



CMIP6 precipitation and temperature projections for Chile

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Precipitation and near-surface temperature from an ensemble of 36 new state-of-the-art climate models under the Coupled Model Intercomparison Project phase 6 (CMIP6) are evaluated over Chile's climate. The analysis is focused on four distinct climatic subregions: Northern Chile, Central Chile, Northern Patagonia, and Southern Patagonia. Over each of the subregions, first, we evaluate the performance of individual global climate models (GCMs) against a suit of precipitation and temperature observation-based gridded datasets over the historical period (1986-2014) and then we analyze the models' projections for the end of the century (2080-2099) for four different shared socioeconomic pathways scenarios (SSP). Although the models are characterized by general wet and warm mean bias, they reproduce realistically the main spatiotemporal climatic variability over different subregions. However, none of the models is best across all subregions for both precipitation and temperature. Moreover, among the best performing models defined based on the Taylor skill score, one finds the so-called "hot models" likely exhibiting an overestimated climate sensitivity, which suggests caution in using these models for accessing future climate change in Chile. We found robust (90% of models agree in the direction of change) projected end-of-the-century reductions in mean annual precipitation for Central Chile (~20% to ~40%) and Northern Patagonia (~10% to ~30%) under scenario SSP585, but changes are strong from scenario SSP245 onwards, where precipitation is reduced by 10-20%. Northern Chile and Southern Patagonia show non-robust changes in precipitation across the models. Yet, future near-surface temperature warming presented high inter-model agreement across subregions, where the greatest increments occurred along the Andes Mountains. Northern Chile displays the strongest increment of up to ~6°C in SSP585, followed by Central Chile (up to ~5°C). Both Northern and Southern Patagonia show a corresponding increment by up to ~4°C. We also briefly discuss about the environmental and socio-economic implications of these future changes for Chile.