Hydrol. Earth Syst. Sci. Discuss., 7, C4927–C4930, 2011
www.hydrol-earth-syst-sci-discuss.net/7/C4927/2011/

Hydrology and Earth System Sciences Discussions

Interactive comment on "Coupling statistically downscaled GCM outputs with a basin-lake hydrological model in subtropical South America: evaluation of the influence of large-scale precipitation changes on regional hydroclimate variability" *by* M. Troin et al.

Anonymous Referee #2

Received and published: 1 February 2011

Summary

The manuscript presents an application of a downscaled method of large scale variable as inputs for a basin-lake hydrological model in central Argentina. The basin-lake hydrological model was developed by the author, and presented in another publication, and in this work its reliability when forced by the NCEP reanalysis and LMDZ

model simulations is explored. The methodology is interesting, and proved to capture the key hydrological cycles of the lake level, except the lowstand in the 1970s.The authors showed that the SWAT simulations using downscaled LMDZ data outperforms the SWAT simulations forced by downscaled NCEP data. This is an unexpected result that should be further address by the authors.

Comments:

1) LMDZ simulations:

It is not clear the setup of the LMDZ ensemble simulations:

The model was forced only by SSTs? If so, what sea ice was used? Each member differs on the initial conditions of sea ice and SSTs? Does it mean that each member started at different dates (using the same atmospheric conditions)?

2) Downscaling

The authors intend to address if it is relevant to force the rainfall-runoff model by downscaled LMDZ and reanalysis output. However, they do not show what would be the results of forcing the SWAT model directly with the GCMs output without downscaling. This could be the benchmark to prove if the downscaling is relevant or not. This is further necessary considering the poor spatial representation of observed precipitation (Troin et al 2010a,b?)

3) Regions/Boxes

Why are the regions (for NCEP) definitions different from the boxes (for LMDZ) definitions? The authors should clarify their choice and state that region B is the same as box C. Why is region A so small (only 1 grid-point) when compared with the other areas?

4) NCEP vs. LMDZ

The lake level trends are better simulated using downscaled LMDZ outputs then NCEP

HESSD

7, C4927–C4930, 2011

reanalysis. These results are more than “An interesting feature” (section 6.2). It is not clear to the reviewer the reasons for these striking results. The authors should elaborate on this topic trying to point possible reasons for this. While the LMDZ simulations can be considered has homogeneous in time the reanalysis is not since different observations were assimilated, leading to different kinds of errors.

The PDM approach is suitable for changing climate context since it assumes that there is a mathematical transformation that translates the CDF of the predictor into the CDF of the predictand. In the reanalysis case the PDM will try to correct a CDF that has different sources of errors during the validation period then during the calibration period. This could be one explanation to the better results of LMDZ when compared with NCEP. As stated in point 2) it would be useful to check what would be the results of using the direct GCMs output.

5) Lower latitudes areas

The best results were obtained with data from regions at lower latitudes than the actual lake catchment. This does not directly suggest that the lake is mainly under tropical climate influence, but that the GCMs and/or PDM over the lake region are not accurate. This is the case, since a SWAT model is used, and it is questionable to force it using downscaled data from a different region then the area of study. This raises a question: Would the PDM or another statistical downscaling method using the same predictands (rainfall, and temperature) predict the lake level directly without recurring to the SWAT model?

Technical corrections:

Pag 9536 after eq(2)The observed runoff and mean observed runoff should be referred in the text as Qo (and not Qs)

Pag 9536: The last term of equation (3) (gamma) is not defined

Pag 9546: There are two references as Troin et al 2010. The authors should include a,

HESSD

7, C4927–C4930, 2011

b and change in the text for the appropriate reference.

Figures 3-6: The authors should increase the resolution and size of the figures. For example, figure 6 can only be clearly analyzed when zooming to 600%. When printed it is difficult to examine the figures.

Troin, M., Vallet-Coulomb, C., Sylvestre, F., and Piovano, E.: Hydrological modelling of a closed lake (Laguna Mar Chiquita, Argentina) in the context of 20th century climatic changes, J. Hydrol., 383, 233–244, 2010.

Troin, M., Vallet-Coulomb, C., Piovano, E., and Sylvestre, F.: Hydrological impacts of climate change: assessment of a basin-lake model applicability using contrasting climatic conditions in subtropical South America, Water Resour. Res., in revision, 2010.

Interactive comment on Hydrol. Earth Syst. Sci. Discuss., 7, 9523, 2010.