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Stratosphere-troposphere coupling: Future trends related to ozone recovery in the Southern Hemisphere in WACCM4 simulations

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Recent observations and climate model studies have shown that ozone depletion and the increase in greenhouse gases occurred during the last few decades are known to affect the stratospheric temperatures and mean circulation over the Southern Hemisphere high latitudes. These changes can propagate down into the troposphere and even reach the surface having important consequences for Southern Hemisphere climate. For future predictions during the 21st century, atmospheric-ocean coupled models used in the Intergovernmental Panel of Climate Change Fourth Assessment Report (IPCC-AR4) and Chemistry Climate Models (CCM) from the CCM Validation 2 (CCMVAl2, SPARC report) activity do not agree. The first ones are coupled to an ocean model, do not fully resolved the stratosphere and do not always account for the expected changes in ozone. The second ones are fully chemistry coupled models with their top well beyond the stratopause; however they are typically not coupled to the ocean missing the ocean-atmosphere feedbacks. While the IPCC models show, as in the past, an intensification of the polar jet in the SH although at a weaker rate, the CCMVal models predict a deceleration on the poleward side during the SH summer, which is attributed to the strong warming induced by the recovery of the ozone hole in the Antarctic lower stratosphere and not always considered in IPCC models. The latest version of the Whole Atmosphere Community Climate Model WACCM4 coupled to a deep ocean model brings together the advantages of both IPCC and CCMVal models. New simulations run for the 21st century as part of the CMIP5 activity will be analyzed here to investigate the role of ozone recovery on the SH jet and their implications for SH tropospheric climate. The results will be compared to those from other high and low top models.