Topographic and Tectonic Controls on Late Palaeozoic Deglaciation of Gondwana

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The Gondwana continents have a remarkably similar Upper Palaeozoic stratigraphy. Devonian quartz-rich arenites are succeeded by glacial deposits of mid-Carboniferous to Early Permian age. These glacial deposits are overlain by black shales which give way to Permo-Triassic heterolithic deposits (commonly prodelta turbidites and deltaic facies with Glossopteris leaves: Gondwana's signature fossil). The black shales mark deglaciation and flooding of interior areas of Gondwana; they also have high TOC, reaching values of 40% in places, making them potentially significant source rocks.

This simple stratigraphy has significant local variation. In this paper we will illustrate the breadth of the variation using data from two areas: San Juan Province (Argentina) and the Falkland (Malvinas) Islands. These areas illustrate the extreme range of the timing of deglaciation, from Namurian-Westphalian (c.320-310 Ma) in San Juan, to Sakmarian (c.283-288 Ma) in the Falklands. The variation in timing can be explained by factors such as palaeolatitude and distance form the ocean, but local facies variations are a function of local settings. In San Juan, deglaciation occurred within a fjord system with the main controls on facies being topographic confinement and isostatic rebound; there is no evidence for cold climate conditions persisting after local deglaciation. In the Falklands, the setting was less topographically confined but there was active tectonism in the early stages of the Gondwanian orogeny (Karoo fold-and-thrust belt), and cold climatic conditions persisted for a considerable time after the end of local glaciation. We will discuss the significance of these observations for Gondwana petroleum geology.