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Antarctic extreme seasons under 20th and 21st century climate change

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Extreme seasons (climate extremes) are of particular relevance to impacts, as they can produce accumulated effects on, for example, surface melt of ice shelves and penguin breeding. There is a gap in knowledge on how extreme seasons may change over Antarctica and the Southern Ocean under future climate forcing scenarios, with Antarctica not included in the IPCC AR6 WG1 Chapter 11 on extremes. In this presentation, available large ensemble datasets in the Coupled Model Intercomparison Phase 6 (CMIP6) archive were used to provide the first multi-variate overview of the evolution of extreme seasons over Antarctica and the Southern Ocean during the 20th and 21st centuries, with projections following medium-to-high radiative forcing scenarios (SSP2-4.5 and SSP3-7.0 forcing experiments). The variables assessed were near-surface temperature, surface precipitation rate and near-surface westerly wind. The results show significant differences between simulated changes in background mean climate and changes in low (10th percentile) and high (90th percentile) extreme seasons. Regional winter warming is most pronounced for cold extremes, particularly over or near to areas of climatological 20th century sea ice cover. In summer there are more pronounced increases in high extremes in precipitation and westerly wind during the ozone hole formation period (late 20th century) affecting coastal regions and in particular the Antarctic Peninsula. At sub-polar latitudes (between 50 and 60 degrees South) there is an approximately 20% reduction in the range of summer season wind extremes. Potential mechanisms/processes responsible for these differences will be discussed.