

The Andrew Whitham CASP Fieldwork Award – 2019 Winner

Applicant: HATZENBUHLER, Diana

Project title: Sediment generation, transfer and dispersal along the NE Colombian Caribbean margin

Award: £2,400

Specific objectives and deliverables: Depositional texture and mineralogy represent the starting conditions which largely regulate post depositional modifications and, eventually, reservoir quality. Initial mineralogical composition and sediment textural fabric (e.g. grain-size and sorting) results from the interaction of both external forcing (tectonic, climate and lithology) and autogenic controls on sediment generation, partitioning and dispersal and eventually the trajectories of sediment particles and solutes. My MSc thesis project is part of a long-term one aiming to link pre- and post-depositional sediment compositional signatures and properties and build models for clastic reservoirs. In my thesis, I will study and possibly constrain controlling factors of sediment generation, transfer and dispersal along the world's highest coastal range, the Sierra Nevada de Santa Marta (SNSM) in the Colombian Caribbean. To link erosion rates to external forcing controls, the study combines cosmogenic nuclides-erosion rates, quantitative petrographic analysis on both sand and heavy mineral separates (Raman spectroscopy), multi-varietal U-Pb dating and geochemistry on zircon, rutile and apatite grains, and detrital geochemical and mineralogy. The final aim is to build a model for the generation and transfer of the sand fraction in which sediment composition and properties are closely linked to tectonics, drainage area and lithological distribution. Results will be compared to those obtained for the Plio-Pleistocene Zamora Formation. Miocene to Pleistocene sediments derived from the SNSM are currently being explored for hydrocarbon. Several oil and gas reservoirs have been discovered over the last ten years. The whole region is considered as the most important hydrocarbon resource to be explored in the years to come. The results of this study will be of critical importance to understand where to find reservoirs and possibly predict their properties.

Proposed work plan:

This project includes 3 weeks of fieldwork in the SNSM for sampling 16 main rivers and 2 Plio-Pleistocene outcrops of the Zamora Formation. Sampling (including drilling in the field for the latter two outcrops) will be carried out following best sampling practices for cosmogenic nuclides including the protocol proposed by the British Society for Geomorphology (Darvill, 2013):

- Survey of sampling sites considering the geomorphic context, impact of shielding, erosion, inheritance and elevation-change, and for avoiding sediment mass transfer, such as landslides. Evaluation, drilling, sampling and recording of positions most favourable for cosmogenic nuclides.
- Survey for examining suitable rivers and tributaries draining single tectonostratigraphic units. Measurements and sample collection of suitable rivers from the middle part of the river channel.
- Investigation and identification of potentially significant geological and morphological features.
- Sample preparation, such as cleansing, deagglomeration, pre-sieving of required grain size fraction (<800 µm).

An important part of this project is the acquisition of data on climate, geomorphology, tectonics and local structural framework. Data will be selected from the database made available by our research partners from the Colombian Geological Survey. There, I will continue sample preparation, packaging, and shipment. Further sample processing and analysis after the fieldtrip will include X-ray fluorescence, bulk sand petrography, Raman heavy mineral analysis, U-Pb dating, cosmogenic nuclides.

Proposed expenditure, including details of any other sources of funding:

Expenditures were provided by average flight prices to Colombia, prices of the local rental company 4 x 4, accommodation costs based on experience of thesis supervisor's prior work in this area.

- *Return flights to Bogotá and Barranquilla:* £ 1300
- *4 x 4 rental for 3 weeks:* £ 700
- *Accommodation for 3 weeks:* £ 700
- *Samples shipment:* £ 300

Total: £ 3000