EGU21-6967, updated on 20 Oct 2021
https://doi.org/10.5194/egusphere-egu21-6967
EGU General Assembly 2021

Are extreme precipitation events becoming stronger and warmer in the Andes?

Miguel Lagos-Zúñiga[1,2,3], Pablo A. Mendoza[1,3], and Roberto Rondanelli[2,4]
[1]Advanced Mining Technology Center, University of Chile, Santiago, Chile
[2]Center of Climate and Resilience Research, University of Chile, Santiago, Chile
[3]Civil Engineering Department, University of Chile, Santiago, Chile
[4]Geophysics Department, University of Chile, Santiago, Chile

The Andes Cordillera serves as a physical barrier that modulates the atmospheric fluid dynamics, affecting the occurrence and intensity of precipitation events through orographic enhancement and the blocking and deviation of humidity transported by jets. The quantification of extreme precipitation events (EPEs) and their associated temperature is critical to address hydrological impacts and water availability for the Andes that also feeds the majority of the river and population in the region.

As the atmosphere is getting warmer, the increasing amount of water vapor available in the troposphere is expected to enhance warm precipitation events during the 21st century. In this study, we examine observational trends in extreme precipitation events by season and analyze possible connections with air temperature. To this end, we perform Sen's Tests and compute Mann-Kendall values Maximum Precipitation daily precipitation and its associated temperature at ~80 meteorological stations. Then, we cluster the results geographically finding positive trends in high elevation areas for extreme precipitation events (EPEs) and their temperature, especially in mid-latitudes. In low stations (<800 m a.s.l.), we obtain a decrease in the magnitude of EPEs but and a decrease in air temperature (up to -0.4 [°C/decade]). In general, the temperature increase in EPEs for high elevation stations < 0.12 °C/year and could rise the freezing level up to 1000 [m], during the fall season. The presented here suggest positive feedback between warmer atmospheric conditions and the open further pathways regarding hydrological impacts such as debris flow, floods, and less snow availability in the Andes regions.