Response to Anonymous Referee #1

Authors would like to thank the anonymous referee #1 for the detailed review and useful comments which certainly improve the manuscript. We will revise the paper according to your comments. The responses to the comments are addressed below.

General comments

Comment: This kind of analysis, however, is insufficient to warrant publication in HESS. There is a long history and a vast literature on empirical Indian monsoon prediction, which the study could have drawn from methodologically. Instead, the authors merely provide little more than a data mining study for the numerous variables involved. Exploiting the correlations for a proper statistical model would have been the step necessary for a valuable HESS contribution. From the authors' own suggestion: "The developed relationships between rainfall and indices or large-scale atmospheric variables would be useful in the development of rainfall forecasting models as presented in Singhrattna et al. (2005b) and Zehe et al. (2006b)."

Response: Since temperature influences atmospheric circulation and monsoon rainfall (Mason and Goddard, 2001; Smith and O'Brien, 2001; Saravanan and Chang, 2000; Harshburger et al., 2002; Gershunov, 1998), this paper develops relationships between rainfall in the study basin and large-scale SST anomalous indices. The relationships with other large-scale atmospheric variables are currently being investigated which ultimately will lead to development of a statistical model to forecast rainfall with a set of selected predictors including large-scale SST. Authors plan to submit a separate paper in near future.

Gershunov, A.: ENSO influence on intraseasonal extreme rainfall and temperature frequencies in the contiguous United States: Implications for long-range predictability, J. Climate, 11, 3192-3203, 1998.

Harshburger, B., Ye, H., and Dzialoski, J.: Observation evidence of the influence of Pacific SSTs on winter precipitation and spring stream discharge in Idaho, J. Hydrol., 246, 157-169, 2002.

Mason, S. J., and Goddard, L.: Probabilistic precipitation anomalies associated with ENSO, B. Am. Meteorol. Soc., 82, 619-638, 2001.

Saravanan, R., and Chang, P.: Interaction between tropical Atlantic variability and El Niño-Southern Oscillation, J. Climate, 13, 2177-2194, 2000.

Smith, S. R., and O'Brien, J. J.: Regional snowfall distributions associated with ENSO: Implications for seasonal forecasting, B. Am. Meteorol. Soc., 82, 1179-1191, 2001.

Specific comments

Comment: The abstract is overloaded.

Response: The abstract will be shortened.

Comment: The introduction misses outlaying the main purpose of the study. So it remains unclear whether the topic is seasonal weather forecast (e.g.) or climate change.

Response: The paper is on seasonal weather forecast. The introduction will be improved to reflect this clearly.

Comment: Selecting from a set of 36000 calculated correlations those that are "significant" is a rather poor and misleading undertaking, because for any given significance level p, p percent would turn out to be significant by pure chance - which in this case would be as much as 1800. This may explain some of a number of inconclusive results of the study (such as the large September-October difference).
Response: This is a good suggestion. We have to admit that we did not consider this aspect. However, to improve the methodology, the predictor selection can be done associated with the maximum absolute correlations for each SST index from 12 lag periods and indicating the significant levels of those correlations. In the revised manuscript, these results will be presented and discussed with respect to the significant levels of identified predictors and corresponding lead periods.

Comment: The actual size of the correlations is often not reported (only whether being significantly nonzero). Similarly, negative and positive correlations are treated equally, which is somewhat counter intuitive and needs explanation.
Response: The actual correlations will be reported in the revised paper. The positive and negative correlations are treated equally with respect to their relationships but they reflect the significance and corresponding lead periods of indices.

Technical details
Comment: 6660, 21: Is the first sentence (the study) about seasonal forecasts or climate change?
Response: It is the seasonal forecasts. This will be corrected in the revised paper.

Comment: 6661, 16: Consider to move paragraph up.
Response: This will be done.

Comment: 6665, 12: In this context one would like to know how large the correlation actually is, and not whether it is significantly nonzero.
Response: The cross-correlations of monthly rainfall between all selected stations ranged between 0.462 and 0.959. This information will be included in the revision.

Comment: 6666, 5: This procedure is highly problematic. Choosing from so many candidate correlations is bound to render a considerable amount of them as spurious, depending on the chosen significance level.
Response: The methodology of predictor selection in the revision will consider the maximum absolute values of correlations of each index among 12 lead periods and will indicate the significant levels of the selected correlations.

Comment: 6667, 19: Please specify exactly what is meant by "±0.26". - Fig. 5 is stretched horizontally so that the displayed correspondence of variables is misleading.
Response: The +0.26 and -0.26 are the upper and lower bound of the 95% confidence levels of correlation.
Fig. 5 is presented in the same range of x-axis (rainfall) to compare the amount of dry season rainfall among three zones.

Comment: 6667, 23: Why do you show a moving window here instead of total correlations?

Response: The moving window correlations can show the variability and development of relationships between temperature and rainfall over decades, whereas the total correlations obtained from the entire time series cannot show the changes of their interdecadal relationships.

Comment: 6667, 26: You explained how temperatures can drive monsoon precipitation. But what is 'vice versa' here? In Fig. 6, the curves are hardly distinguishable.
Response: The "vice versa" is that if the air temperature during MAM is low, the MJJ and ASO rainfall are expected to decrease. This will be clearly described in the revision
The legends in Fig. 6 will be changed to make it more distinguishable.

Comment: 6668, 9: The statement "The negative correlations ..." is unclear.
Response: The negative correlations between ASO rainfall in HRZ and surface temperature over the study basin shown in Fig. 7a are consistent with the negative correlations from 20-year moving window analysis shown in Fig. 6. In the revision, authors will make it clearer for readers.

Comment: 6668, 14: If correlations are better or more consistent with the SST then why isn't SST considered in the first place?
Response: This study considered the SST in terms of the standard SST indices which are the large-scale anomalous SST over different regions of the Pacific Ocean and Indian Ocean – i.e. NINO1+2, NINO3, NINO4, NINO3.4 and ION. The study did not consider other variables. Authors are currently analyzing other large-scale variables to develop a statistical forecasting model.

Comment: 6668, 27: The trend analysis here starts somewhat unmotivated from the context.
Response: The idea of trend analysis here was to investigate if there has been any trend in MAM temperature (Fig. 9) and rainfall during dry (November to April) and wet (MJJ and ASO) season (Fig. 8 and Fig. 10, respectively).

Comment: 6668, 28: The time series obviously exhibit inhomogeneity, as evidenced by the sharp change in lag-1 autocorrelation around the year 1980.
Response: Fig. 8 shows the standardized anomaly time series of dry season rainfall and not the correlogram.

Comment: 6670, 24: The large difference between September and October is very likely indicative of the low significance of the reported correlations (see comment 6666, 5).
Response: The methodology will be revised as mentioned above, and this will change the results. The revised paper will discuss the results.