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CLIVAR-SPAIN contributions: Statistical downscaling for winter Miño river flow and its potential use to obtain regional climate change projections

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The Miño river basin is located in the Northwestern of the Iberian Peninsula. It covers a limited territory, bordered by the Atlantic Ocean and the Cantabric Sea. Relationships between winter Miño streamflow anomalies and several atmospheric teleconnection patterns, seasonal sea level pressure (SLP) and sea surface temperature (SST) have been examined. Based on the found relations, a multiple regression model for the winter river flow has been fitted. The data base of streamflows comprises monthly data from 19 stations, covering the period from October 1950 to September 2008. Taking in mind, that river flow data usually are not normally distributed, the monthly data are first logarithmically transformed, and then the winter seasonal average is calculated using the months of December, January and February. A Principal Component Analysis of these winter data has been carried out, finding a single significant PC with a associated variance of 82%. In a first step, teleconnection patterns and sectors from the oceanic SST and SLP anomalies that can be related with Miño's river flow have been identified. To this end, the point linear correlation between the winter and streamflow PC series and the teleconnection indices, the Northern Hemisphere SLP and the global SST, both from simultaneous and previous seasons have been evaluated. Regions showing significant correlations have been identified as potential explanatory variables, or even predictors. The second step has been to identify, among these teleconnections and regions, those that can be considered as stable. This has been achieved through the analysis of the variability of the correlation between the winter Miño streamflow anomalies and the potential explanatory variables previouly found using a moving window of 20 years. The correlation is considered to be stable for those regions where streamflow and explanatory variables are significantly correlated at 95% level ($r = 0.3$) for more than 80% of the 20-year windows covering the period 1950-2008 and, furthermore, that the sign of the correlation does not change with time. Regions verifying this criterion are considered as robust explanatory variables or predictors, and will be used in a multiple linear regression model for the Miño streamflow. The preliminary results show that winter Miño streamflow is mostly dominated by the contemporary NAO, EA, EAEW and SCA teleconnection patterns, along with SLP anomalies over the Iberian and Scandinavian Peninsulas and in the Northeastern of Canada, explaining around 60% of the winter Miño river flow variability. On the other hand, there is also a remarkable and stable influence from, the previous autumn SST anomalies in a region placed in the South Pacific (180^{o}W-155^{o}W; 20^{o}S-25^{o}S) and also from a cotemporary SST anomaly pattern in the North Atlantic, that resemblances the known SST tripole. Finally, these selected predictors have been used to fit a model to the streamflow, and the ability of this modelling for obtaining future river flow projections will be evaluated. For this propose, the consistence and stability of the teleconnection patterns of SLP and SST from the outputs of some 20th century General Circulation Models (GCMs) and for the 21th century under the A1B scenario will be analyzed. After all an attempt to obtain future winter Miño streamflow under this scenario emission through the downscaling of these models is planned. Acknowledgements: the Spanish Ministry of Science and Innovation, with additional support from the European Community Funds (FEDER), project CGL2010-21188/CLI has financed this study.
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