PERSPECTIVES ON PAST KIMBERLEY CLIMATES

At the meeting of 5 May, Dr Karl-Heinz Wyrwoll set the scene for past Kimberley climates by putting it in a world context: between 18,000 and 7,000 years ago the huge ice sheets over northern Europe and North America almost disappeared, persisting in Greenland. In the southern hemisphere Pleistocene glaciation only occurred in the south-east corner of Australia but of course persists in Antarctica. The melting of continental ice sheets and glaciers caused a massive rise in sea level from about 150 m below the present level, when the shoreline of north-western Australia would have been at the edge of the continental shelf, to near its present level.

Ice volumes increase and decrease with the changing orientation of the earth around the sun under the influence of various cyclical factors e.g. eccentricity (100,000 year cycles), tilt (41,000 yr cycles) and precession (20,000 yr cycles).

The Kimberley is currently on the southern margin of the Asian monsoon weather pattern, the other side of which is on the northern edge of the Tibetan Plateau. The climate is also affected by the south-east trade winds driven by the southern high pressure systems while the monsoon is partly driven by the hot water belt north of Australia. Weather patterns are intermittently modified by the El Niño system.

Dr Wyrwoll has studied in detail fluviatile and other fresh water deposits to clarify the nature of past climate in the Kimberley Over the past several thousand years.

Gregory Salt Lake, Dragon Tree Soak, the Fitzroy River and more recently the Ord River have provided evidence from geomorphology, cores of lake deposits, satellite images of old river courses, lake shorelines and dunes, evidence from the eolioan dunes themselves and the paleo flood record of the Fitzroy River. It is now at an exciting stage with computing ability available to reconstruct past climates from the mass of data.

From Dragon Tree Soak fibrous peat, plant remains and leaves enable a picture to be gained of past vegetation very different from the present. In Mandora Swamp wood, peat, charcoal and roots can be dated and pollen analysed. From the Fitzroy and Cunningham rivers an 11 metre thick sequence of flood deposits also has a story to tell. Gregory Lake when full in 7-10 m deep and 15 km across but satellite images of old shorelines show that the modern lake is much smaller than at certain times in the past. At its largest size rainfall would need to be double that at present to fill it.

Lake deposits can be dated in several ways: Radiocarbon techniques give good resolution to 12,000 years and useful results to 40,000 years before the present.

Thermoluminescence dates range from 2.5 to 390 thousand years with limited resolution, problematic for the older dates. Dates from dunes give an age to 234 and lake deposits to 390 thousand years.

At about 300 thousand years ago the Kimberley was at least twice as wet as at present but around 20,000 yr BP, at a time of severe global cooling, there was a collapse of the monsoonal system in south-east Asia, with a corresponding decline in Kimberley rainfall. At that time the north coast would have had a rainfall of about 600 mm/yr compared with 800 mm for a present day drought year and a normal rainfall of 1200 mm/yr. Over the last 6000 years the climate has been relatively dry compared with humid phases of the past. There is no apparent record of El Niño in the past climatic records.

The sedimentary record shows that the Kimberley climate has changed extensively over the past 300,000 years with a number of fluctuations in temperature and rainfall over shorter time scales. The present climate has been fairly stable over the past 6000 years.

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