

Interactive comment on “Explaining and forecasting interannual variability in the flow of the Nile River” by M. S. Siam and E. A. B. Eltahir

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We would like to thank the reviewer for his comments and thoughtful suggestions.
Comment 1:

I have two problems with this manuscript. Firstly, I am not at all sure what, if any, of the findings can be considered to be novel. One of the main findings is that the SOI index is useful in describing the flow in the Nile, but this appears to be well-known from work the authors have already published in Siam et al (2014) – page 4855, line 27-28. As such the correlations derived in his study can hardly be considered surprising, but the existence of these connections reported as one of the main findings (first bullet point in the conclusion).

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Reply 1:

The published work of the authors in Siam et al (2014) is only discussing the physical mechanism that connect the South Indian Ocean and ENSO to the Nile flow and did not discuss how these connections can be used in forecasting the Nile flow or the different modes of natural variability in the flow of Nile river. The authors summarize this mechanism in the introduction. In this study, we build on this work and describe the different modes of natural variability in the flow of Nile river and how we can combine the SOI index with ENSO to accurately forecast the Nile flow. This study also has an advantage compared to the others similar studies as it is based on physically explained correlations between the Nile flow and SSTs indices. Most of similar studies are based on random correlation found between the Nile flow and global SSTs, which increases the confidence in the suggested forecast method.

Comment 2:

Secondly, in Section 3 the connection between flow and SOI & ENSO is established through a simple linear regression (Table 1). I am not entirely sure I understand how the 'neutral, and 'non-neutral' classes are derived, but as far as I can work out the conditional probabilities reported in Section 4 are based on slightly more refined subsets of SOI and ENSO and therefore offer no real insight that has not already been reported in section 3, or could not easily have been derived from the regression analysis. In any case, it was already well-known that these correlations existed (see comment above). I like the forecasting index in Eqs. (3) and (4), but this also appears to have been developed in a previous study (Wang and Eltahir, 1999).

Reply 2:

The authors modified this part in the manuscript to make it more clear for the readers to understand the difference between neutral and non-neutral years and the regressions are made. In this study, we suggest a framework that is able to predict the Nile flow with several months ahead. The authors focuses in Section 3 in describing the different

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modes of Natural variability in the flow of Nile river, while Section 4 describe how these modes can be used in the forecast algorithm.

Comment 3:

I found the introduction difficult to read. I think the authors should provide a more structured discussion of previous findings and listing of the main drivers. For example, it is difficult to understand if the rainfall over East Africa is important or not (page 4853, line 15-28). In the last paragraph of the introduction there are numerous climatological phenomena introduced, and I would have liked to see a more order discussion, possibly aided by a figure or a table, to enable a better assessment of the novelty and validity of the subsequent analysis.

Reply 3:

The authors modified this part in the manuscript to make it more clear for the readers to understand.

Comment 4:

Page 4856, line 18: This reference to Table 1 comes before any discussion of the analysis and results presented in the Table.

Reply 4:

The reference in this line is removed and placed in the discussion of this part.

Comment 5:

Table 1: When using both ENSO and SOI the R2 increases, but is this not a normal consequence of using two rather than one explanatory variable? Maybe this is worth a comment?

Reply 5:

The authors describe how the addition of the SIO index to ENSO improves the ex-

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plained variability in the flow of Nile river. This is mainly because the SIO index can explain some additional variability in the flow of Nile river that is independent from ENSO. For example, when the SSTs over the North and Middle of the Indian Ocean were used with ENSO index, they did not explain any new variability in the flow of Nile river as the SIO index did. The SSTs over the North and Middle Indian Ocean are dependent on ENSO, hence, their use in presence of ENSO did not increase the explained variability in the flow of Nile river. This discussion is added in the modified manuscript. A new figure is added to show the improvement due to adding SIO index in the Forecast (Figure 4 in the modified manuscript).

Comment 6:

Page 4856: I think more details of how the 'neutral' and 'non-neutral' years were classified –perhaps add a figure with a time series of SST and to illustrate the variability?

Reply 6:

The authors modified this part in the manuscript to make it more clear for the readers to understand.

Comment 7:

Page 4859, line 8: there is no Winkler (1972) in the references.

Reply 7:

The reference is corrected in the modified manuscript.

Please also note the supplement to this comment:

<http://www.hydrol-earth-syst-sci-discuss.net/11/C4259/2014/hessd-11-C4259-2014-supplement.pdf>

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