

Tracking the atmospheric moisture sources of the Mississippi basin under different weather regimes in present and future climate

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Tracking atmospheric moisture back from its sink (precipitation) to its source (evaporation) determines the moisture sources of an area. We are interested in the sources of mean and extreme precipitation over the Mississippi basin and how these are affected in a changing climate, as extreme precipitation is likely to increase in the future. Previous studies determined the moisture sources of this basin for short periods (10-days climatology), specific seasons (summer) and specific dry or wet years (1993 and 1988). All these studies are based on re-analysis data, which does not allow to project changes in moisture sources in a future climate.

Here, we apply a Eulerian tracking algorithm (WAM2-Layers; van der Ent, 2014) on global climate model data to create a climatology of moisture sources for the Mississippi basin under different weather regimes. With re-analysis data, specific humidity and wind are available at multiple vertical levels, whereas for global climate models (GCMs) this depends on the available output. We use EC-Earth GCM data at high spatial resolution (~25 km) and available at five pressure levels. First, we validate our method on the use of EC-Earth against ERA-Interim re-analysis data. Thereafter, we study the influence of different weather regimes, such as El Nino/La Nina and a cold/warm Atlantic Ocean, on the moisture sources of the basin with the GCM under current and future climate conditions. For example, if more favourable hurricane conditions increase moisture transport from the Gulf of Mexico to the Mississippi basin.

Van der Ent, R. J. (2014), A new view on the hydrological cycle over continents, Ph.D. thesis, 96 pp, Delft University of Technology, Delft. <http://dx.doi.org/10.4233/uuid:0ab824ee-6956-4cc3-b530-3245ab4f32be>