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Hydrology and Earth System Sciences Discussions

Interactive comment on "Downscaling of surface moisture flux and precipitation in the Ebro Valley (Spain) using analogues and analogues followed by random forests and multiple linear regression" *by* G. Ibarra-Berastegi et al.

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Summary: The aim of the paper is to explore the utility of analogues for downscaling, and assess that approach relative to adding additional steps to the downscaling including analogues and multiple linear regression. To that extent it is reasonably approached, and the methods generally appear to support the conclusions. What is missing principally is the tie to downscaling GCMs, and generalizing the results to future conditions, which presumably is a motivation for this effort.

1) p. 1952, lines 21-26 and top of following page: This sets the stage for the experiment, where the challenge of using large scale (1.5-4 degrees) GCM output to estimate

'site-specific scenarios' requires some type of downscaling. There are two main issues separating the analysis presented in the manuscript from this, namely 1) by downscaling ERA products at about 1 degree spatial resolution there is much greater spatial resolution than most existing GCMs, and 2) by using reanalysis products, even though precipitation observations are not directly assimilated, other observations are, giving it much higher skill than any GCM will exhibit. For development of downscaling approaches this type of analysis is common, but a discussion of the implications of the findings in the context of much coarser, lower skill input to the downscaling procedure is missing.

2) p. 1957, lines 4-9, some important source regions providing teleconnections to IP climate are noted. However, on p. 1959, lines the domain for large-scale predictors is limited to the predictand domain alone. What is the justification for this?

3) p. 1961, lines 12-14, the GPCP dataset is used for reference values. Since the GPCP product is a merged data set of observations from a variety of sources, it is unclear why "any downscaling effort on precipitation could only be justified if better results than local persistence and/or raw GPCP data ...were obtained." Does the GPCP data include the observations stations for which downscaling is being performed? Why should any downscaling effort be expected to provide a better estimate of local conditions than an observationally-based data set? Something is not clear here.

4) p. 1964, line 4, express the RMSE as a percent of the mean value either instead of or in addition to the raw RMSE.

5) section 2.3, the list of statistics for evaluating the methods could be more inclusive of extremes. One of the motivations for downscaling of daily data is to capture better extreme values. For precipitation, are extreme values captured more successfully by one method than another? Since RMSE is heavily affected by high values there may be an implicit assessment of this, but comparing estimates of heavy rain events would be interesting.

6) One issue in using historical analogues is that, when applied to future climates that may bear less resemblance to historic climate, the number of available analogues and their correspondence to simulated patterns may decrease significantly. Some comment on the range of projections and how that might affect the applicability of this method in future climates would be helpful.

Interactive comment on Hydrol. Earth Syst. Sci. Discuss., 8, 1951, 2011.