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The impact of ocean gateways on the Late Neogene atmosphere and the global ocean conveyor belt

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During the late Neogene tectonic changes altered two important low latitude ocean gateways: the constriction and southward displacement of major passages of the Indonesian Throughflow (ITFPas) (prior 3 million years (ma) before present) and the closure of the Central American Seaway (CAS) (effective closure around 4 Ma ago) are thought to have influenced the global ocean circulation, but the individual climate impact of these events is not yet clear.
Using an atmosphere-ocean general circulation model (AOGCM) we study the climate impact of these gateways in 4 different configurations:
a) ITFPas widened, CAS 1000m deep ("Late Miocene")
b) ITFPas widened, CAS closed ("Early Pliocene A")
c) ITFPas modern , CAS 100m deep ("Early Pliocene B")
d) ITFPas modern , CAS closed ("modern").
In our experiments the constriction of the Indonesian passages results in a reduction of the Indonesian Throughflow but does not change ocean circulation globally.
In contrast the Closure of the Central American seaway causes a complete reorganisation of the warm water route of the global "conveyor belt" which implies drastic changes in water mass properties and interbasin heat and freshwater transports. By analysing transports in density classes we are able to propose a sketch of the Late Neogene conveyor belt.

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.