Interactive comment on "Long-term precipitation forecast for drought relief using atmospheric circulation factors: a study on the Maharloo Basin in Iran" *by* S. K. Sigaroodi et al.

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General comments:

(1) The paper attempts to conduct precipitation forecast at monthly time scale and for categories of normalbelow and above normal (with focus on droughts). Step wise regression and ANN methods are used todevelop relationships between precipitation and 40 global indices. The methodology is sound andrigorous and concisely mentioned. Some of the findings are very useful confirming the relationship ofsome of the global indices to local precipitation in Southern Iran.

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Interactive Discussion

Discussion Paper

Reply: We thank the Editor for this favourable assessment of our manuscript. We are very grateful to the reviewer for his/her time and constructive comments on our manuscript. We have considered all the comments from open discussion carefully and substantially revised the manuscript in accordance with these comments. We took great efforts to rewrite the Abstract and some parts of Discussions and Conclusions. More insightful analyses were made on the model accuracy and coefficient of determination. Please kindly refer to the detailed response and the revised manuscript.

Detailed responses to each comment:

1) However a critical explanation and discussion of the results is lacking. Some of the conclusions and recommendations drawn from the paper do not reflect the results. For instance, authors state in abstract, "Based on this research, the monthly precipitation anomalies in the Maharloo Basin in north of Persian Gulf can be forecast about ten months earlier using NOAA (National Oceanic and Atmospheric Administration) climate indices such as NAO (North Atlantic Oscillation), PNA (Pacific North America) and Nino, which will support droughtâĂŘrisk alleviation in the region." This statement does not reflect the presented results and could be misleading.

Reply: Our results indicated that in many cases a significant relationship could be established between climatic indices and monthly precipitation. For instance: rainfall of February, March and April is correlated to NAO (11 months earlier), GIAM (9 months earlier) and NAO (11 months earlier) respectively. Therefore, anomalies' effects of mentioned indices can be visible ten months later in the study area. Such a finding is very meaningful to drought mitigation and water resource management, especially in area suffered from lacking of data. We added this point in the manuscript (pages 2 and 11).

2) The results clearly show that the forecast performance is very low in case of all studied indicators (e.g. R2, Heidke skill score given in Table 9). It seems that the given scores are very low and thus may not deliver reasonable forecasts in most instances.

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The authors should have indicated a threshold level of acceptance where the results could be used for water management and drought mitigation.

Reply: Accuracy indices revealed a relatively weak relationship which can be explained by far distance between original location indices and other environmental factors. But it is noticeable that the results statistically are significant and optimistically can use together with further regional variables such as physiographic characteristics to reach a higher accuracy. In addition most previous works report the same case in other regions (e.g. Heo et al., 2013; Li et al., 2012). The added points for this comment can be found in Pages 2, 12.

3) Thus, a critical description of the achieved results is lacking and conclusions and recommendation needs revision according to the given results. The performance in dry months (May to September) is comparatively better than wet months (October to March), although in all cases remain lower than the expected values to confidently guide water management and drought mitigation decision making. Authors should discuss the value of forecast in these months when precipitation is already too low. Most of the precipitation occurs in October to April in the study region when forecast was very poor both by regression and ANN methods.

Reply: In the study area (Meharloo watershed), the most proportion of precipitation is in the cold months (October- May), while in the warm months the precipitation is very low. Although the most recorded data show zero precipitation for July – September period, the rarely rainfall events in the warm months (e.g. June 1979; Aug 1994 and 1996; Sep 1994 in table 8 with W and VW sign) could be very valuable, and they were well predicted through both (ANN and regression) models. This is exactly the function of models. The reviewer pointed out the accuracy coefficients of both Regression and ANN models in warm months are higher than other months. It looks true that the models appropriately predicted the rarely rainfall events in dry period and consequently the accuracy indices of warm months are higher than the other months. However, significant relationships were also established for wetted months (Table 8) and the

precipitation was forecasted acceptably. For example low precipitation in January of 1968, 1977, 1994 and high precipitation of January of 1969, 1978, 1991 and 2002 were predicted appropriately (table 8). We elaborated these points in Pages 1, 4, 12

4) It is suggested to give monthly averages of precipitation to give the readers a quantitative oversight on the intraâĂŘannual variability of the precipitation. This is important to compare the performance of different months and judge forecast value and usefulness in water management and drought mitigation in the study region. Considering these points, a major revision is recommended.

Reply: In regards to model accuracy and compare of different months' performance, we added a new figure (Fig. 4) to show the monthly precipitation and accuracy together. In addition more discussion was added into the conclusion section (page 12) to highlight this issue.

Please also note the supplement to this comment:
http://www.hydrol-earth-syst-sci-discuss.net/10/C7012/2014/hessd-10-C7012-2014-supplement.zip

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