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## Paleo-climate shifts in the Atacama Desert from PMIP4 simulations

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The Atacama Desert in Northern Chile is considered to be the driest desert on Earth. At present, the annual rainfall amount is less than 1mm for parts of the hyper-arid core of the desert. The processes controlling this hyper-aridity are known, but the mean state and variability of the regional climate on geological time scales is not well understood. In this study, we aim to analyse climate conditions in the Atacama Desert from PMIP4 simulations. Our focus is on the Last Glacial Maximum (LGM), when climate records from the Central Atacama point to a substantially different climate with wetter conditions than at present (Diederich et al., 2020). We statistically analyse and evaluate PMIP4 historical simulations with respect to circulation patterns over the Southeast Pacific and Western South America which are associated with rare rainfall events in the Atacama Desert. For the evaluation, PMIP4 simulations for the historical period are compared to Reanalysis data, and we will focus on troughs and cutoff lows over the subtropical Southeast Pacific, and on the Bolivian High (Reyers et al., 2020). We then assess changes of the characteristics, e.g., the frequency of occurrence, of such circulation patterns for Paleo-climate conditions compared to the present. In the framework of our study, we perform km-scale simulations with the regional climate model WRF, using results from PMIP4 experiments for the historical period and for the LGM as boundary conditions. In the future, these simulations will be used to better understand the meso-scale processes, e.g., involved in local wind systems, that contribute to changes in the hydrological cycle and potentially impact the dust-emission activity of the desert. This study is part of the Collaborative Research Centre 1211 "Earth- Evolution at the dry Limit" (<https://sfb1211.uni-koeln.de/>).

Diederich, J, Wennrich, V, Bao, R, and co-authors (2020). A 68 ka precipitation record from the hyperarid core of the Atacama Desert in northern Chile. *Global and Planetary Change*, 184, 103054. DOI:10.1016/j.gloplacha.2019.103054.

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