Ice-Sheet Dynamics of the Late Palaeozoic Glaciation in West Australia and Oman: Constraining Palaeogeographic and Sedimentological Models with Provenance Analysis

Martin, Joe R.[1], Jonathan Redfern[1], Brian P. J. Williams[2] (1) University of Manchester, Manchester, United Kingdom (2) University of Aberdeen, Aberdeen, United Kingdom

Sediments deposited during the Late Palaeozoic in Western Australia and Oman provide a record of the glaciation of Gondwana. They are important hydrocarbon exploration targets, containing over 3.5 billion barrels of oil in place in Oman. Discoveries have also been made in glacial facies in the Canning Basin, although as yet not economically significant. Glacial environments are characterised by high erosion rates and complex sedimentation patterns, making prospects with glacial reservoirs challenging exploration targets and often difficult to develop effectively.

Previously, work in both areas has documented the local sedimentology and depositional history, yet the regional setting and basin-fill evolution is still poorly constrained. There are a number of conflicting models for glaciation in both areas, based solely on field observations that, taken alone, provide insufficient evidence for interpreting the evolution of ice-sheet dynamics. This study investigates the provenance of both successions aiming to provide a better regional framework to refine current sedimentological and depositional models. An integrated approach has been adopted, examining field (e.g. subglacial striation and palaeocurrent information), petrographic (conventional heavy mineral analysis) and isotopic (U-Pb and Lu-Hf LA-ICPMS analysis of detrital zircons) data to determine Late Palaeozoic ice-sheet dynamics and the involvement of neighbouring cratonic blocks as source terranes. Results provide a valuable constraint on the palaeogeography and allow the development of better depositional models.