

STATISTICAL DOWNSCALING OF CLIMATE SCENARIOS IN PERUVIAN CENTRAL ANDES

GUSTAVO DE LA CRUZ⁽¹⁾, DELIA ACUÑA⁽¹⁾

⁽¹⁾ National Service of Meteorology and Hidrology, Lima, Peru, gdelacruz@senamhi.gob.pe

ABSTRACT

The Chillón, Rímac, Lurín and High Mantaro basins are very important because they supply surface water for consumption in Lima and Callao, which are located in arid areas. It is expected that water demand in this area will increase in the coming decades, for this reason it is necessary to study the water availability in these basins under climate change conditions. In this research, statistical downscaling methods for precipitation and extreme temperatures have been developed to calculate the changes in the Chillón, Rímac, Lurín and High Mantaro basins in the period 2036- 2065 in order to get knowledge how the climate could change in the future. The statistical models are based on analog method for precipitation and multiple linear regressions for maximum temperatures and minimum temperatures. We explored ten geographical domains and a set of 33 predictors, which are the physical large-scale forcing for precipitation and extreme temperatures of representative locations in the basins. Predictors and optimal domains were selected under the principle that should have a significant and physically interpretable association with the predictand, in addition to the necessary statistical support. The downscaled scenario shows a significant increase of the mean precipitation by about 20-100mm under a moderate emission scenario (RCP 4.5) and a high emission scenario (RCP 8.5). The main increase of precipitation amounts occur during winter in the High Mantaro basin which could change the future water availability. In case of maximum temperature, the downscaling provides warming values in the range from 1°C to 4°C; the most pronounced changes correspond to the highest emission scenario. Finally, some locations have a slightly warming of the minimum temperature by about 1°C-2°C; however, locations over the High Mantaro basin don't show a significant change. The evident increasing of temperatures over highlands regions of these basins may will have a significant impact in ecosystems and Glaciers located in these regions.

Keywords: Climate change scenarios, statistical downscaling, precipitations, temperature.