

Gondwanan Glacial Events and Their Influence on Petroleum Systems in Arabia

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Throughout the period from the late Proterozoic to the end of the Palaeozoic, the Arabian Peninsula was part of Gondwana and lay at moderate to high latitudes in the southern hemisphere. Several glacial episodes are identified during this time across Gondwana and four distinct glacial events are recorded in the sedimentary record of the Arabian Peninsula. Three of these periods are connected with petroleum systems. The two oldest events are known from outcrop and wells in Oman and are dated as late Precambrian in age. The younger Marinoan glacial event, capped by a deglaciation related marine flood, shows source rock potential and is correlated to oils in Oman. The Ashgillian aged Hirnantian glacial event is also expressed in outcrops, seismic and wells in the peninsula. As with the Marinoan event, a deglaciation linked marine transgression results in the deposition across Gondwana of a Llandovery aged source rock which is typed to gas and oil accumulations, including the supergiant North Field in Qatar. Unlike the Marinoan event, reservoir potential is also recognised in the glacial sediments below the Llandoveryan flood, and is a proven play in the north of Arabia. The fourth glacial event is the Carboniferous- Permian (Al Khlata) glacial event, a proven reservoir unit. Recent published work has shown source rock potential in deglaciation related lacustrine shales. Structural controls in the Pan-African basement of Arabia partially explain the distribution of these four glacial units. However differences between them are marked, controlled by a combination of proximity to ice-sheets, the duration of the glacial event, the nature of the sub-crop and evolutionary effects.