
Attribution of observed precipitation trends in Southern South America

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Abstract

Southern South America (SSA) is one of the regions in the world where the largest trends in precipitation have been recorded during the last 120 years. While South-Eastern South America (SESA) has been affected by a noticeable increase in austral summer rainfall, a remarkable decrease has been observed in Southern Andes (SAn). In spite of the large impacts related to these trends, the attribution of them is still an open-question.

The objective of this work is to assess the attribution of the observed austral summer rainfall trends in SSA to anthropogenic and natural forcings using the experiments from the Detection and Attribution Model Intercomparison Project (DAMIP). For this purpose, 13-models historical simulations driven by all available individual forcings were evaluated to analyse the climate response to each individual forcing for the 1901-2014 period.

Positive (negative) rainfall trends in SESA (SAn) are identified in most historical simulations. For both regions, greenhouse-gases-forcing-only simulations show trends consistent with all-forcing simulations, while natural-forcing-only simulations exhibit negligible values. SESA (SAn) shows negative (negligible) trends associated with aerosol-forcing-only simulations and high uncertainty (negative trends) for stratospheric-ozone-forcing-only simulations. Moreover, SAn rainfall trends could be also connected to consistent trends of opposite sign for the Southern Annular Mode (SAM). Overall, our results provide evidence for anthropogenic influences on SSA rainfall trends.

Keywords: Southern South America, precipitation trends, DAMIP, greenhouse gases, natural, aerosol, ozone

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