Catchment changes in response to tectonics and climate: using river terraces and DEM data in the southern High Atlas Mountains (Morocco)

Jesse R. Zondervan[1]*, Martin Stokes[1], Sarah J. Boulton[1], Anne E. Mather[1], Matthew W. Telfer[1]

*jesse.zondervan@plymouth.ac.uk

[1]*School of Geography, Earth and Environmental Sciences, Plymouth University, Plymouth PL4 8AA*

Tectonics and climate drive the generation and transport of sediment in mountain rivers as these evolve over time. On a glacial-interglacial scale, in particular catchment reorganisation and catchment incision dynamics control these processes, and affect fan deposition in sedimentary basins[1]. The Atlas Mountains in Morocco exhibit ongoing catchment reorganisation and an abundance of river terraces recording glacial fluvial aggradation and interglacial-glacial incisional periods[2], opening up insight into the processes behind catchment evolution over geological timescales.

Topography and river profiles across drainage divides are similar in a stable divide, and if they are unequal they indicate active catchment reorganisation. When reorganisation occurs, it results in irregularities in river long profiles and changes in river valley erosion. River strath terraces are formed by transition between valley widening and downcutting of terraces in response to local divergence of sediment-transport capacity[3]. Consequently, they record changes in catchments due to river capture, climate and tectonics. The presence of river terraces enables catchment processes over time to be investigated.

A combination of remote sensing and field mapping and logging was completed in May 2018. River terraces have been mapped with newly released high resolution DEM data in the southern High Atlas in Morocco, and additional surveying was done in the field. Geomorphological indices suggest river catchment capture is a key control on the development of drainage networks. River long profiles suggest tectonic controls have also influenced landscape development over the last few million years[4]. Logging of terrace sediments together with high-resolution sampling for OSL dating enables these catchment-wide effects to be compared with paleo-hydrological and sediment transport characteristics of the fluvial system.

The combination of geomorphological DEM and sedimentological field data enables us to explore drivers of catchment change, and will contribute to the wider understanding of fluvial system response to climate and tectonic controls, and to its transport into the sedimentary record.

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