Ozonesonde Observations at South Pole Station During the 2018 Ozone Hole

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Balloon-borne, electrochemical-concentration cell (ECC) ozonesondes launched at South Pole station have tracked the development of the yearly Antarctic ozone hole since 1986. The severity of ozone depletion depends on active chlorine concentrations in the stratosphere, wintertime stratospheric temperatures, and the stability of the polar vortex. In 2018, satellite and sonde observations showed very cold Antarctic lower stratosphere temperatures (Kramarova et al., 2019, BAMS 2018 State of the Climate Report) resulting in severe depletion. The South Pole ozonesonde minimum profile of 104 Dobson Units recorded on October 12, 2018 was the 12th lowest in the 33-year record.

Figure 1 shows the smoothed 8-year medians of ozone and temperature in the 16–18 km layer, where the maximum ozone loss occurs. There are signs of improvement in the 2009–2016 period trending above the 1990–2014 median, but remains well below the higher ozone observed during the 1986–1992 period, when stratospheric chlorine levels were lower. Year-to-year variability in ozone depletion, driven by dynamical activity over Antarctica, is shown by comparing the warm (2017) and cold (2018) stratospheric vortex conditions. Trends in the 2-km column ozone layers from 10 to 24 km will be presented.

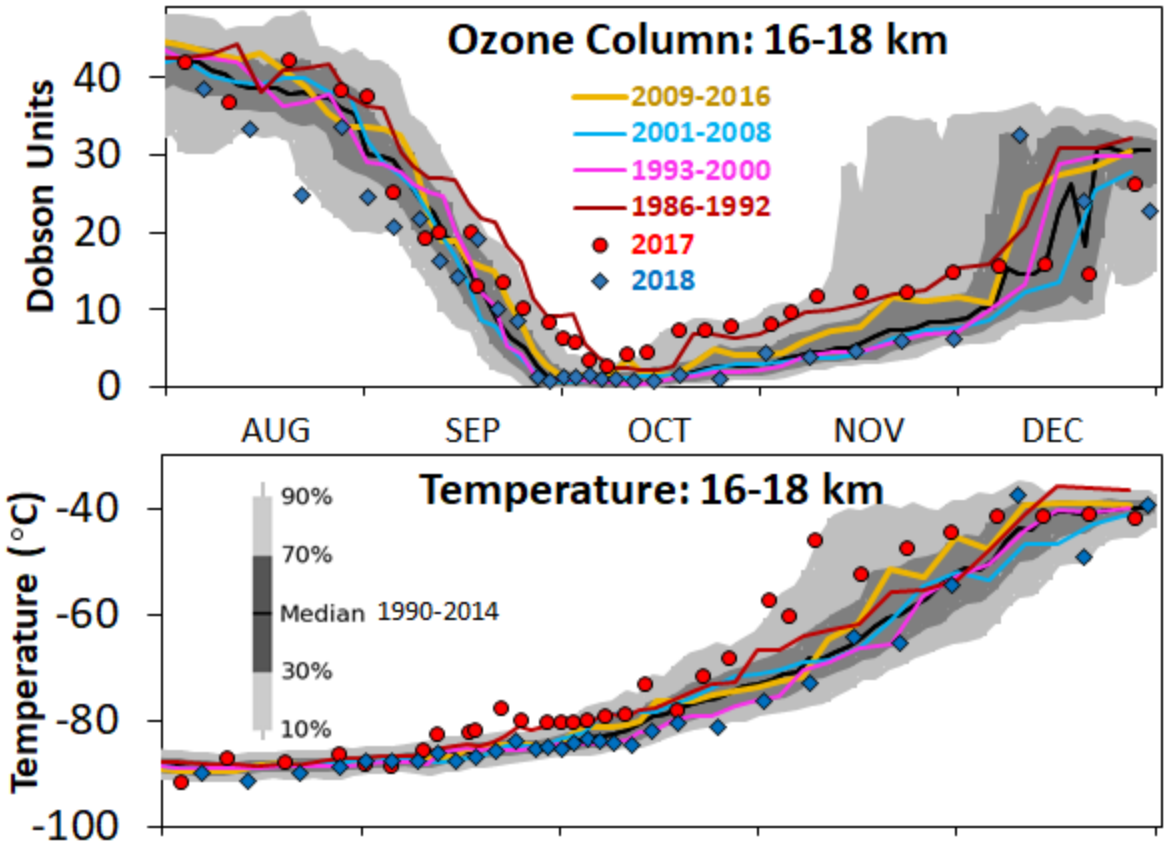

Figure 1. 8-year medians of ozone partial column and temperature within the 16–18 km layer compared to the 1990–2014 median climatology at South Pole Station. The cold, stable vortex in 2018 correlates with 100% ozone depletion by late September, while 2017 showed much higher ozone during warm stratospheric conditions.