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Atmospheric moisture recycling and its influence in the Sudd Region in the Upper Nile Basin

Yueyang Chen and Asaad Shamseldin
University of Auckland, Department of Civil and Environmental Engineering, New Zealand (yueyang.chen@auckland.ac.nz)

Moisture recycling, is defined as the precipitation in a region which is partially contributed by evapotranspiration from the same region. It is the interaction between terrestrial hydrology and atmospheric processes, and plays a crucial role in forming local water resources and affecting local climate. Up to date, global moisture recycling at regional and continental scales has been understood relatively well, the patterns of local moisture recycling and the main variables impacting it remain unclear. For wetlands, the evaporation alters local climate by re-precipitation in surrounding regions, which can also be analysed from the viewpoint of moisture recycling. Yet, there is rare research has been done in this viewpoint to analyse and manage water resources of wetlands. It is thus of importance to carry out such research to unveil it. As the largest wetland in Africa, the Sudd region has relatively large precipitation recycling contributed by the surrounding regions, as well as large swampy areas of upper Nile Basin, which makes it an appropriate study case for the moisture recycling of wetlands. In this research, it is the first time to carry out atmospheric moisture recycling of Sudd region, considering anthropogenic activities such as engineering practices, hydro-politics and complex system. In this article, we will present multi-year hydro-climatology patterns of Sudd, and the calculation results from Water Accounting Model-Two Layers (WAM-2layers), including water vapor sources of its precipitation, and the reprecipitation of its evapotranspiration. We will also analyse their spatial distributions, origin and destination, and find the multi-year average moisture recycling ratio of the basin. From our calculation, it is as high as 24% in some regions. In summary, this work shows that Sudd region is of great significance to the neighbouring regions in terms of moisture recycling, and this would be also useful to provide a practical basis for planning by considering local land-atmosphere interaction.