Water in Earth

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Water is essential for life on Earth's surface, but its origin is likely to be intimately linked with the deep interior. How much water was initially accreted, how much resides in its deep interior, and how it is recycled through deep time are challenging questions requiring a multi-disciplinary approach involving theory and experiment. In this talk I will provide an overview of recent work and take an approach of understanding water in Earth from the inside out from the perspective of petrology, geochemistry, geophysics and geodynamics. What phases can host water in the interior and what constraints we can place on its abundance in Earth's interior reservoirs? Experimental and theoretical studies indicate that the core can be a substantial reservoir for water, and its effect on elastic properties of solid iron can potentially provide constraints on its abundance in the inner core. How water partitioned between the core and the silicate mantle during Earth's magma ocean stage may have set the initial water content of the bulk silicate Earth. Earth's mantle has the potential capacity to store many ocean masses of water in nominally anhydrous phases, but controversies remain about how much water resides in the mantle. Water is recycled into the mantle at subduction zones and can be transported into the deep mantle in nominally anhydrous phases like stishovite. Water reduces the melting point of silicates and may cause partial melting, especially at the upper and lower boundaries of the mantle transition zone. Such melts may be buoyant relative to the mantle making it unlikely to preserve large differences in the water contents of the upper mantle, transition zone, and lower mantle over geological timescales.

For background information about this presentation, see:
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