

Interactive comment on “Spatiotemporal Changes in Aridity of Pakistan during 1901–2016” by Kamal Ahmed et al.

Anonymous Referee #3

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Comments on “Spatiotemporal Changes in Aridity of Pakistan during 1901–2016” submitted by Kamal Ahmed et al. to Hydrology and Earth System Science

General comments In this manuscript, the authors investigated spatial distribution and temporal trend of precipitation, potential evapotranspiration, and aridity in Pakistan for the 20th and 21st centuries. They used GPCC and CRU PET datasets, allowing them to conduct long-term analyses. Several non-parametric statistics such as Mann-Kendall test and Sen’s slope estimator were used. These trend analyses were conducted for annual and two cropping seasons (Kharif and Rabi); most readers are not familiar with this cropping scheme but seems unique in this study. They found that some significant changes in hydrological regime in this region occurred between 1971 and 1980. I know that Pakistan is one of the highly-populated regions and its hydro-

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logical regime shift would have serious impacts, directly by altering available water and indirectly by affecting agricultural yields. In this regard, this kind of study is meaningful for planning sustainable society. Nevertheless, this study obtained, in my view, quite data-specific results. In general, long-term data such as GPCC and CRU are subject to uncertainties especially in the early period when observational data so sparse. Recent studies use multiple datasets to examine the consistency and difference, in order to obtain robust results. Indeed, no range of uncertainty or confidence interval was shown for the results obtained in this study. The use of non-parametric statistics looks reasonable. However, the hydrological regime shift obtained by these analyses were not adequately discussed. In Discussion (Page 22 Line 5), the authors related the regime shifts to the Asian monsoon, but no sufficient evidence was presented. I guess some human impacts, such as land-use conversion and overuse of ground water, could be responsible. Finally, I felt insufficient about the lack of discussion about the impacts of aridity change on human dimensions such as agriculture. Although this is not the main topic of the manuscript, I recommend adding some discussion about the impacts of increasing or decreasing aridity in this area. Finally, I can't recommend the manuscript as a candidate for publication in the present form. Please look my specific points.

Specific points Figure 4: What the dots in the panels represent? I guess it means significance of trend, but please clarify.

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