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Impacts of climate change on extreme precipitation and dry spells in New Zealand

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Global warming is expected to enhance El Niño Southern Oscillation (ENSO), with potential impacts on frequency and severity of floods and droughts in numerous countries of the Asia-Pacific region. However, the limited time coverage of historical records and the large uncertainties underlying climate model projections impair our ability to identify trends in extreme rainfall and dry spells. Here, we generate and analyze a long-term stochastic precipitation dataset for New Zealand that accounts for the potential effects of climate change. For this purpose, we draw on a 60 year-dataset of daily precipitation maps to identify the rainfall principal components and quantify their temporal correlations with the ENSO signal. We then generate a long-term stochastic set of daily rainfall maps correlated with ENSO projections, corresponding to different climate change scenarios. Our results indicate that climate change may lead to more intense precipitation in the Southern Alps during positive ENSO phases. Conversely, extreme precipitation is likely to increase in the North Island during negative ENSO phases. Our analyses also suggest that the duration of extreme dry spells may significantly increase along the east side of the North and South Islands during positive ENSO phases. These results may guide the implementation of effective adaptation and mitigation strategies against the increasing risk of natural catastrophes.