Hydrol. Earth Syst. Sci. Discuss.,
https://doi.org/10.5194/hess-2018-183-AC2, 2018
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Hydrology and Earth System Sciences
Discussions

Interactive comment on "Season-Ahead Forecasting of Water Storage and Irrigation Requirements – An Application to the Southwest Monsoon in India" *by* Arun Ravindranath et al.

Arun Ravindranath et al.

arunravi86@gmail.com

Received and published: 14 July 2018

We thank the three referees for their valuable comments. Here are our point-by-point responses. Some comments that had similar concerns were grouped together for the response. ÂăNote the following convention: RC = referee comments, AC = author comments (replies).

Referee 2

The manuscript is very well written and it was a very pleasure to read it. The proposed index - the cumulative deficit index (CDI)- is novel and original and well-motivated. The

forecast model of such index has a strong contents of innovation, and furthermore appears to be very useful from a practical/applicative point of view in agriculture water management. The approach followed to construct the forecast model of CDI is novel and scientifically sound. Results have been obtained following a rigorous and clear procedure of validation. They are convincing and confirm the validity of the proposed methodology. Therefore I recommend the publication of the manuscript in the present form. I just did very few minor comments in the file attached. The authors can choose whether to take such comments into account.

Thank you for the comments. In the revised version, we are including your suggestions.

RC1: [In reference to CDI equations in section 3] I am not sure that this is the best way to define these variables Âăbecause Dt,d t is the year, but in Dj,t j is the location. I think that these formulae could be written in more clear formalism.

AC1: We have changed the indices on the defined variables (supply, demand, rainfall, crop-coefficient, etc.) to reflect day d and location j and have done away with the year index t. ÂăThe assumption is that these calculations can be made this way in any given year. The year index logically only applies when calculating the finally CDI. Here are the revised equations as they are now written in the manuscript (see supplementary pdf):

RC2: [In reference to lines 273 - 275 in first draft of manuscript] This figure could be quoted before in paragraph 3 to clear the meaning of CDI

AC2: We have put this reference to Figure 2 at the end of Section 3 as suggested by the referee and have inserted a one sentence reminder of this Figure in the paragraph where the original reference used to be.

RC3: [In reference to lines 288 - 290 in first draft of manuscript] Comment on Page 8

AC3: We thank the referee for their input, but we feel that the meaning of this sentence is clear and elect not to make any changes here. ÂăHence, the sentence remains as

“Since agriculture tends to be one of the largest consumers of water — about seventy-percent of all the world’s freshwater withdrawals go towards irrigation use (USGS, 2017), and this is in addition to what is rainfed — this is an integral part of water resources management.”

RC4: [In reference to the mistaken reference to MSE instead of RMSE on page 10 first draft of manuscript, line 406]

AC4: The change from MSE to RMSE has been made. ÂăHere is the new, revised sentence:

“In this manner, a single RPSS value and RMSE value were calculated for every possible combination of the predictor variables.” Âă

RC5: This is a very interesting results because you start with a very large number of predictors but your procedure reduced the number of predictors just to three, limiting in such a way the dimensionality of the problem. I think that such result should be emphasized. Furthermore a synthetic explanation about the physical reasons of the dominance of the three predictors would be useful.

AC5: We will emphasize this point. As per the predictors, we have cited relevant literature for the choices in the previous manuscript and described the physical connections when we first introduced the predictors (section 4.1.2). We now added a few lines of interpretation of the trend term as appropriate. ÂăThe sentences added are:

“Their investigation showed that the Darwin pressure anomalies decrease from DJF to MAM before the occurrence of heavy monsoon rainfall and increase prior to the occurrence of deficit monsoon rainfall.”

RC6: [In reference to lines 585 - 588 of the first draft manuscript submitted] Are authors sure that these definitions should not be inverted ?

AC6: We believe that it seems intuitive to define false alarm as a situation in which the outcome is not as dire or severe as the forecast implies. In this regard, the forecast

reporting a high likelihood of above normal water stress is alarming, and this sense of alarm is rendered false and assuaged by the observation reporting below average water stress. In the situation of a miss, it is reasonable to assert that the observation reports above normal water stress, but our forecast misses this important event and instead reports high likelihood of below normal water stress. ÂăAccordingly, no change has been made and we maintain the definitions we have. Hence, the definitions remain in the original sentences:

“We say that a hit has occurred if identical directionality is observed. ÂăA miss occurs if the forecast implies below average water stress, but the observation shows above average water stress. ÂăFinally, a false alarm occurs if the forecast implies above average water stress while the observation shows below average water stress.” Âă

RC 7: [In reference to Figure 2 title] What is CWSI ?

AC7: The title was mistakenly written as CWSI (an old reference to this index) and has been changed to CDI accordingly. ÂăThe revised Figure (3) is now (see first figure attachment):

Please also note the supplement to this comment:
https://www.hydrol-earth-syst-sci-discuss.net/hess-2018-183/hess-2018-183-AC2-supplement.pdf

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Interactive comment on Hydrol. Earth Syst. Sci. Discuss., https://doi.org/10.5194/hess-2018-183, 2018.

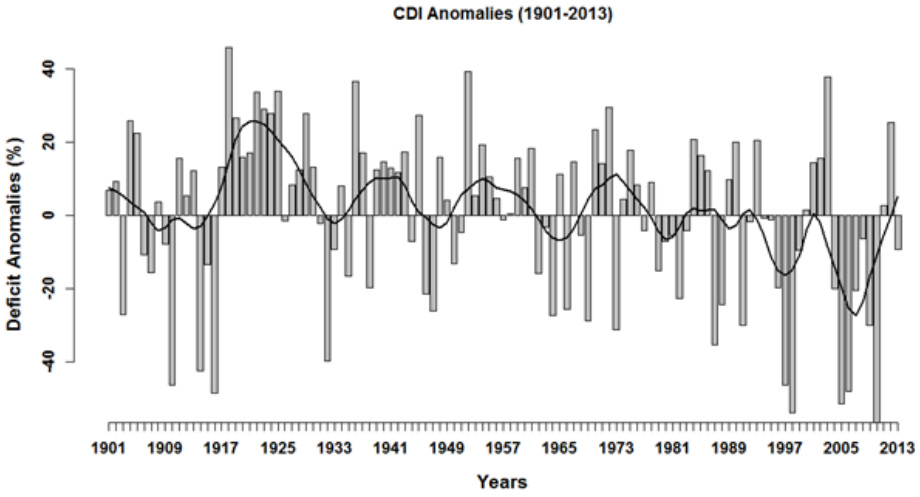
CDI Anomalies (1901-2013)
Deficit Anomalies (%)
40
20
0
-20
-40
1901
1909
1917
1925
1933
1941
1949
1957
1965
1973
1981
1989
1997
2005
2013
Years

Fig. 1.