The Andrew Whitham CASP Fieldwork Award - 2020-21 Winner

Applicant: Robledo Francisca
Project title: Sediment routing in tectonically-influenced deep-water systems: chasing the Annot turbidites in the Western Alps

Scientific question and rationale: Sedimentary systems are best studied by understanding deposits down their length: proximal areas may forecast distal deposits while the distal areas can test deductions of flow processes up-system. The Annot turbidite system in SE France is the premier outcrop test-bed for deep-water flow and depositional processes. Sourced axially from the south, it was once thought to terminate in the western Alps, ponded against the Ecrins basement massif. Recent work has debunked this notion, showing turbidity currents continued to flow northwards, routed on sinuous, structurally-controlled corridors. These lead to the "Aiguilles d'Arves flysch" of Alpine workers – a well-exposed tract of turbidites in Savoie that has yet to receive modern sedimentary analysis.

Specific objectives and deliverables: The aim of this fieldwork is to initiate this analysis. Reconnaissance (by PhD supervisor Butler), allied to published maps and ancient studies, has identified four locations for this – that combine seismic-scale cliff sections (informing architectural deductions) and accessible outcrops for building composite sedimentary logs. Palaeoflow (using bed-base features) will test the inference of southerly derivation. Sediment compositions will be compared with those of the Annot system. Bed character will establish where flows ponded or, as in the southern outcrops continued to bypass the area. Alpine deformation (large-scale folds) will be mapped and measured so logged sections (and their data) can be structurally corrected. The results will test whether the Aiguilles d'Arves flysch is part of the Annot system, and whether it too is a confined, uncontained turbidite succession. This will form the foundations for opening up the Annot system, and other parts of the western Alps to further sedimentary/stratigraphic research.

Proposed work plan: To execute a fieldwork-based multidisciplinary (sedimentology, structural geology) research of a deforming deep-water system by describing and mapping the stratigraphy of the Aiguilles d'Arves turbidite basin. In order to do this, we propose 3 main stages.

Stage 1: Before fieldwork. Winter -Spring 2020. Recognizing the relevance that fieldwork has, training on basin tectonics, structural and sedimentary geology including field techniques (e.g. mapping techniques) will be provided to the applicant as an early stage. In addition, deep study of available literature and remote-sensing data (journal publications, maps, satellite imagery, and aerial photography) is included. Using published geological maps and GPS coordinates of already identified outcrops, four locations have been identified containing suitable outcrops for data collection during fieldwork in the Aiguilles d'Arves turbidite basin.

Stage 2: Fieldwork. Summer 2020. Two 15-days fieldwork campaigns between June to July. The weather in the French Alps is very varied up and down the mountain chain, hence, the dates will be based on the forecast to avoid summer thunderstorms in August. Geologic transects across will be done applying field techniques and operating safely in unglaciated mountainous environments. (1:25K – 1:5K) outcrop mapping of strata geometries principally using cliff sections. Detailed sedimentary descriptions including logging and mapping lateral depositional architectures. The applicant has experience of working in mountainous terrain. Fieldwork will be undertaken using Alpine refuges that act as mountain rescue posts and accompanied by field assistant where appropriate. The PhD is supervised by Professors Rob Butler and Adrian Hartley, both of whom have decadal research experience on Alpine geology and turbidites.

Stage 3. Autumn 2020. Compilation of the whole collected data, sample processing, and analytical work.

Proposed expenditure, including details of any other sources of funding: The following expenditure includes a field assistant and the total considers the two campaigns. KLM Flight prices based on economy class plus a bag. Car prices from AVIS (cheapest option). Accommodation cost based on supervisor's experience.

-Flight tickets (180 GPB per flight plus £60 for bags, £240 per flight, £480 per trip with assistant): £960
-Car rental service for 30 days (price for 15 days £277.59): £555.18
-Accommodation for 30 days (26 Euro/night at half board double for field assistant).: £1279

Total: £ 2794.18