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Impacts of stratospheric ozone extremes on Arctic high cloud

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Stratospheric ozone depletion in the Antarctic is well known to cause changes in Southern Hemisphere tropospheric climate; however, due to its smaller magnitude in the Arctic, the effects of stratospheric ozone depletion on Northern Hemisphere tropospheric climate are not as obvious or well understood. Recent research using both global climate models and observational data has determined that the impact of ozone depletion on ozone extremes can affect interannual variability in tropospheric circulation in the Northern Hemisphere in spring. To further this work, we use a coupled chemistry-climate model to examine the difference in high cloud between years with anomalously low and high Arctic stratospheric ozone concentrations. We find that low ozone extremes during the late twentieth century, when ODS emissions are higher, are related to a decrease in upper tropospheric stability and an increase in high cloud fraction, which may have contributed to Arctic surface warming via a positive longwave cloud radiative effect in the past few decades compared to other regions. A better understanding of how Arctic climate is affected by ODS emissions, ozone depletion and ozone extremes will lead to improved predictions of Arctic climate and its associated feedbacks with atmospheric fields as ozone levels recover.