Reconstructing the history of the West Antarctic Ice Sheet using sediment provenance techniques

Supervisors: Prof. Tina van de Flierdt and Dr Jim Marschalek

Background: The marine-based West Antarctic Ice Sheet lies on a retrograde bed slope, making it particularly vulnerable to runaway mass loss. This part of the Antarctic cryosphere is already seeing ice acceleration, thinning, and grounding zone retreat. Whether this ice sheet will decay rapidly over the coming decades or prove more resilient remains the largest contributor to uncertainties in sea level rise projections.

One way we can better predict the future of the West Antarctic Ice Sheet is by using the sedimentary record to better understand how it has responded to environmental change in the geological past. Ice sheet extent and flow patterns can be reconstructed using sediment provenance techniques, which identify the geochemical 'fingerprint' of geological source regions in sediments.

This studentship will focus on analysing the sediment provenance of new sedimentary records collected as part of the Sensitivity of the West Antarctic Ice Sheet to 2°C warming (SWAIS2C) project (https://www.swais2c.aq/) or the EvoWAIS project (UK-Germany collaboration with upcoming expedition to the Amundsen Sea in early 2027). Targets for the SWAIS2C and EvoWAIS drilling campaigns reach from Holocene sediments all the way back to the Greenhouse world in the Cretaceous. New records to be recovered will be compared to those collected from recent ship-based drilling by the International Ocean Discovery Program.

You will conduct radiogenic isotope analyses on fine-grained and bulk sediments in the MAGIC (Mass Spectrometry and Isotope Geochemistry at Imperial College London) laboratories at Imperial College London, co-led by Prof. Tina van de Flierdt. These analyses will be complemented by geochronology (and thermochronology) work via established collaborations with the London Geochronology Centre (University College London) and the Argon Geochronology for Earth Sciences (AGES) laboratory at Lamont-Doherty Earth Observatory (Columbia University) or German colleagues at AWI, U Bremen, MARUM and BGR.

You will be part of a large international community, which will open ample opportunities to network in the UK and around the world.

The project is suitable for a student with a background in geochemistry, geology and Earth Sciences or an equivalent qualification and can be focused in a variety of directions.

Further information on the research can be obtained from Tina van de Flierdt (tina.vandeflierdt@imperial.ac.uk). Please do not hesitate to reach out if you are interested.