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Session 5: Advances in modelling and projections

Title: The impact of ozone forcing on the 2020 Antarctic super vortex and associated surface climate

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After the record-breaking vortex weakening event in spring 2019, the Antarctic stratosphere experienced three consecutive stronger-than-normal vortex events in austral spring seasons of 2020-2022. In particular, the super vortex event of October to December 2020 was the strongest on record; however, it was poorly predicted by the Australian Bureau of Meteorology's operational seasonal climate forecast system, ACCESS-S, even from the beginning of the austral spring, which motivated this research. Here we explore (i) causes of the limited predictability of this event and (ii) a potential role of the realistic ozone forcing in the 2020 super vortex event and associated positive Southern Annular Mode (SAM) with forecast sensitivity experiments that use climatological versus observed ozone concentrations. Our results show that the 2020 super vortex event did not follow the canonical evolution pattern that was observed in the previous spring vortex strengthening events, whereas the ACCESS-S forecast did, which accounts for the forecast bust at up to 1 month lead time. Furthermore, forcing ACCESS-S with the realistic ozone significantly improves the skill in predicting both the super vortex in October to December and the related positive SAM and the rainfall increase over eastern parts of south-eastern Australia in December 2020.