

Imperfections in mantle minerals and the fate of volatiles in the deep Earth - *EMU Research Excellence Medal Lecture*

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As a consequence of plate tectonics volatiles are recycled into the Earth's interior via subduction. In fact, in the past few decades laboratory experiments have revealed that large quantities of H₂O can be stored in the Earth's interior as H defects in the structure of minerals, dramatically affecting their physicochemical properties and, as such, governing mantle dynamics. The existence of deep-H₂O reservoirs in the Earth's mantle has been confirmed by analyses of natural specimens, including diamonds containing H in the crystal structure and/or in the mineral/fluid inclusions they contain.

One of the major debated questions in planetary sciences concerns how and when Earth acquired its H₂O, which is fundamental to understand the formation of habitable planets. Studying diamonds (and their imperfections) can help elucidate whether H₂O was already present in the deepest regions of our planet from the first seconds of its formation or whether it was transported to the Earth's interior at a later stage through subduction.

This presentation will summarise past and recent results on the role of imperfections in mantle minerals with a particular emphasis on H in diamonds as a potential key to unravel the origin of Earth's water.

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