WCRP CORDEX 17TH-20TH MAY 2016 STOCKHOLM, SWEDEN ICRC-CORDEX 2016

PARALLEL SESSION B : FRONTIER DOWNSCALING TOOL
B1: VERY HIGH RESOLUTION MODELLING

High resolution modeling to understand the physical processes relating to rainfall in the Mantaro basin (central Peruvian Andes) using WRF

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The Mantaro River Basin (MRB), located in the central Peruvian Andes, has a great economic importance for the country, because it provides about 35% of the hydropower energy for the country. On the other hand, the Mantaro Valley is highly productive and supplies with the main food stock to Lima (IGP, 2005). However, the agriculture in this area is developed almost 80% without irrigation, so this activity is highly sensitive to rain variability and other extreme weather events such as frost.

Previous studies on climate variability and trends in the MRB indicate high variability at different scales and changes in the seasonality of rainfall and frost (Silva et al, 2007; Trasmonte et al, 2007; Silva and Trasmonte, 2011). Therefore in the present study, the WRF is used in order to understand the physical mechanisms responsible for climate variability in the basin, focusing primarily on the dynamics of rainfall.

This paper we present preliminary results of the runs made with the WRF with tree domains (27, 9 and 3km) for the MRB for February (the wettest month in the central Andes of Peru). The model was forced with the final NCEP reanalysis data for 2000-2012 period. The validation of the interannual variability for the study period were done using observed data of 20 stations and for the spatial distribution the 3B42 and 2A25 from the Tropical Rainfall Measuring Mission (TRMM) products were used.

Preliminary results of 9km resolution, compared with TRMM 2A25 product, indicate a better distribution of rainfall in the southern part of the basin; however, the model tends to overestimate the precipitation. When analyzing the rainfall variability in comparison with the station data, the correlation is low. However, the model reproduces the diurnal cycle, according to the TRMM most precipitation occurs on the western edge of the Andes around 4pm to 7pm, while the WRF is given a little further east, on the Valley. Analyzing the dynamics, the WRF produces a strong convergence of moisture between 4 and 7pm, being more intense at 4pm. These results indicate that more observed data are needed to validate the TRMM data and models. For this purpose, the Laboratory of Microphysics and Radiation -LAMAR (for its acronym in Spanish) where implementented in the Mantaro valley, with many atmospherics instruments and wind profiler and clouds radar.