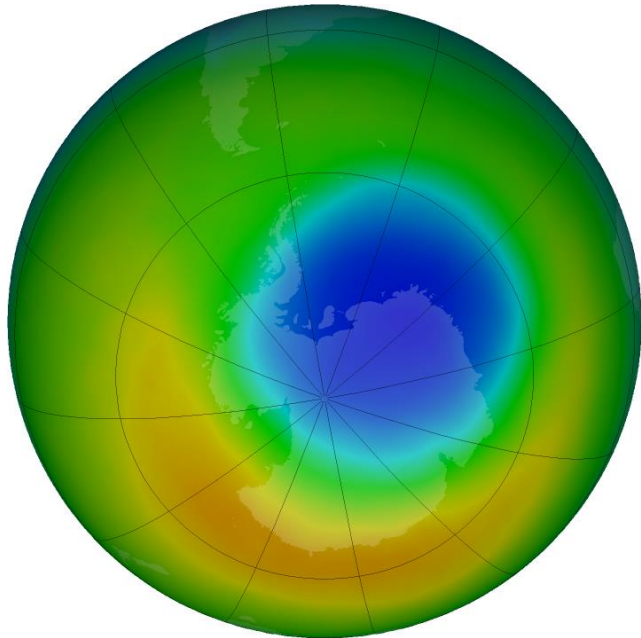


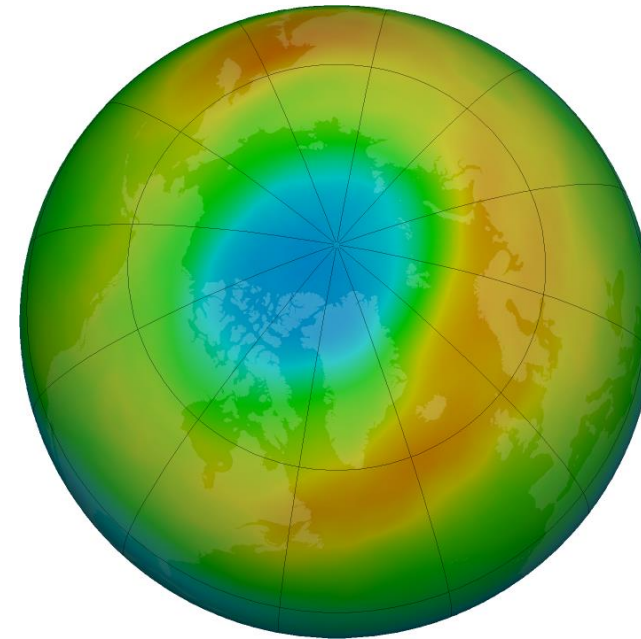


Record levels of polar column ozone during 2019/2020 polar winters

October 2019



March 2020

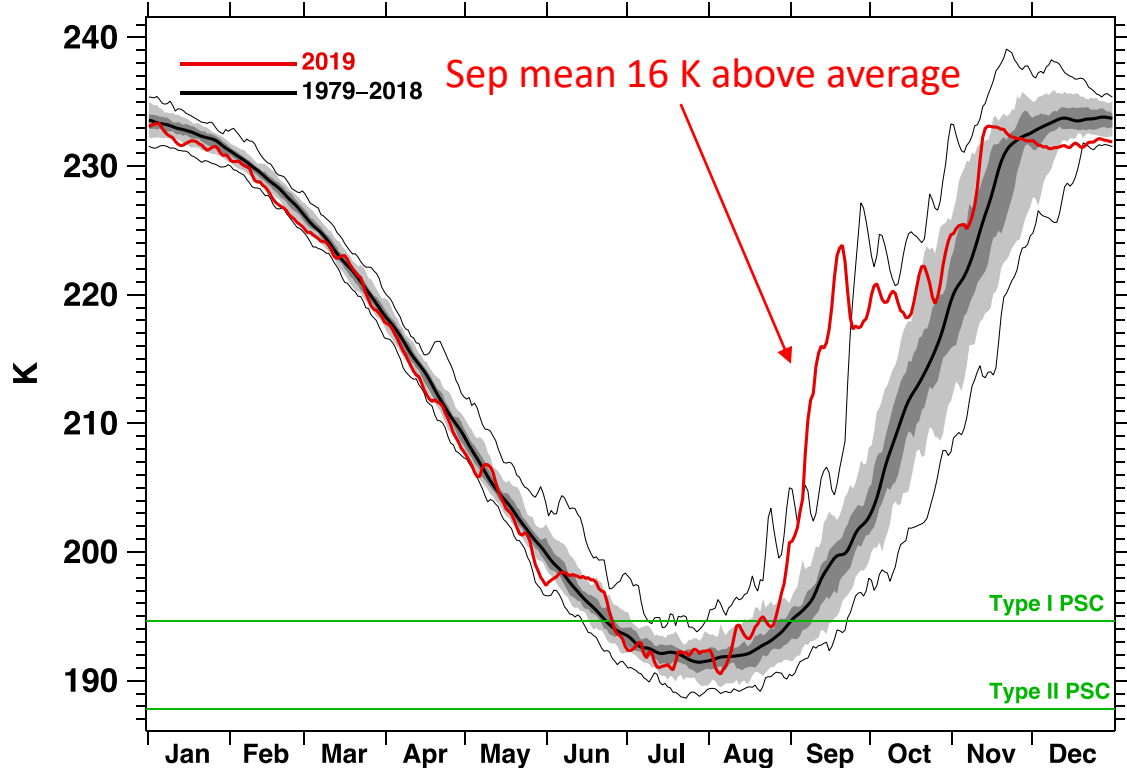


Natalya Kramarova, P. Newman, E. Nash, S. Strahan, L. Coy, C. Long,
B. Johnson, M. Pitts, M. Santee, I. Petropavlovskikh, and J. de Laat

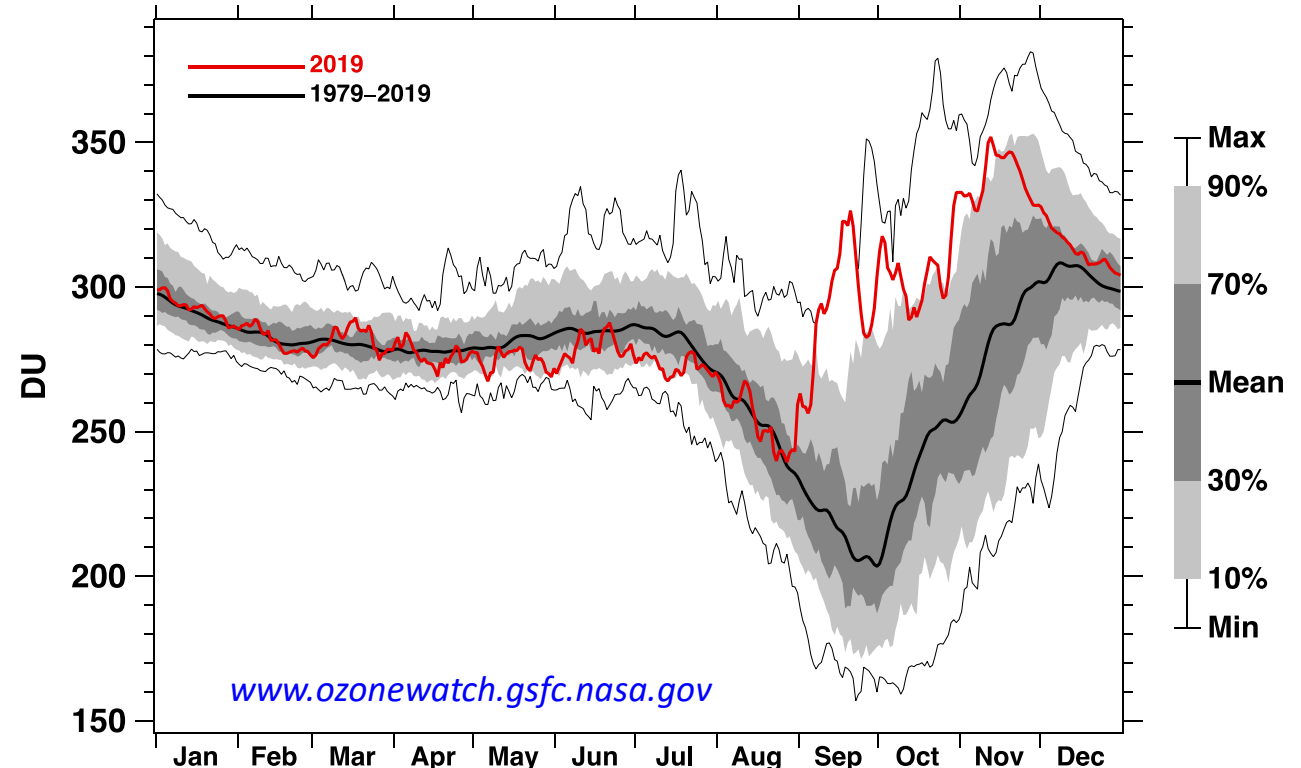


The 2019 Antarctic polar ozone

Polar Cap Temperature (50 hPa)



Polar Cap Total Column Ozone

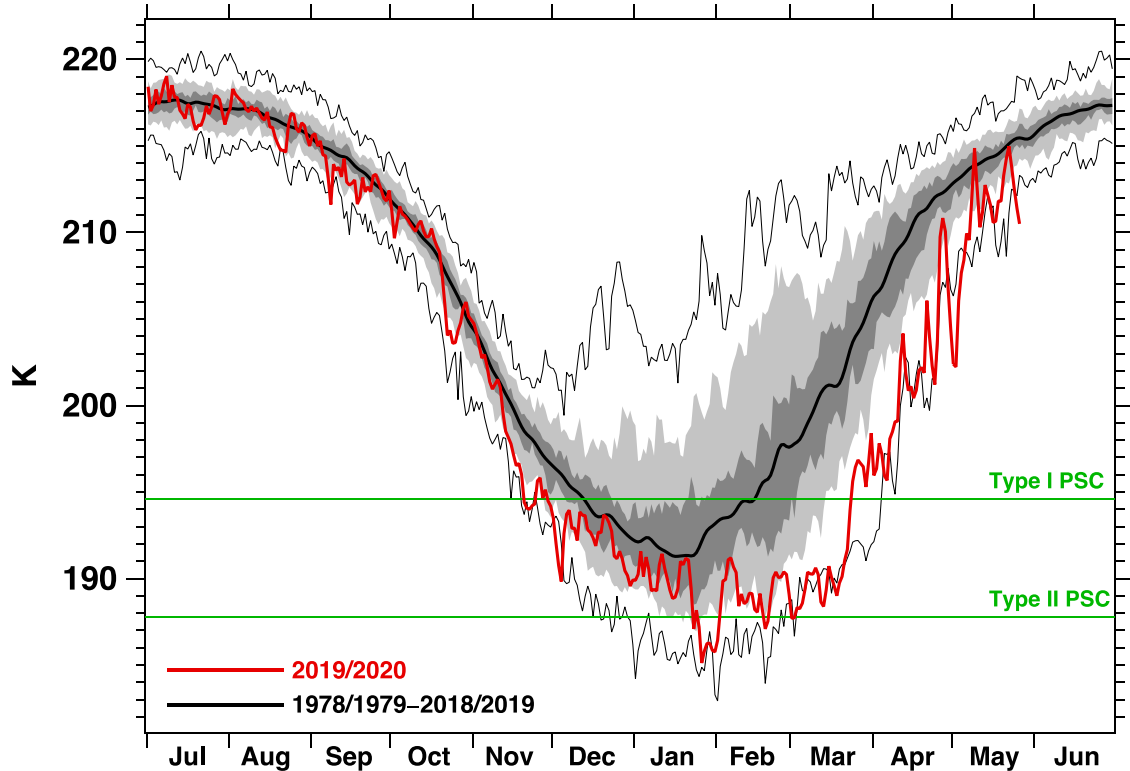


- The 2019 Antarctic hole the smallest since 1983;
- Caused by series of strong planetary-scale waves;
- Record warm stratospheric temperatures →
- reduced amount of PSCs;
- Increased meridional and downward transport;
- Implication on precipitation patterns in SH.

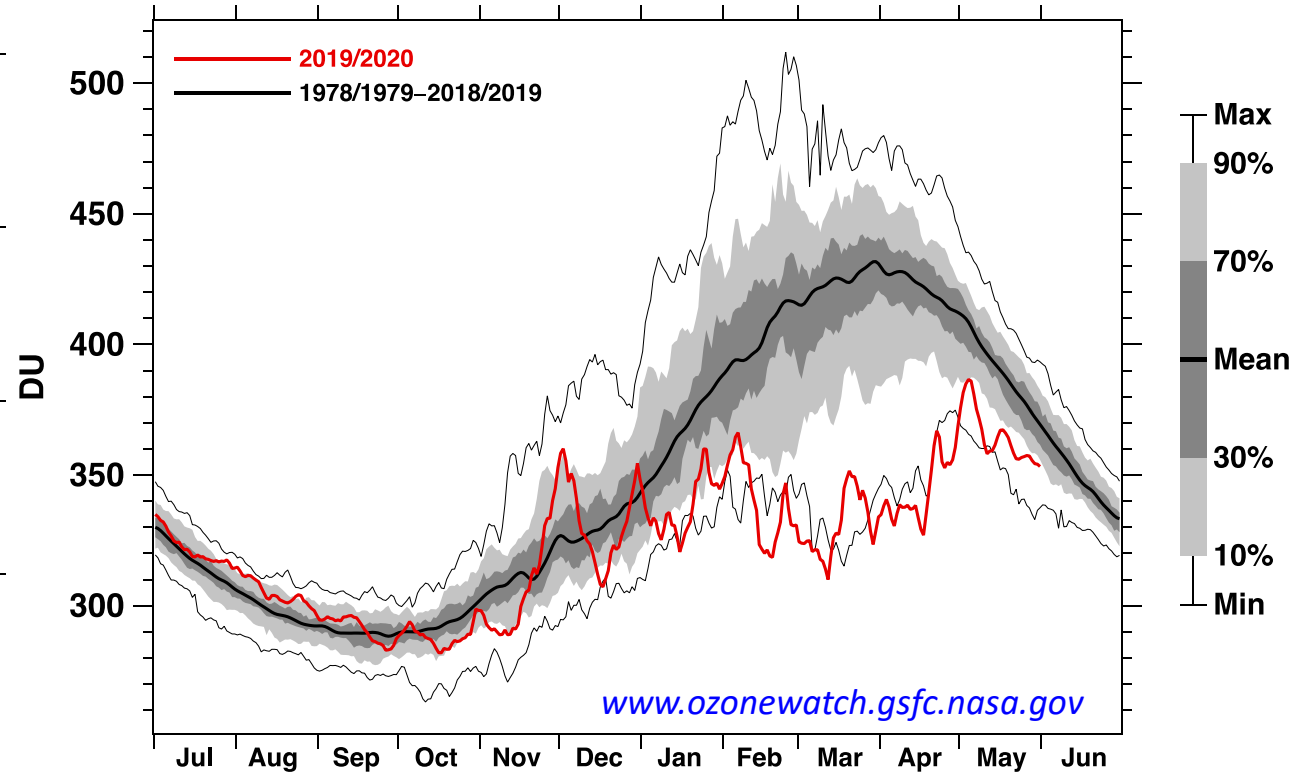


The 2019/2020 Arctic polar ozone

Minimum Temperature (50 hPa)



Polar Cap Total Column Ozone



➤ The Arctic depletion in March 2020 is the worst in 1979-2020 record;

➤ Caused by the lack of planetary wave forcing;

➤ Persistently cold temperatures in 2019-2020 → increased amount of PSC;

➤ Reduced meridional transport.



Summary

- The 2019 Antarctic ozone hole was the smallest since 1983;
- Arctic ozone depletion in March 2020 was the worst in the 1979-2020 record;
- Both events were caused by abnormal dynamical patterns in the polar stratosphere:
 - ✓ series of strong planetary waves in the Antarctic in Aug 2019;
 - ✓ lack of wave events in the Arctic in Feb-Mar 2020;
- As the amount of Ozone Depleting Substances is gradually declining since 2000, because of the Montreal Protocol, the inter-annual variability in polar ozone columns is mainly controlled by the year-to-year variability in the polar stratospheric dynamics;
- These record levels of polar ozone columns during 2019/2020 polar winters are consistent with our current understanding of polar stratospheric dynamics and chemistry.



Sources

- For more details, please, see www.ozonewatch.gsfc.nasa.gov
- A special session dedicated to unusual 2019/2020 polar winters at the **2020 AGU Fall Meeting:**
SESSION TITLE: [Atypical polar stratospheric winters in 2019 and 2020: causes and consequences](#)
SESSION ID: [102130](#)
- A special issue in [Geophysical Research Letters](#) and [Journal of Geophysical Research: Atmospheres](#).
TITLE: [The Exceptional Arctic Stratospheric Polar Vortex in 2019/2020: Causes and Consequences.](#)
- For questions, please, contact Natalya.a.Kramarova@nasa.gov



Back up slides

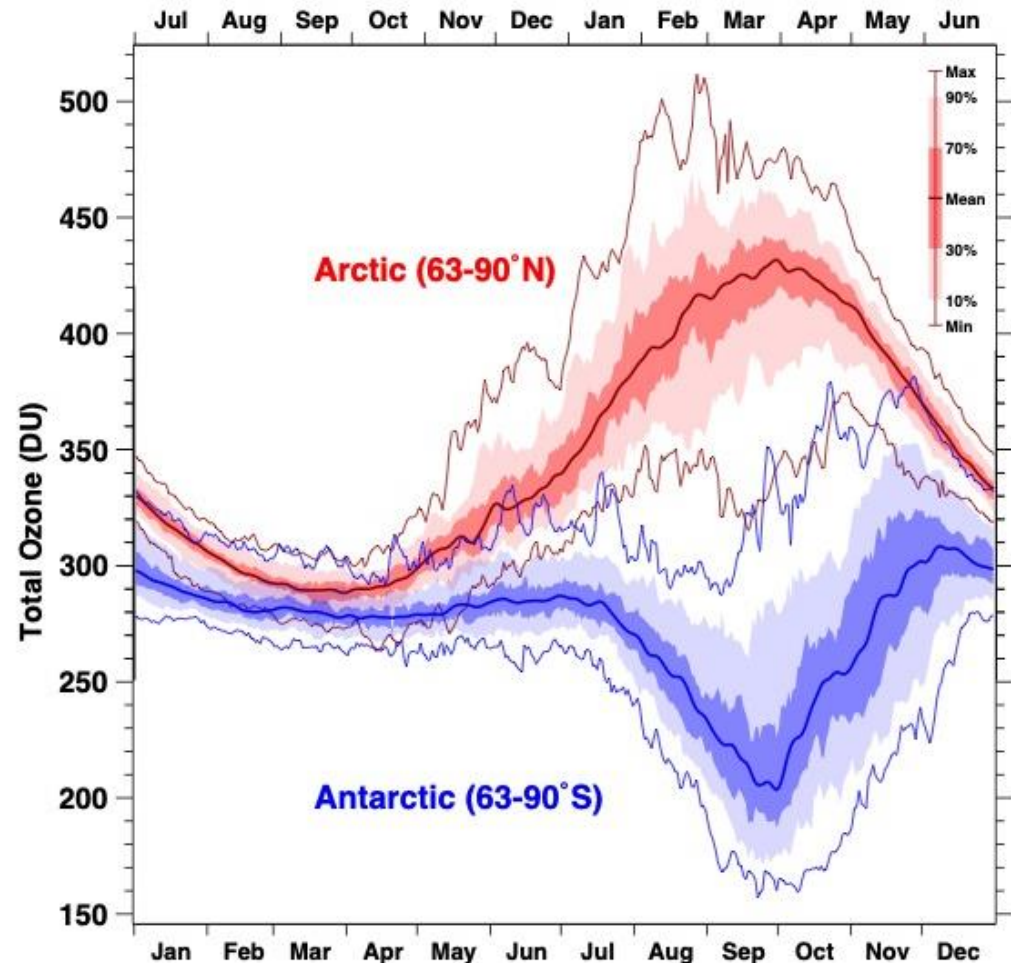


The Arctic and the Antarctic

The Arctic has low ozone in the fall, high high ozone in spring

In contrast, Antarctic ozone is lowest in the spring → the Antarctic ozone hole

Year-to-year variability is expected





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Arctic: Feb.-Apr. 2020

Antarctic: Sept.-Oct. 2019

