZ, indirect inferences from geochemical and geophysical observations provide some constraints on the water content in this layer. They include the water contents in various mantle-derived magmas and geophysical observations such as electrical conductivity and the topography and the width of seismic discontinuities and anomalous seismic wave velocities. These observations suggest that the water content in MTZ varies regionally but in the Pacific MTZ, it is ~0.1-0.3 wt%. This value is about ten times higher than the water content in the upper mantle asthenosphere and is close to the critical water content for partial melting at just above 410-km discontinuity. This suggests that the water content in MTZ is self-regulated by partial melting.