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INHERIT - Diamonds as the key to unravel the origin of Earth's water

The origin of Earth's water is still an unsolved mystery in Earth Sciences. Yet, precisely answering this question is paramount to assessing the evolutionary history and modern structure of Earth and constrain the conditions for life-sustainable planets to form. Comparing Earth's original deuterium-to-hydrogen ratio (D/H) with those of Solar System objects can constrain on the provenance of water. However, the exact value for Earth's primordial D/H is not known since it got lost after its formation. Diamonds from the Earth's mantle may be key as they contain trace amounts of hydrogen and are inert and robust time capsules able to survive over several billion years.

The overarching goal of this project is to determine Earth's primordial D/H by investigating the H content and isotopic composition of a unique set of worldwide, natural diamonds dating 3.5 to 0.09 billion years. The isotopic data will be complemented by atomistic ab initio simulations to understand the atomic and diffusion behaviour of hydrogen in natural diamonds. The new results will be fundamental to pinpoint Earth's water origin with long-term implications for understanding planet habitability. In a time where international space agencies are actively searching for potentially habitable planets and extra-terrestrial life, the new knowledge will be fundamental to understanding the geological and biological evolution of planets in our Solar System and beyond.

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