



The Climate Impact of Late Neogene Ocean Gateway Changes

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During the late Neogene tectonic changes altered two important low latitude ocean gateways: the constriction and northward displacement of major passages of the Indonesian Throughflow (around 5 Ma ago) and the closure of the Central American Seaway (around 3 Ma ago) are thought to have influenced the global ocean circulation, but the individual climate impact of these events is not yet clear.

Mimicking this sequence of tectonic gateway changes we study three equilibrated experiments using an atmosphere-ocean general circulation model (AOGCM) with a) both seaways open ("pre-5Ma" setting) b) Indonesian passages constricted, Central American Seaway open ("pre-3Ma" setting) and c) Indonesian passages constricted, Central American Seaway closed ("modern" setting).

In our experiments the constriction of the Indonesian passages results in a reduction of the Indonesian Throughflow and the Closure of the Central American seaway causes a intensification of the Atlantic meridional overturning circulation and increasing sea surface temperatures in the northern North Atlantic.

Both Gateway changes result in strong changes of precipitation in the low latitudes.

Using an uncoupled vegetation model, we demonstrate that the simulated climate change might initiate substantial changes in African, South American and Australian ecosystems. In particular the Australian continent experiences a progressive desertification from "pre-5Ma" to "pre-3Ma" to "modern" setting.