Geophysical Research Abstracts
Vol. 20, EGU2018-469-1, 2018
EGU General Assembly 2018

Performance of Global Circulation Models to replicate the observed long-term trends in hydrometeorological time series. Case of study: Central Chile.

Franco Ricchetti and Ximena Vargas
Department of Civil Engineering, University of Chile, Santiago, Chile

Climate change is an important issue for Chile. The measured time series analysis in different locations of the country suggest that is possible identify trends in hydrometeorological data with mathematical techniques. The aim of this research is study the capacity of Global Circulation Models from ESGF dataset to replicate the observed long-term trends in Central Chile.

The studied time series are seasonal rainfall, extreme rainfall and monthly average temperature. At first, trends are identified in selected stations with a long number of record data. The study of tendency is developed with MK test, Change Point Analysis and linear fits of tendency, for average and variance. Dimensionless time series are computed to remove bias in model and measured data. After, moving average and moving variance are calculated to smooth the series, enable comparison between model and measured data. Finally, dimensionless time series are compared, developing useful indicators to quantify the performance of the models. For 22 GCMs available in the study area, the research compares the measured data with 4 nodes of the model's grid and 2 computed nodes according the IDW, choosing the best node for each station and model.

A percentage of GCMs that have a correct replication of trends is defined. On the one hand, for seasonal rainfall, the results show that around 64% of the models can replicate the long-term trends. In the arid zone, the models can replicate in better way trends in rainy season than in the dry season (73% vs 32%). However, in rainy climate, the models replicated better trends in dry season than rainy season (77% vs 55%). On the other hand, for monthly average temperature, the models can replicate trends in central valley (86%) in better way than coastline (36%). In central valley stations, trends in summer months (100%) are better replicated than the winter months (23%). Evaluating the GCM in multiobjetive criteria (rainfall and temperature together), a trade off in the models exist: those that replicate in better way trends in temperature failed in represent trends in rainfall and viceversa. In this case, is possible to construct a Pareto optimal frontier. Finally, for extreme rainfall, 64% of GCM can replicate average's trends and 82% of GCM can replicate variance's trends.

The conclusion suggests that all the models cannot replicate the long-term trends in central Chile. An important problem is the geography of Chile and the low-resolution grid from the ESGF data that assign the same nodes in coastline and central valley stations. In case of seasonal or monthly variables, the success of the model to replicated trends depends of climate features, the location of hydrometeorological station and the temporal resolution of evaluation. In extreme cases, the models replicate the changes in variance better than the changes in averages.