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Hydrology and Earth System Sciences Discussions

Interactive comment on "Improving runoff estimates from regional climate models: a performance analysis in Spain" *by* D. González-Zeas et al.

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General comment

A good example of how to condense a very large data set from 10 different RCMs into few meaningful analysis tests is provided in this work with an in-depth insight into the applicability of RCM for hydrological and water management evaluations which is really a hot topic in today's hydrology debate. This study underlines the value of the direct surface runoff simulated by RCMs, suggesting that, despite the need of bias correction, the accuracy of the results may be comparable to those obtained by other studies using the climatic model output as an input to finer resolution water balance models (standard procedure). Besides this, 5 aridity index based on climate simulations are

also adopted as a long-term mean water balance estimator. The novelty of this work is mainly in the use of these two approaches adopted to test the accuracy of different RCM in predicting discharge in large river basins. Natural discharge data from the entire mainland territory of Spain are compared with different RCM output downscaled to 2.5-min resolution (about 4x4 km) using different (but very simple) interpolation methods thus evaluating the ability of each method to reproduce the observed behaviour. The interpolation alternatives consider the use of the direct runoff from the RCMs and the mean annual runoff calculated using different aridity indices and are evaluated in terms of their bias and index of agreement with observations thus providing a convincing picture of the performance of the different RCMs, interpolation methods/grids and aridity index formulation. In this sense, this work could help the scientific community in further advancement towards a better use of climate scenarios in hydrological applications. A few improvements in the presentation of methods, application and results will probably enhance the evaluation of this paper by the community concerned with the hydrological impacts of climate change at river basin scale.

Specific comments

The problem of bias when dealing with RCM output is well introduced in section 3.4, though the presentation of more popular techniques of bias correction does not give proper credit to the statistical downscaling methodology and related literature works which represent one of the more efficient way to operate bias corrections on the whole empirical frequency distribution of the interested variable (i.e. quantile mapping method, applied by e.g. Wilby et al. already referenced papers; Déqué, Global and Planetary Change, 2007; Bardossy and Pegram, WRR, 2011).

The bias correction method presented in section 3.4 is applied to the monthly series in section 4.3. Comparison against observation was performed between monthly frequency distributions while the reader would have found a comparison between time-series more significant. Therefore it would be interesting to report the performance of the applied bias correction using the NS to the time series before sorting operation.

Moreover, the comparison between frequency distributions themselves (Fig. 6) is only qualitative or based on overall statistical indicators such as the NS which is not common for distributional comparisons. Comparison between frequency distributions is usually performed with specific statistical test exploring both the average and extreme behaviour of the variables (see e.g. Portoghese et al., NHESS, 2011) while the adopted performance test are more commonly used to analyze the fitting between time series. Furthermore the authors should put emphasis on distributional differences since it is likely that major effect of climate change will concern extreme events (floods/droughts) and climate variability in general rather than the average behaviours.

Technical corrections

On page 177, lines 16 and 17, the term layer referred to data records corresponding to river section measurements is not properly correct. May be changed into runoff dataset.

On page 178, line 21, the term desegregation is wrong. Should be changed in disaggregation. This term is used somewhere else through the text. Please check.

On page 183, line 28, the term relation may be ambiguous. Better using ratio.

On page 183, line 28, and in all other cases (please check) the term evaporation should be evapotranspiration according to the commonly used notation and adopted formula reported in Table 2. According to the same water balance terms, the adjective current on page 184, line 1, and in all other cases (please check), should be changed into actual.

Interactive comment on Hydrol. Earth Syst. Sci. Discuss., 9, 175, 2012.