



**Scenario**  
DOCTORAL TRAINING PARTNERSHIP

**NERC**  
SCIENCE OF THE  
ENVIRONMENT

## Quantifying responses to abrupt climate change in the Andes, South America: Empirical data and model synergies

**Lead Supervisor:** Stuart Black, University of Reading, Department of Geography & Environmental Science, SAGES

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**Co-supervisors:** Nicholas Branch, Department of Geography & Environmental Science, SAGES; Christopher Vane, British Geological Survey; Joy Singarayer, Department of Meteorology.

**Background:** In South America more than 80% of past and present populations have been reliant on water supplies from mountainous areas for drinking water and agriculture. The main source of this water discharge is stored in mountain glaciers, which are known to be retreating at an unprecedented rate. These glaciers in turn feed upland Andean lakes and mire deposits from the mountain glacier discharge making them very sensitive repositories of past climate and environmental change signals. **The aim of this project** is to integrate isotope and palaeoecological data from a series of upland Andean lakes with quantitative climate modelling to determine the impact of pre-Columbian climate and environmental change on land use and human occupation for the



Peruvian highlands.

**Approach and Methods:** *Isotopes:* Isotope analysis of organic biomarkers (coprostanols, lipids etc) will be combined with stable light (C,N,O,H,S) and heavy (Pb, Sr) isotopes of organic and inorganic fractions to fingerprint human, animal and sediment sources in highland lake sequences in Peru. *Palaeoecology:* will further reveal ecosystem responses to past climate change. *Climate modelling* will be undertaken using the latest simulations to provide a framework for the empirical data and help predict key environmental/climate proxies. Appropriate *numerical and statistical analyses* will be undertaken to reveal intra- and inter-site relationships

between different ecological, geochemical and palaeoecological data.

**Training opportunities:** Training will be provided in isotope (Black and Vane), palaeoecology (Branch) and modelling and numerical techniques (Singarayer). There will be an opportunity for the student to undertake fieldwork in Peruvian Andes to collect core material. The student will also visit training facilities at BGS and other core NERC facilities.

**Student profile:** At least a 2.1 BSc degree in geology/biology/geography/environmental science or meteorology is required. A strong background in numerical/statistical techniques is essential. Knowledge of any of the analytical techniques would be advantageous.

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