

Department of Physics and Astronomy Colloquium Series

Tuesday, April 21, 2026, 2:30pm in PSE 317

Speaker: Hanika Rizo

Institution: Carleton University

Abstract: Earth is approximately 4,567 million years old, yet investigating its first ~500 million years remains challenging because very few rocks from this period are preserved in the geological record. In the absence of direct archives, short-lived isotope systems—produced by now-extinct radionuclides active during the earliest stages of Solar System evolution—provide powerful tools for studying early Earth processes. Under favourable conditions, the isotopic signatures they produce can be preserved in rocks of much younger ages.

In this seminar, I will present recent advances from high-precision Nd isotope studies of rocks spanning a wide range of ages, which provide new insights into Earth's earliest silicate differentiation. This differentiation may be linked to the crystallization of the last global magma ocean or to the formation of Earth's first crust, and thus to the thermal and chemical evolution of the planet following accretion. I will also discuss evidence for chemical exchange between Earth's core and mantle, inferred from variations in tungsten isotopic compositions. Tungsten isotopes are a sensitive tracer of metal–silicate separation and are recorded in some volcanic rocks whose sources may reside in the deep mantle. Such core–mantle interactions could have been facilitated by secular core cooling, grain-boundary diffusion, or chemical disequilibrium at the base of the mantle.

Together, these observations suggest that signatures of early differentiation and core–mantle interaction may persist far longer than previously recognized. Despite recent progress, fundamental questions about the timing, mechanisms, and consequences of early Earth differentiation remain unresolved. Addressing these questions is essential for constraining when Earth became habitable and for establishing a baseline for comparison with other terrestrial planets and rocky exoplanets.

Short-bio:

Hanika Rizo is an Associate Professor in the Department of Earth Sciences at Carleton University. She earned her Ph.D. at the Laboratoire Magmas et Volcans (France) and conducted postdoctoral research at the Carnegie Institution for Science in Washington, DC (USA). She leads a research group focused on fundamental questions in planetary science, including the formation and evolution of planets, the timing and mechanisms of Earth's differentiation into a metallic core and silicate mantle, and the stabilization of continents and emergence of life. To address these problems, her team has pioneered high-precision mass spectrometry techniques capable of resolving isotopic signatures from extinct radioactive systems, providing new constraints on planetary processes and Earth's early geological history.