Pacific climate swings found to affect Western Indian Ocean rainfall

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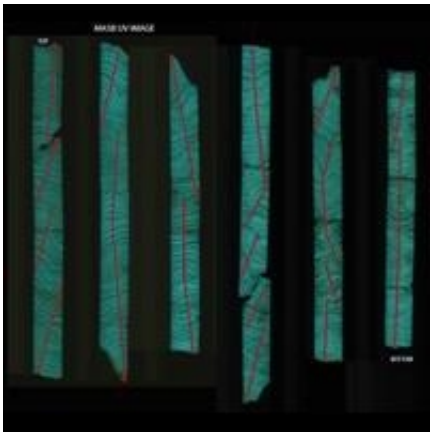

Bright luminescence of the coral core related to river run-off into the ocean. The bright lines indicate when river run-off was highest in every year, even cyclones are registered by sharp bright lines.

(Phys.org) —Giant ancient corals off the coast of Madagascar have revealed that climate swings thousands of kilometres away in the Pacific Ocean have a major impact on rainfall variations in the Western Indian Ocean, adding new insight to managing water resources in a warming climate.

An international group including scientists from The University of Western Australia, the Royal Netherlands Institute for Sea Research and the Wildlife Conservation Society uncovered climate swings of 20-30 years and 50-70 years in signs of river run-off recorded in coral cores.

They traced the origin of the river run-off to a source in the northern Pacific Ocean that also affects the Asian Monsoon season. Indian Ocean temperatures were found to be affected by these long climate swings, which in turn controls the amount of rainfall in the western Indian Ocean.

Dr Jens Zinke from the UWA Oceans Institute said researchers also found that the response of rainfall and river run-off in Queensland (Australia) to the same 20-30 and 50-70 year climate swings in the Pacific is opposite to that of the western Indian Ocean. Currently, the swing is in a phase that reinforces more river run-off in Queensland, probably intensified by warming oceans.

"We were able to drill a set of coral cores off a medium-sized mountain river that discharges large amounts of sediment, freshwater and organic plant material into the coastal coral reefs after heavy rains," Dr Zinke said. "One coral core 3.5 metres long gave us a glimpse into the climate history for the past 300 years, and three other corals covered the past 100 years."

Using a new technique that is able to reconstruct a picture of past changes in river run-off by showing luminescent bands under ultraviolet light (Spectral Luminescence Scanning), the researchers were able to get a sharp image of the yearly changes.

Each sub-millimetre-scale bright band records changes in organic soil substances transported to the coastal ocean that provides the scientists with unprecedented detail, including signs of past deforestation in Madagascar.

"The results also confirmed the well-documented deforestation between 1950 and 1980, associated with Madagascar's economic collapse at this time and the return to subsistence agriculture," Dr Zinke said. "Erosion

of top soil accelerated and the human land-use signal was so intense that it overprinted the climate signs."

The findings suggest that next to human land-use, long-term rainfall variability in Madagascar and the western Indian Ocean needs to be taken into account when considering water resource management in river catchments under a future warming climate.

The paper: Madagascar corals reveal a multidecadal signature of rainfall and river runoff since 1708, has been published by the European Geosciences Union in the online journal *Climate of the Past.*

More information: www.clim-past.net/9/641/2013/cp-9-641-2013.html

Provided by University of Western Australia