Stratigraphic record of deep-marine flow evolution in a post-rift lobe system: Neuquén Basin, Argentina

Supervisors: Kane, I.A.¹, Flint, S.S.¹, Hodgson, D.M.², Jackson, C.³, Schwarz, E.⁴

¹ School of Earth and Environmental Sciences, University of Manchester, Manchester M13 9PL, UK
² Stratigraphy Group, School of Earth and Environment, University of Leeds, Leeds LS29JT, UK
³ Basins Research Group (BRG), Department of Earth Science & Engineering, Imperial College, Prince Consort Road, London, SW7 2BP, UK
⁴ Centro de Investigaciones Geológicas (CIG), La Plata, Provincia de Buenos Aires, Argentina

Basin-floor lobes are formed by deposition of sediment transported by gravity flows that pass through slope channel-levee systems. Lobes are of interest as reservoirs for hydrocarbons, as potential locations for Carbon Capture and Storage, and are increasingly recognised as sites of deposition for human-made pollutants. These sedimentary accumulations can develop in both confined and unconfined basin settings, and the scale (i.e. height, width, etc.) and shape of the confinement controls lobe morphology and sedimentology. This study will take an integrated field- and laboratory-based approach to test the working hypothesis that the rate of flow deceleration, for a given flow type, will control the resultant deposit geometry and the sedimentary facies developed. These are important to understand in consideration of the applied context discussed above.

A key component of this study will be the characterisation of the pinch-out geometry and facies of lobes against a range of topographic constraints. The stratigraphy of the Early Jurassic Los Molles Formation, Neuquén Basin, Argentina records the syn- to post-rift evolution of the basin, representing an excellent location in which to study lobe termination styles. The flows that entered the basin during the post-rift phase interacted with prominent rift-related structural topography, and in addition to more subtle topography associated with differential compaction-induced subsidence over buried rift shoulders. Excellent exposure and 3D control of a number of lobes allows them to be traced towards their frontal and lateral terminations, allowing us to record their rates of thinning and facies variability. Ultimately, the rates of stratigraphic thinning and facies change, and the grain-scale characterisation of lobes approaching different types of topography will be catalogued. The field-based study may be augmented with a petrographical and/or petrophysical component.

There is also an opportunity to investigate the properties of different flow types and their interaction with topography Sorby Environmental Fluid Dynamics Laboratory (Leeds). The experimental sediment-laden gravity currents will be allowed to flow down a slope and interact with an opposing slope of varying angle; steeper angled slopes will result in more rapid flow deceleration, whilst shallower slopes will result in a slower deceleration. These are anticipated to control the deposit morphology and facies types. In addition, a series of experiments will investigate the effect of flow concentration on the extent to which flows can surmount topography. In both cases, deposit sampling will be used to investigate the effects of the topography and the rates of grain size change and sorting, as a proxy for sedimentary facies in the natural prototype.

This studentship is focused on a topic of international importance and will form part of the Lobe3 project, which is an Industry-funded research programme. We expect you to submit manuscripts to international scientific journals during the course of their studentship, and to present the results of their research at relevant UK and International conferences. The project will provide excellent training in physical modeling, fieldwork, process sedimentology, experimental sedimentology, data analysis, and the development of geological models. You will join one of the largest groups in the world working on earth surface processes and sedimentary basins, having access to excellent facilities and the support of supervisors with leading expertise in process sedimentology and the physical modelling of deep-marine sedimentary processes and systems.

Application deadline is 23rd March, and interviews will be held in April in Leeds. For more information on this studentship please contact Dr Ian Kane (ian.kane@manchester.ac.uk; +441612753949) and complete the online application form indicating the project title and primary supervisor at: http://www.manchester.ac.uk/study/postgraduate-research/admissions/how-to-apply/