



Mississippi's moisture sources shift from land to ocean in a future climate

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It is important to know if the moisture sources of a basin are from a continental or oceanic origin, and if these sources are changing towards the future. One can determine the moisture sources of a basin, i.e. the evaporative areas which contribute to precipitation over a basin, by tracking moisture using atmospheric data. So far, atmospheric moisture tracking has mostly been applied to re-analysis data, only giving estimations for present climate. Therefore, an important open question is: how are moisture sources of river basins affected by climate change?

Here, we apply the Eulerian offline moisture tracking method WAM2-Layers to high spatial resolution (~ 25 km) global climate simulations from EC-Earth for present and future climate (RCP4.5), to determine changes in moisture sources of the Mississippi basin under climate change.

We find that the most important continental moisture sources are the Mississippi basin itself (recycling of moisture) and the area South-West of the Mississippi. Sources from the oceans are primarily transported from the Gulf of Mexico/Caribbean and the Pacific to the Mississippi basin. All sources vary per season, with more recycling of moisture within the river basin in summer and more transport of moisture from the ocean towards the river basin in winter. In the future, we find an increase in moisture sources from the oceans (related to higher sea surface temperatures in the future), which results in more precipitation over the Mississippi basin in winter. In summer, we find a decrease in moisture sources from the basin itself (i.e. lower recycling ratios within the basin), although precipitation is not decreasing. We conclude that the moisture sources of the Mississippi basin will become less local in a future climate, with more water originating from the oceans.