

On the down side: monsoons and aridity in the southern sub-tropics of Australia in the late Pleistocene

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The arid centre of Australia is a textbook example of a sub-tropical desert on the descending arm of the Hadley cell. However, this aridity is moderated by the seasonal incursion of monsoonal rain in the austral summer when the ITCZ migrates to a position over northern Australia.

Proxy records of environmental conditions in arid northern Australia come from three sources: pollen, lake levels and aeolian dust. All show consistent patterns of dry / sparsely vegetated conditions in the glacial intervals and wetter / better vegetated conditions in interglacial intervals of the last 3 or 4 glacial cycles. However the Holocene is somewhat drier than previous interglacial periods.

This simple and consistent pattern strongly suggests that the monsoons (including cyclones and tropical depressions) are more effective in interglacial periods. It is not clear from this evidence if they are stronger (because of higher SSTs, for example), or if their penetration into the continent is enhanced by the advancing shorelines across the very broad continental shelf.

Conversely, the descending arm of the Hadley cell (the sub-tropical high) appears little changed in position or pressure gradient throughout. Proxy data from southern Australia indicates minimal latitudinal shift of the winds or change in strength. There is very little available data on dunes in northern Australia and the requirements for mobilisation. Although stronger LGM winds have been widely invoked the arguments are flawed and vegetation (moderated by rainfall, temperature and carbon dioxide) is probably the key factor here, as in southern Australia.