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Oceanic versus continental sources of precipitation

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In the classical representation of the hydrological cycle, water evaporates from the ocean, from where it is advected to the continents, where it precipitates as rain or snow, turns into runoff, which eventually flows back to the ocean completing the cycle. However, this picture is much too simple as we showed that about 40% of the land precipitation has its origin in land evaporation (i.e. recycled water) rather than oceanic evaporation (van der Ent et al., 2010. WRR). The potential effect on precipitation from human-induced changes will thus not only act through an increased evaporation flux over the ocean, which is expected to change with global warming, but also through the evaporation flux over land, which is affected by land use changes as well as global warming.
In this research we follow the water through the atmosphere and present the concept of the precipitationshed: the probabilistic source area of precipitation for a specific region. We also present the concept of the evaporationshed: the probabilistic sink area of evaporation from a specific region. Knowing where the water comes from is valuable information on the susceptibility of a region to changes in its precipitationshed. Such changes can for example include higher sea surface temperatures or deforestation. On the other hand, being able to predict where the water goes helps us to assess the effects of these human-induced changes. Furthermore, this research consist of several case-studies illustrating the applicability of the precipitation- and evaporationshed concepts.