High-resolution NWP forecast precipitation comparison over complex terrain of the Sierras de Córdoba during RELAMPAGO-CACTI

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, Schumacher, Russ S., García, Carlos Marcelo and Catalini, Carlos Gastón (2021) *High-resolution NWP forecast precipitation comparison over complex terrain of the Sierras de Córdoba during RELAMPAGO-CACTI.* Weather and Forecasting, 37 (1). ISSN 0882-8156

Resumen

Sierras de Córdoba (Argentina) is characterized by the occurrence of extreme precipitation events during the austral warm season. Heavy precipitation in the region has a large societal impact, causing flash floods. This motivates the forecast performance evaluation of 24-hour accumulated precipitation and vertical profiles of atmospheric variables from different numerical weather prediction (NWP) models with the final aim of helping water management in the region. The NWP models evaluated include the Global Forecast System (GFS) which parameterizes convection, and convection-permitting simulations of the Weather Research and Forecasting Model (WRF) configured by three institutions: University of Illinois at Urbana-Champaign (UIUC), Colorado State University (CSU) and National Meteorological Service of Argentina (SMN).

These models were verified with daily accumulated precipitation data from rain gauges and soundings during the RELAMPAGO-CACTI field campaign. Generally all configurations of the higher-resolution WRFs outperformed the lower-resolution GFS based on multiple metrics. Among the convectionpermitting WRF models, results varied with respect to rainfall threshold and forecast lead time, but the WRFUIUC mostly performed the best. However, elevation dependent biases existed among the models that may impact the use of the data for different applications. There is a dry (moist) bias in lower (upper) pressure levels which is most pronounced in the GFS. For Córdoba an overestimation of the northern flow forecasted by the NWP configurations at lower levels was encountered. These results show the importance of convection-permitting forecasts in this region, which should be complementary to the coarser-resolution global model forecasts to help various users and decision makers.

TIPO DE DOCUMENTO: Artículo

DOI: https://doi.org/10.1175/WAF-D-21-0006.1

PALABRAS CLAVE: Sierras de Córdoba. Argentina. Precipitación. Estación cálida. Inundación. Impacto social.

TEMAS: G Geografía. Antropología. Recreación > GE Ciencias Ambientales

Q Ciencia > Q Ciencia (General)

UNIDAD ACADÉMICA: Universidad Católica de Córdoba > Facultad de Ingeniería