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Meteorites from the Australian outback: A new terrestrial climate proxy?

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The aims of this project are to test the novel idea that meteorites can provide a detailed record of changes in the Earth's climate. This climatic information is stored within 'desert varnish', a finely laminated crust that forms on rock surfaces in arid regions. Varnished meteorites recovered from desert floors are potentially far more useful for palaeoclimate studies than terrestrial rocks because the time since they landed and started accreting varnish can be determined precisely. However, it is unknown whether the varnish on small and isolated meteorites will be sufficiently continuous and well preserved to provide long-term and regionally consistent climate records.

These ideas will be tested by analysing varnished meteorites that have lain exposed on the Nullarbor Plain (Western Australia) for up to 40,000 years, during which time the region's climate has changed significantly. The student will analyse varnished meteorites from collections at the Western Australian Museum (Perth), and petrographic thin sections of most are already available. Microstratigraphies will be characterized by imaging varnish cross-sections using transmitted light, then the chemical and mineralogical 'fingerprint' of each layer will be determined by scanning electron microscopy, X-ray microanalysis, laser Raman spectroscopy and transmission electron microscopy.

This work will yield a temporally and spatially highly resolved matrix of varnish microstratigraphies, which will be cross-correlated using statistical techniques including time series analysis. In order to test this climate proxy, the dataset will be interrogated by asking questions including: (i) is there evidence for abrasion or non-deposition of layers? (ii) are varnish microstratigraphies consistent throughout the region? (iii) is information from the meteorites consistent with data from Western Australian lake levels and records from further afield (e.g. Antarctic ice cores)? If the meteorite varnish proxy passes these tests it will provide much new information on the climatic evolution of Western Australia, and will be ready to use in palaeoclimatic studies elsewhere.



Application procedure and deadlines

To be considered for PhD studentships to be held in the School of Geographical and Earth Sciences (GES), suitably qualified candidates should apply via the website of the College of Science and Engineering (http://www.gla.ac.uk/colleges/scienceengineering/graduateschool/prospectivestudents/essentialinformation/). Closing dates for University and research council funded studentships will be in early in the new year, as stated on the GES studentships page: http://www.gla.ac.uk/schools/ges/research/postgraduate/.

Non- English speakers must meet the University's English language requirements. Candidates for NERC studentships should also meet the NERC's requirements for both academic qualifications and residential eligibility. For more information go to http://www.nerc.ac.uk/funding/application/studentships and please note that *non-UK European Union citizens will be awarded fees only by NERC.*

For informal enquiries about the research projects please contact the relevant supervisors. Information on the GES graduate school and the application process can be obtained from Mrs Jean McPartland, the assistant to head of the School (Jean.McPartland@glasgow.ac.uk).