Geologists demonstrate extent of ancient ice age

June 16 2009

Geologists at the University of Leicester have shown that an ancient Ice Age, once regarded as a brief 'blip', in fact lasted for 30 million years.

Their research suggests that during this ancient Ice Age, global warming was curbed through the burial of organic carbon that eventually lead to the formation of oil - including the 'hot shales' of north Africa and Arabia which constitute the world's most productive oil source rock.

This ice age has been named 'the Early Palaeozoic Icehouse' by Dr Alex Page and his colleagues in a paper published as part of a collaborative Deep Time Climate project between the University of Leicester and British Geological Survey.

The Ice Age occurred in the Ordovician and Silurian Periods of geological time (part of the Early Palaeozoic Era), an interval that witnessed a major diversification of early marine animals including trilobites and primitive fish as well as the emergence of the first land plants.

The Early Palaeozoic climate had long been considered characterised by essentially greenhouse conditions with elevated atmospheric CO_2 and warm temperatures extending to high latitudes, and only brief snaps of frigid climate. However, during his doctoral studies in the internationally renowned Palaeobiology Research Group of the University of Leicester, Department of Geology, Alex Page and his colleagues Jan Zalasiewicz and Mark Williams demonstrated how the ice age was probably of much

longer duration.

The team demonstrated that the Late Ordovician and Early Silurian Epochs were characterised by widespread ice formation, with changes in the extent of continental glaciation resulting in rapid sea level changes around the globe.

They compared evidence of sea level change from the rock record of ancient coastlines with evidence of sediments being deposited by glacial meltwaters or icerafting at high latitudes, and with chemical indicators of temperature in the strata.

The team showed that although the Early Palaeozoic Icehouse was of similar extent and duration to the modern ice age, the workings of the carbon cycle appeared markedly different to that of the present day. Unlike the modern oceans, the oceans of the Early Palaeozoic were often oxygen-starved 'dead zones' leading to the burial of plankton-derived carbon in the sea floor sediments. The strata produced in this way include the 'hot shales' of north Africa and Arabia which constitute the world's most productive oil source rock. In fact, the burial of organic carbon derived from fossil plankton may have served to draw down CO_2 from the atmosphere to promote cooling during the Early Palaeozoic Icehouse.

Page commented: "These fossil fuel-rich deposits formed during relatively warmer episodes during the Early Palaeozoic Icehouse when the partial melting of ice sheets brought about rapid sea level rise. This meltwater may have bought a massive influx of nutrients into the surface waters, allowing animals and algae to thrive and bloom in the plankton, but also altered ocean circulation, creating oxygen-poor deep waters which facilitated the preservation of fragile, carbonaceous planktonic fossils. The deglacial outwash formed a less dense, low salinity 'lid' on the oceans preventing atmospheric oxygen penetrating to the seafloor.

The absence of oxygen under such conditions served to shut down decay accounting for the preservation of these fossils."

Page added that the burial of oil shales in deglacial anoxia "may have been a negative feedback mechanism that prevented runaway warming, meaning that in the Early Palaeozoic Icehouse at least, processes eventually leading to oil formation may have been the solution to the greenhouse effect."

Source: University of Leicester (news : web)