Ozone super recovery cancelled in the Antarctic upper stratosphere

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Ozone is expected to fully recover from the CFC-era by the end of the 21st century. Furthermore, because of the anthropogenic climate change, cooler stratosphere accelerates the ozone production and is projected to lead to a super recovery. We investigate the ozone distribution over the 21st century with four different future scenarios using simulations of the Whole Atmosphere Community Climate Model (WACCM). At the end of the 21st century, higher polar ozone levels than pre CFC-era are obtained in scenarios that have highest atmospheric radiative forcing. This is true in the Arctic stratosphere and the Antarctic lower stratosphere. The Antarctic upper stratosphere forms an exception, where different scenarios have similar level of ozone during winter. This results from excess nitrogen oxides (NOx) descending from above in stronger future scenarios. NOx is formed by energetic electron precipitation (EEP) in the thermosphere and the upper mesosphere, and descends faster through the mesosphere in stronger scenarios. This indicates that the EEP indirect effect will be important factor for the future Antarctic ozone evolution, and is potentially able to prevent the super recovery in the upper stratosphere.