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Simulating the Late Miocene climate using a coupled atmosphere-ocean general circulation model

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The Late Miocene belongs to the late phase of the Cenozoic climate cooling. Various proxy data suggest that it was a generally warm and humid episode. Some recent evidences indicate that the Arctic Ocean was already ice-covered in the Miocene, but high-latitudes were still warmer than present. Aiming to better understand the weak the meridional temperature gradient in the Late Miocene, we present a model experiment using a complex state-of-the-art atmosphere-ocean general circulation model, which is adapted to Late Miocene conditions. As compared to a present-day control run, the Miocene experiment represents globally warmer and more humid conditions. Primarily northern higher latitudes are warmer and sea ice is much reduced in the Miocene run. Consistent to proxy data, the low elevation of the Tibet Plateau leads to a weaker-than-present Asian monsoon in the Miocene run. In contrast to the global warmth, the Miocene simulation illustrates cooler conditions in the North Atlantic region because the open Central American Isthmus weakens the thermohaline circulation in the Atlantic Ocean. A quantitative comparison of model results and terrestrial proxy data indicates that the model is slightly too cool in the North Atlantic region. This discrepancy might be due to a too deeply opened Central American Isthmus in the model. However, the overall agreement between model results and proxy data is fairly good.