Long-term records and impacts of glacially-fed river systems in Patagonia

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Introduction:

The Atlantic coastline of Argentine Patagonia is a critical zone where key terrestrial, oceanic and atmospheric systems interact. Here, major river systems of the past have drained freshwater eastwards across the Argentine steppe into the Atlantic Ocean at latitudes influenced by the precipitation-bearing Southern Westerlies Winds. This project seeks to reconstruct the long-term fluvial record east of the former Patagonian Ice Sheet (~43 to 50 °S) and explore the potential for atmospheric-oceanic impacts of freshwater input into the Atlantic Ocean.

Project Summary (max 700 words inc introduction):

Patagonia is a key region at mid-latitudes of the ocean-dominated Southern Hemisphere that is influenced by the precipitation-bearing Southern Westerlies Winds. With ocean currents branching off from the Antarctic Circumpolar Current and flowing northwards up the coasts of Chile (Humbolt Current) and Argentina (Malvinas current), the Patagonian region is also an important part of the ocean circulation system (e.g. Lamy et al. 2004). During the Last Glacial Maximum, the Patagonian Ice Sheet extended from 38 to 56 °S (Glasser et al. 2008), occupying overdeepened valleys to the east that developed large glacially-fed lakes during deglaciation. Previous studies have shown how glacial lake drainage in Patagonia could have caused negative temperature and salinity anomalies in the adjacent ocean, which weakened the ocean circulation and likely reduced winter precipitation (Glasser et al. 2016). However, existing studies have focussed on freshwater input into the Pacific Ocean (e.g. De Pol-Holz et al. 2006; Glasser et al. 2016; Turner et al. 2005) and there is little data for the Atlantic coastline. Understanding freshwater inputs along the Atlantic coastline is important due to the proximity of the Malvinas Current, which carries cold and relatively fresh waters northwards to converge with the warmer Brazil Current; this convergence helps drive the ocean circulation in the South Atlantic and maintains the regional temperate climate (Gordon, 1989).

This project will focus on the three major river systems in eastern Patagonia: the Rio Chubut (~43 °S), Rio Deseado (~48 °S) and Rio Santa Cruz (~50 °S). It will combine remote mapping with field studies to determine the long-term geomorphological and sedimentary record of these river systems. Luminescence dating will be used to determine the timing of sediment deposition (e.g. Smedley et al. 2016), which includes the potential to explore new, innovative luminescence dating methods using gravel (e.g. Sohbati et al. 2012). The new empirical dataset can then be used to inform numerical modelling of freshwater input into the Atlantic Ocean and explore the potential atmospheric-oceanic impacts this may have had in the past.

We are looking for a highly motivated PhD student with relevant background in physical geography, oceanography and/or environmental science and who is at ease with experimental work. The prospective PhD research will gain comprehensive training in luminescence dating, geomorphological mapping and field sediment description and interpretation, in addition to exploring numerical modelling towards the latter stages of the project. He/She will benefit from a supervisory team including Rachel Smedley (luminescence dating, Patagonia), Richard Chiverrell (sedimentology, fluvial) and Joy Singarayer (modelling). He/She will benefit from training opportunities inherent to the Doctoral Training Partnership that joins expertise from Liverpool, Manchester and the National Oceanographic Centre, and be part of a cohort of enthusiastic DTP PhD students and will develop strong interdisciplinary skills through specific training.

Image 1– Rio Deseado flowing eastwards towards the Atlantic Ocean, Argentine Patagonia.

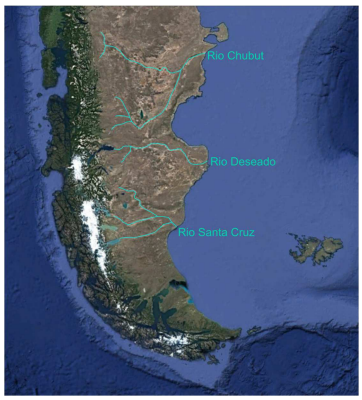

Image 2 - GoogleEarth image of the southern Patagonia showing the three major river systems.

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