The University of Oxford Department of Earth Sciences

EARTHSCIENCES

UNIVERSITY OF OXFORD

Active tectonics of Azerbaijan and the South Caspian

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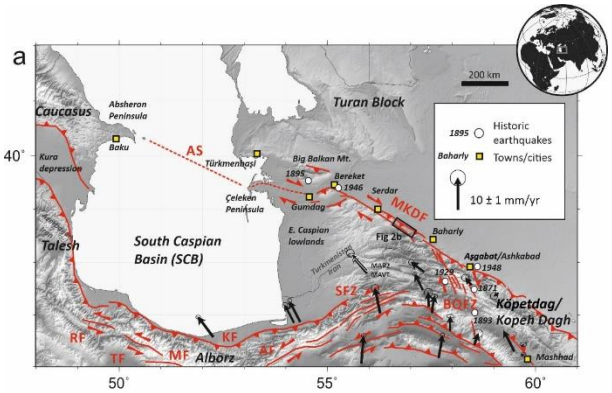
Overview

This project aims to determine the timing, rates, and structure of active faults within and at the margins of the South Caspian Basin. The project contributes to a major new research direction within the Oxford Active Tectonics group, and offers potential for exposure to a wide array of cutting edge techniques in the study of active faulting.

The PhD student will undertake a detailed analysis of the active faults as observed within digital topographic and bathymetric datasets. Analysis of industrial and heritage seismic reflection data will enable detailed sub-surface structural models to be developed.



Map showing the South Caspian region and active faults (in red) around its margins. GPS velocities relative to Eurasia are from Mousavi et al., (2013). The advertised project aims to determine the distribution, style, and evolution of faulting within the offshore regions, and to combine these constraints with studies of the adjacent onshore.

It is likely that the project will involve fieldwork in Azerbaijan and/or Turkmenistan to unravel the tectonic history of this enigmatic and poorly understood region and to provide constraints on the earthquake hazard posed to populations and to infrastructure.

Methodology

The student will use a combination of satellite image mapping, digital topographic analysis, and interpretation of seismic reflection data.

The project will include fieldwork to locate active faults through careful analysis of the landscape. Particular focus will be given to faults that display evidence of surface rupture in individual earthquakes, which can be retained in the landscape for more than 1,000 years, or for faults that are suspected of having caused major historical seismic events. Field investigation will incorporate detailed geomorphological survey using satellite imagery and aerial survey using drones, and determination of fault slip-rates through the dating of offset landscape features. Analysis of these survey data will enable us to reconstruct the magnitude and other parameters of the source**.** We will bracket the ages of the earthquakes using palaeoseismic trenching, and by applying state-of-the-art developments in Quaternary dating methods.

The detailed mapping and characterisation of faults will be combined with region-wide studies of recent seismicity and GPS measurements of crustal strain. The focal mechanisms and depths of recent earthquakes of moderate size provide vital information about the types of faulting that might be expected in particular regions, and also the potential magnitude of an earthquake on a fault of

given length (as the magnitude scales with fault area).

Timeline

Year 1: The first year will develop core skills in geomorphic mapping and in reflection seismic interpretation, as well as developing background knowledge of active tectonics in continental regions. We will select a primarily lab-based introduction project to build skills in scientific writing and publication. We anticipate the first field work in the summer (~9 months into the project).

Years 2 and 3: Years two and three will consist of seismic reflection interpretation, remote-sensing analysis, fieldwork, and the preparation and analysis of samples for Quaternary dating.

Year 4: Data integration, thesis completion, papers for international journals/conference presentation.

Training & Skills

The student would receive training in:

(a) Interpretation of sub-surface geophysical data including industrial seismic reflection profiles and wells, and also earthquake data from regional and global seismometer networks.

(b) Field methods relating to the project (i.e. tectonic geomorphology, field surveying using drones, palaeoseismic trenching, sampling for a range of Quaternary dating techniques.

(c) Analysis of satellite imagery and digital topographic models to map and measure earthquake displacements. Construction of digital topographic datasets from stereo satellite imagery and from aerial photographs collected by drone survey.

(d) The student would interact with the wider 'COMET' community of students and researchers, enabling wider training and sharing of knowledge.

References & Further Reading

Knight et al

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Further Information

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