Geophysical Research Abstracts
Vol. 13, EGU2011-215, 2011
EGU General Assembly 2011

Quantifying precipitation sources of large, water stressed basins

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Moisture recycling, defined as the precipitation falling within a region that relies on terrestrial evaporation, is a very important hydrological process that sustains continental rainfall. Within this framework the quantification of the terrestrial moisture sources of specific areas is of key relevance for water resources, especially in water scarce areas, as it reveals the degree of moisture dependence of a region on other regions.
In this study we use a water-accounting model based on ERA-Interim reanalysis data (1.5° latitude x 1.5° longitude grid of the whole Earth for the period 1998-2008). By applying the atmospheric water balance principle and using available wind patterns we track the moisture coming into a region backwards in time to find its origin.
We quantify the source regions of precipitation for nine large river basins: the Nile, Niger, Limpopo and Volta basin in Africa, the Indus, Ganges-Brahmaputra, Mekong and Yellow River basin in Asia and finally, the São Francisco basin in Latin America. The quantification of the moisture dependence of a region is approached by the calculation of the 'precipitationshed', areas that supply water through evaporation to the study region.
We observe that 70% of the moisture coming into the Yellow River basin has its origin on the Eurasian continent and also for the other basins the dependence on moisture of terrestrial origin is significant ranging from 27% in the Mekong basin to 62% in the Niger. Results are presented in terms of the amount of evaporation that the source regions supply and the amount of precipitation that are generated from within the study region.
Part of the terrestrial moisture is generated within the boundaries of the basins and the rest outside. The Nile is an interesting case, where 43% of its precipitation originating from terrestrial evaporation is generated within its boundaries, whereas in Yellow River, only 15% is generated inside it; a fact that reveals a strong dependence of the basin's water resources on external sources of moisture.
Further quantification of the impact of land-use change within the identified source regions will allow quantification of the impact of land use change on moisture recycling, precipitation and water resources in each study region.