Press release

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The oldest trace of a marine sedimentary environment?

New isotope analyses confirm the sedimentary origin of the mysterious Akilia rock

A decades-old geological debate may now be resolved. Zhengyu Long, a PhD student working under the supervision of Frédéric Moynier at the Institut de Physique du Globe de Paris (IPGP/Université Paris Cité/CNRS), in collaboration with international partners, has demonstrated that the quartz-pyroxene rock on Akilia Island, Greenland, is highly likely to have a marine sedimentary origin. Dating back over 3.6 billion years, it is one of the oldest rocks on Earth, and possibly one of the earliest witnesses to life.

A heavy isotopic signature like that of the primitive ocean

The origin of the Akilia rock has long been debated: is it the result of magma, or was it deposited as a chemical sediment in an ancient ocean? To answer this question, the team turned to an innovative tracer, of which IPGP's cosmochemistry group is a world specialist: potassium isotopes. By analyzing ancient rocks such as Banded Iron Formations (BIFs), they revealed a clear trend: chemical sediments low in potassium have a heavier isotopic signature, similar to that of seawater.

A rare witness to early Earth's surface environments

This discovery reinforces the idea that, over 3.6 billion years ago, the Earth already had oceans interacting with fragments of continental crust, enabling the accumulation of sediments and the cycling of elements such as potassium. This testifies to the early alteration of continental surfaces, chemical flows towards the ocean, and the existence of nutrient transfer pathways - all essential conditions for the emergence of life.

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A new tool for exploring ancient oceans

Beyond the specific case of Akilia, this study introduces potassium isotopes as a new tool for reconstructing the chemistry of the Earth's oldest oceans and tracking nutrient cycles between continents and the sea. It opens a new window on the evolution of the earth's surface and perhaps the biosphere during our planet's earliest history.

Outcrop on Akilia Island (Greenland), home to some of the oldest traces of terrestrial sediment. Credits: Mark Van Zuilen