How may the presence of mantle water be interpreted?

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Mantle and crustal rocks may contain water as part of their mineral phase. It is estimated that these rocks contain between 0.5 and 5 times the volume of the current oceans.[1] Olivine in the upper mantle has extremely little water, as interpreted from electrical conductivity measurements.[1] However, laboratory measurements show mantle transition zone minerals can potentially contain 2–2.5% water.[2,3] In the transition zone, located 410–660 km below the earth's surface, the increased pressure causes more compressed and denser phases of olivine and other upper mantle minerals to form. Wadsleyite generally occurs above 510 km depth, ringwoodite is generally found at 510–660 km depth, and majorite-garnet occurs throughout the whole transition zone (figure 1).[4] The deep mantle below 660 km is expected to be *anhydrous* high-pressure phases of mostly olivine.[2]

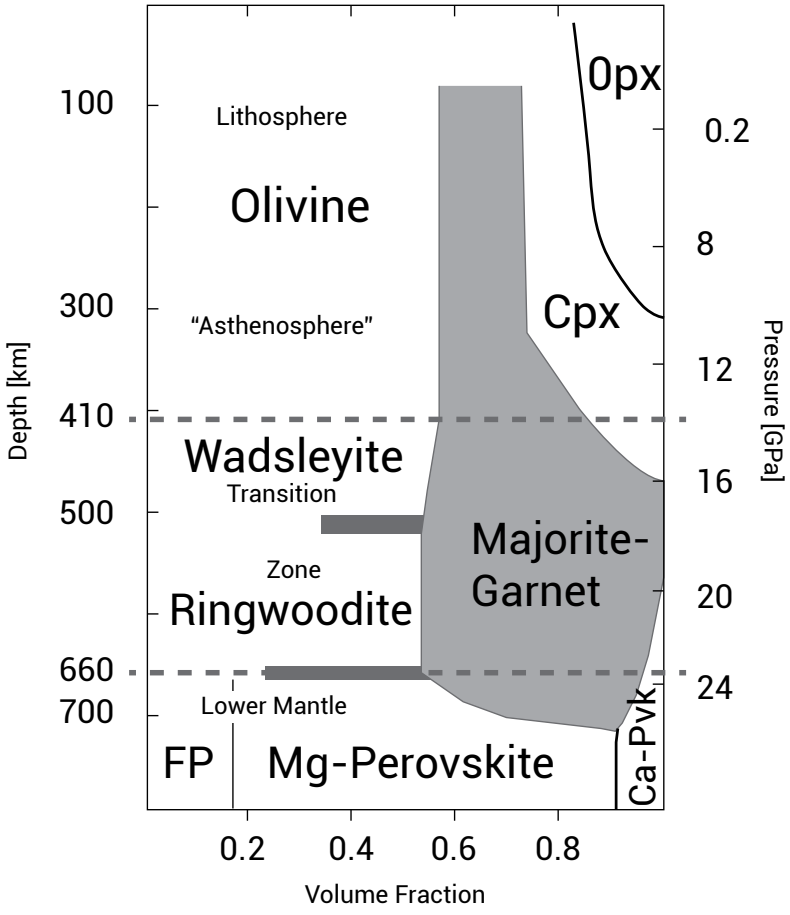

Figure 1. Relative mineral proportions and phase transitions in the earth's mantle[4]

An amazing mantle sample of ringwoodite

Recently, the first sample of ringwoodite was found in a mineral inclusion within a diamond. This confirms estimates of the amount of water in the transition zone.[2,3] Diamonds usually originate below 140 km but some are believed to have originated from the transition zone or below.[5] Ringwoodite and wadsleyite should have reverted to olivine in kimberlites, small intrusions that contain diamonds.[4] However, the uplift of the rock in the kimberlite must have been extremely rapid, so that the transition zone minerals did not change.[3] The ringwoodite inclusion contained a minimum of 1.5% water.

How much water in the transition zone?

How representative of the amount of water in the transition zone is this one sample? Pearson *et al.* conservatively estimate that, at least locally, the transition zone has about 1% water. This is also consistent with measured seismic wave velocities[2] and with the water content of some kimberlites.[3] If the amount of water in the ringwoodite is representative for the lower part of the transition zone (510–660 km depth), then a speculative estimate suggests that this layer contains about 1.4×10^{21} kg of water; about the same mass as found in the present oceans.[3] This does not include the water in wadsleyite in the upper transition zone, which is suggestive of an equivalent amount.

What could high water content in the transitional zone mean?

Secular scientists presume that over billions of years, the oceans collected their water from volatile outgassing from the mantle. Now they have a possible source for the oceans in their deep-time model.

How should creationists interpret the possibility of large quantities of water in the mantle transition zone? Could the water for the Flood have originated from the mantle, as a few creationists have suggested? It is doubtful, since there are about 400 km

of dry olivine and other upper mantle minerals between the surface and the transition zone. Moreover, how would this water be released from the minerals? If it could be released, a huge amount of ringwoodite and wadsleyite in the form of olivine and other mantle minerals would have uplifted to the earth's surface in some giant overturning. On the contrary, there is very little exposed mantle rock at the earth's surface.

Could runaway subduction in the Catastrophic Plate Tectonics (CPT) model transport water down to where it can be absorbed within transitional zone minerals? This is possible but only on a local or regional scale. Maybe if the water in the transitional zone is rare, CPT could explain it. But, then there is the problem of how water from a subduction zone can end up within the mineral lattice of ringwoodite and wadsleyite.

Given this information and considering the uncertainties in the estimated quantities, a third option seems most likely: the water was placed in the transition zone at Creation. The alternatives seem too improbable in comparison.

References

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