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Near-Complete Local Reduction of Arctic Stratospheric Ozone by Severe Chemical Loss in Spring 2020

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In the Antarctic ozone hole, ozone mixing ratios have been decreasing to extremely low values of 0.01–0.1 ppm in nearly all spring seasons since the late 1980s, corresponding to 95–99% local chemical loss. In contrast, Arctic ozone loss has been much more limited and mixing ratios have never before fallen below 0.5 ppm. In Arctic spring 2020, however, ozonesonde measurements in the most depleted parts of the polar vortex show a highly depleted layer, with ozone loss averaged over sondes peaking at 93% at 18 km. Typical minimum mixing ratios of 0.2 ppm were observed, with individual profiles showing values as low as 0.13 ppm (96% loss). The reason for the unprecedented chemical loss was an unusually strong, long-lasting, and cold polar vortex, showing that for individual winters the effect of the slow decline of ozone-depleting substances on ozone depletion may be counteracted by low temperatures.