

## Influence of the Gulf Stream on the hemispheric-scale coupled atmosphere-ocean-sea ice system

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In this study, we artificially changed the path of the Gulf Stream in a global coupled GCM by slightly modifying the bottom topography around the Florida Peninsula and investigated the response of the hemispheric-scale coupled atmosphere-ocean-sea ice system.

When the narrow channel east of the Florida Peninsula is deep enough in the model, the Gulf Stream takes a realistic path around the peninsula (otherwise the Antilles Current is enhanced unrealistically), but it overshoots northward in comparison to the case with the shallower channel. As a result, positive sea surface temperature (SST) anomalies are found around the Gulf Stream "Extension" (after it separates from the east coast of the North America) and in the Barents Sea. This is consistent with the observed fact that northward shift of the Gulf Stream Extension induces positive SST anomaly in the Barents Sea. On the other hand, SST around Japan increases as opposed to the previous studies that warm anomaly in the Barents Sea brings cold anomaly over Eastern Eurasia. In our model, decrease of sea ice in the Arctic Ocean caused by the modification of bottom topography creates negative sea-level pressure anomaly that elongates along the entire Arctic rim, which may induce northward shift of the atmospheric circulation in the lower Troposphere and the subtropical gyre in the North Pacific, and hence, positive SST anomaly around the Kuroshio Extension.