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Atmospheric - oceanic teleconnections during the last interglacial

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A 20,000 year model simulation has been performed with an earthsystem model forced with time transient insolation starting at 129 kyr BP. The model consists of a coupled atmosphere ocean GCM coupled to a dynamic land biosphere model and oceanic carbon cycle model. During the warm optimum (127 - 125 kyr BP) an increase in atmospheric moisture transports over North America of about 63 milli Sverdrup (mSv) into the Atlantic/Arctic catchment area north of 30 °N is simulated. However, the surplus in the North is compensated by a strong loss in the tropical Atlantic yielding a net freshwater loss of 27 mSv for the Atlantic drainage basin north of 30 °S. As result, a large positive salinity develops in the western tropical Atlantic which translates far into the North Atlantic via the North Brazilian Current and Gulf Stream.
The changes at the ocean surface have a significant impact on the deep ocean. As a result of the increased salinity in the North, North Atlantic Deep Water (NADW) becomes warmer and more salty. In the Southern Ocean, deep convection is enhanced mainly due to the mechanism of salt injection by the higher saline NADW into the ACC. A larger volume of Antarctic Bottom Water enters the Atlantic at 30 °S while NADW is injected more into intermediate layers. As a consequence, intermediate layers are depleted by nutrients whereas accumulation takes place in the deep layers. In the Pacific Ocean the surface layer is considerably nutrient depleted. This leads to a significant reduction of the export production/biological pump.
Oceanic carbon storage is reduced by roughly 200 Gt which nearly compensates for increased storage in the land biosphere. Thus, modeled atmospheric CO_2 changes are low (<20 ppm).