

## 2019\_38: Releasing the sediment cascade: landscape response to active normal faulting in the Gulf of Corinth, Greece

**Supervisors:** Dr Alex Whittaker ([a.whittaker@imperial.ac.uk](mailto:a.whittaker@imperial.ac.uk)); Dr Rebecca Bell, ESE; Dr Dan Hopley, University of Cardiff

**Department:** Earth Science and Engineering

**Background:** The erosional response of upland catchments to active faulting can release a sediment cascade whose characteristics – in terms of sediment volumes, grain sizes, and composition – determine: (i) the nature, timescale and style of landscape evolution and (ii) the locus and characteristics of sediment deposition in neighbouring basins. This project seeks to quantify this effect by evaluating the impact of sediment release from catchments crossing active normal faults in Greece that differ in terms of their slip-rate, footwall lithology, long-term erosional dynamics and timing of tectonic perturbation using field, GIS and numerical modelling techniques. These results will then be synthesised with field observations of hanging-wall stratigraphy to complete the source to sink system.

**Methods:** This project will initially focus on field sites in the Gulf of Corinth, Greece where we have excellent constraints on the timing of fault motion in the last 1-3 My and where the Plio-Pleistocene hangingwall stratigraphy is well-exposed. The student will:

- (i) Use digital elevation model (DEM) analysis to identify and probe catchments cutting across active normal faults that differ in terms of their slip rate and structural growth. The timing, rates and evolution of faulting will be carefully constrained using seismic, structural and geomorphic techniques.
- (ii) Conduct two field seasons to evaluate the grain-size and origin of sediment currently being released from using in-situ and photogrammetric techniques;
- (iii) Explore numerical models of sediment flux dependent incision, sediment release and delta development with a DeltaSim model and the Landlab surface process modelling environment.
- (iv) Compare the magnitude and length-scale of the sediment release and model output with uplifted Plio-Pleistocene deltaic stratigraphy and Gilbert deltas imaged in seismic data.

**Outcomes:** The research programme will link tectonic geomorphology with sedimentological analysis to produce novel insights into (i) the dynamic coupling of

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tectonics, erosion and sediment deposition and (ii) the influence of sediment supply in governing long-term landscape evolution and (ii) the influence of active faulting and sediment discharge on stratigraphy. Field and modelling results from the PhD will be published in high-impact journals and the student will also get the chance to present key findings both at UK conferences and at least one international meeting.

**Training:** This PhD is ideally suited for quantitative geoscientists with an interest in the coupling between uplift, erosion and sedimentation from field and numerical modelling perspectives. The student will receive a broad range of training in field sedimentology, tectonics and geomorphology. The student will use numerical modelling techniques to understand sediment-supply-dependent landscape evolution. Additionally, the student will gain experience of using GIS software such as ARC and Petrel.

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