Hydrol. Earth Syst. Sci. Discuss., 2, S106–S108, 2005
www.copernicus.org/EGU/hess/hessd/2/S106/
European Geosciences Union

Hydrology and Earth System Sciences Discussions

Interactive comment on "Hydroclimatology of the Nile: results from a regional climate model" *by* Y. A. Mohamed et al.

Y. A. Mohamed et al.

Received and published: 29 March 2005

We very much appreciate the detailed comments of the referee, who raised some very interesting points. We have made good use of the suggestions made, which we shall incorporate in the final paper. Below, on behalf of my co-authors, I would like to clarify some of the points raised by the referee.

1. The moisture recycling formula considers only the water budget, and as pointed out by the referee it doesn't include the thermodynamics of the atmosphere and other feedback loops, which are also important for assessing the impact of a land use change on climate. We agree with the referee that it would be interesting to analyse the impact of draining part of the wetland. Only with a regional climate model (RCM) is it possible to assess the full impact of land use change on mesoscale atmospheric circulation with reasonable accuracy. However, such an analysis is the subject of another paper that builds on the present model and its validation presented in this paper.

Full Screen / Esc

Print Version

Interactive Discussion

Discussion Paper

The dimensionless numbers presented in the paper for precipitation recycling, precipitation efficiency, etc, are basin indices reflecting regional scale characteristics rather than parameters with prognostic values (p. 13, line 14, p. 24 line 5). However their advantage is that they are simple to apply and allow comparison with other regions. It may even be possible to derive qualitative conclusions based on these numbers. For instance, the precipitation recycling over the Nile is 11%, which already indicates a small contribution of evaporation to basin precipitation. So, since the Sudd area in itself is relatively small ($<$1% of the Nile catchment) one would expect a relatively small influence of the Sudd evaporation on meso-scale atmospheric circulation. However, as we pointed out, a more complete answer is attainable when considering all land surface-atmosphere interaction processes through RCM simulations. This is the subject of another paper.

2. On the statistics of the comparison between different parameter fields, indeed we presented only time series and their temporal variability (standard deviation). Hence, we have added information by considering the RMSE and correlation with a reference data set. We shall amend these results to the final manuscript. The RMSE in the rainfall datasets: GPCC, FEWS and MIRA against the reference dataset (Fig. 6) are: 0.87, 0.86 and 1.33 mm/day, respectively. The correlation coefficient of: GPCC, FEWS and MIRA against the reference dataset (Fig. 6) are: 0.77, 0.82 and 0.91, respectively. The results show that although MIRA has a high correlation coefficient, it also has a high RMSE. The GPCC and FEWS datasets have the same order of magnitude values both for RMSE and correlation coefficient.

Additionally, the RMSE of the comparison of model result and observation have been determined for all climate parameters. The RMSE of runoff for the 4 sub-basins: Nile, Atbara, White Nile and Blue Nile (Fig. 7), are 3836, 340, 2011 and 1754 m3/s, respectively, and for precipitation (Fig. 8) 0.47, 0.52, 0.65 and 0.95 mm/day, respectively. The RMSE for the water budget components over the Sudd (Fig. 11) are 0.86, 1.17, 1.09 and 0.03 mm/day, for precipitation, evaporation, runoff and change of soil moisture storage, respectively. The RMSE in W/m2 for the radiation comparison (Fig. 12) are 22, 7.5 and 21.2 for Riyadh short wave radiation, Riyadh long wave radiation and Ndabibi long wave radiation, respectively. The final paper will mention these results.

3. In responds to the referee's request, the spatial pattern of climate parameters is presented as time series for the four sub-basins: Atbara, Blue Nile, White Nile and the Sudd (location given in Fig. 3) instead of just map plots for different moments in time. This allows inspection of spatial results at smaller spatial scale than the whole Nile basin and for higher temporal resolution (monthly time step). It also allows checking the correlation of different climate parameters in a sub-basin. e.g., precipitation and runoff from the same sub-basin.

4. We used monthly data to smoothen out irregularities of the climate fields, which exist at high temporal resolution both in sample observations and model results. Moreover, some of the datasets were only available on a monthly basis (e.g. GPCC). Considering the overall objective of the modeling exercise (sensitivity study) a monthly time step was considered acceptable.

Interactive comment on Hydrology and Earth System Sciences Discussions, 2, 319, 2005.