

Denmark/Greenland

National report to the Ozone Secretariat, UNEP, for the 11th WMO/UNEP Ozone Research Managers Meeting April 2020, Geneva, Switzerland

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1. OBSERVATIONAL ACTIVITIES

Total ozone is monitored at one site in Denmark by DMI (Danish Meteorological Institute) and at two sites in Greenland. The Greenland ozone monitoring is funded by the Danish Environmental Protection Agency.

The two sites in Greenland are situated in Kangerlussuaq (Søndre Strømfjord, 67N, 51W) and Ittoqqortoormiit (Scoresbysund, 70N, 22W). The site in Denmark is in Copenhagen at DMI (55N, 12E).

The instrumentation in Kangerlussuaq consists of two Brewer spectrometers (#053 and #202), a Saoz spectrometer and an Aeronet Sun Photometer (NASA).

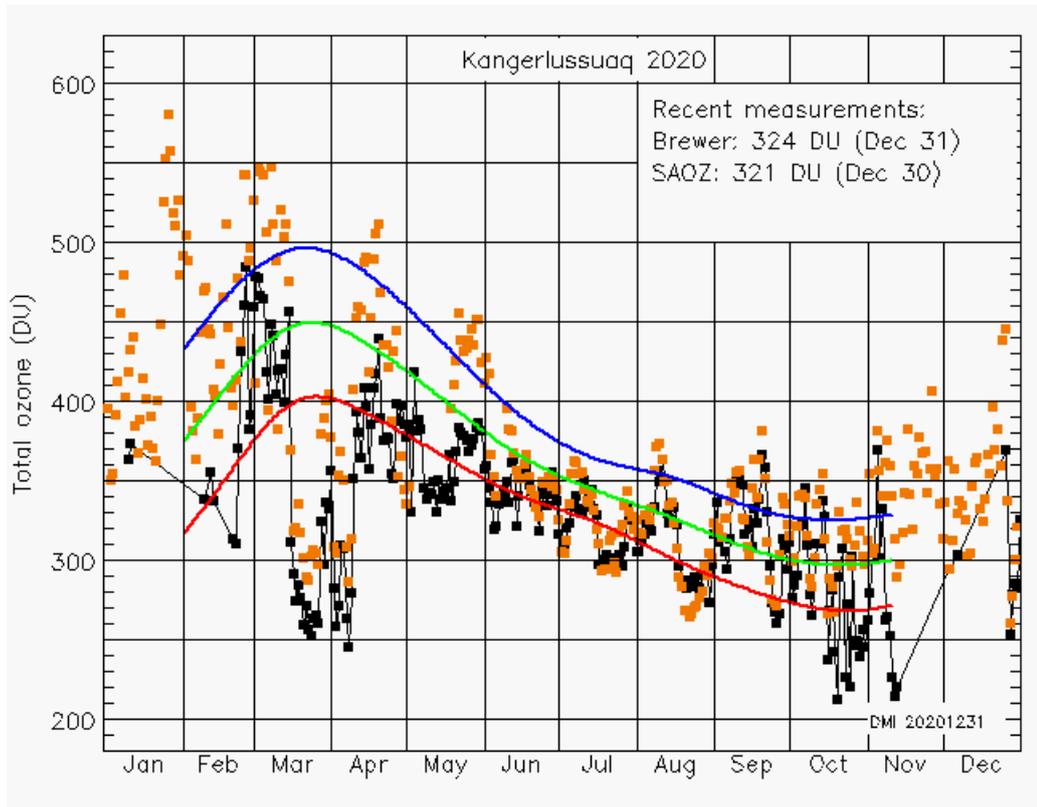
Every 2 years Brewer #202 is participating in a comparison campaign in Spain, led by AEMET. On this campaign the ozone and uv performance is checked and corrected if necessary. Brewer #053 is corrected according to this. The Saoz spectrometer is owned by DMI but all data handling is taken care of by LATMOS (France).

The instrumentation in Ittoqqortoormiit consists of an ozone sounding station (currently using Vaisala radiosondes and EnSci ozonesondes). A broadband UV instrument (GUV2511) is also situated here along with a Aeronet Sun Photometer (NASA). Also a Saoz spectrometer owned by LATMOS is situated here. Ozone soundings take place once a week all year. In case of a depletion event more soundings may be performed.

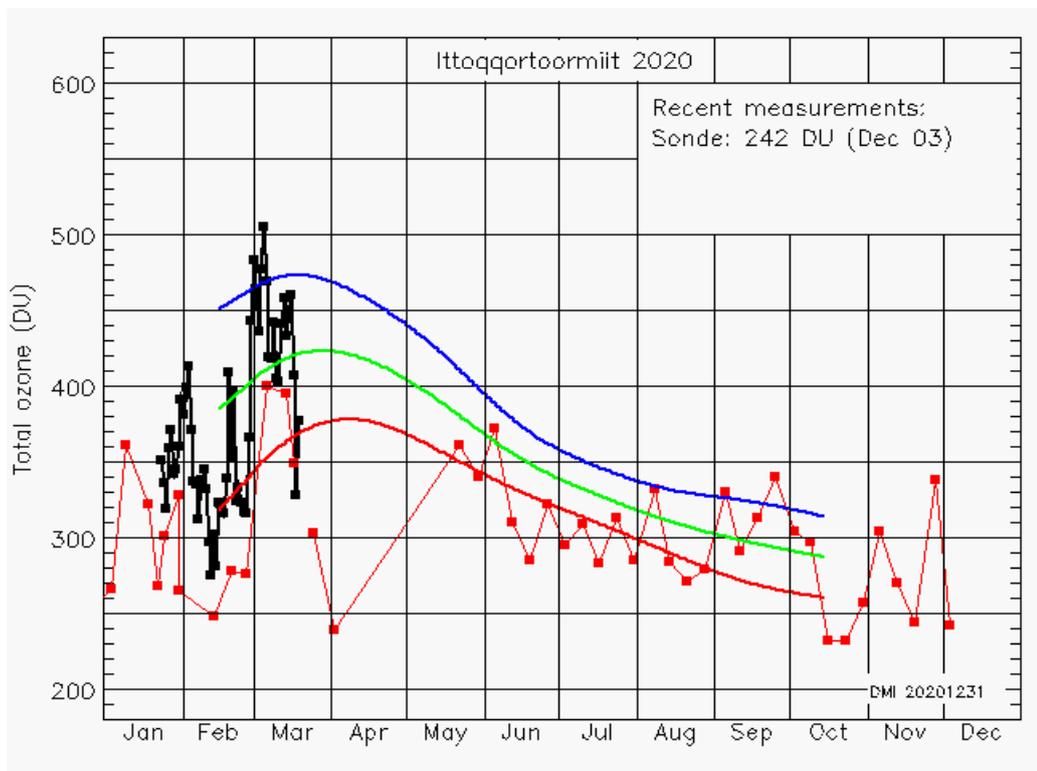
The instrumentation in Copenhagen consists of two Brewer spectrometers (#082 and #228) and a YES UVI instrument.

As for Brewer #202 Brewer #228 also participates in the comparison campaign every two years.

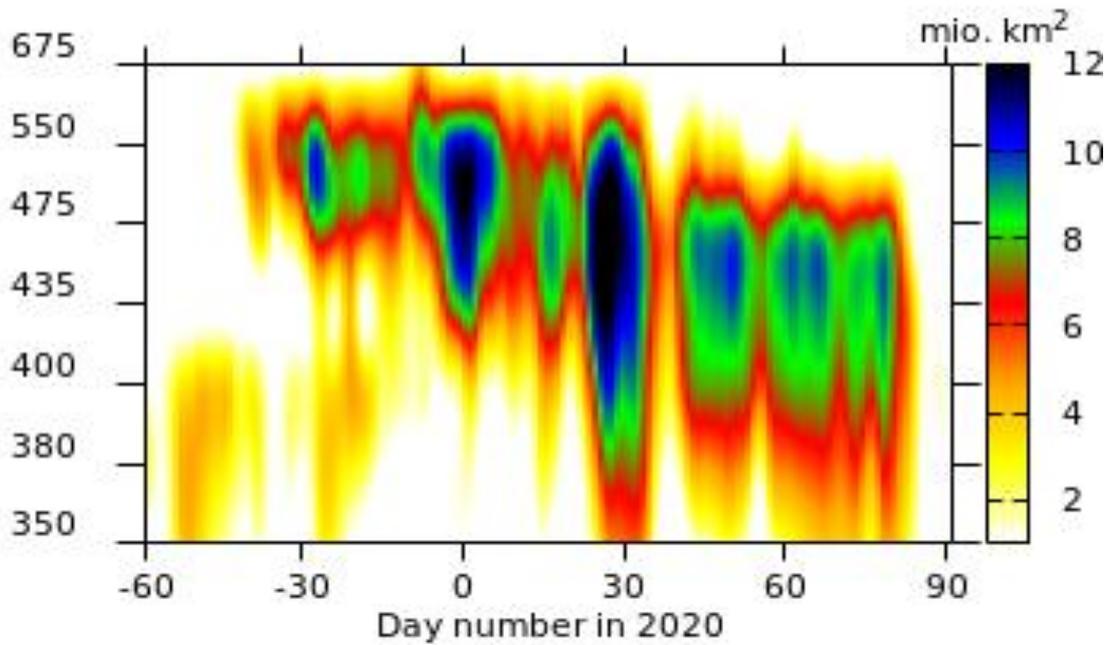
2. SAMPLE RESULTS



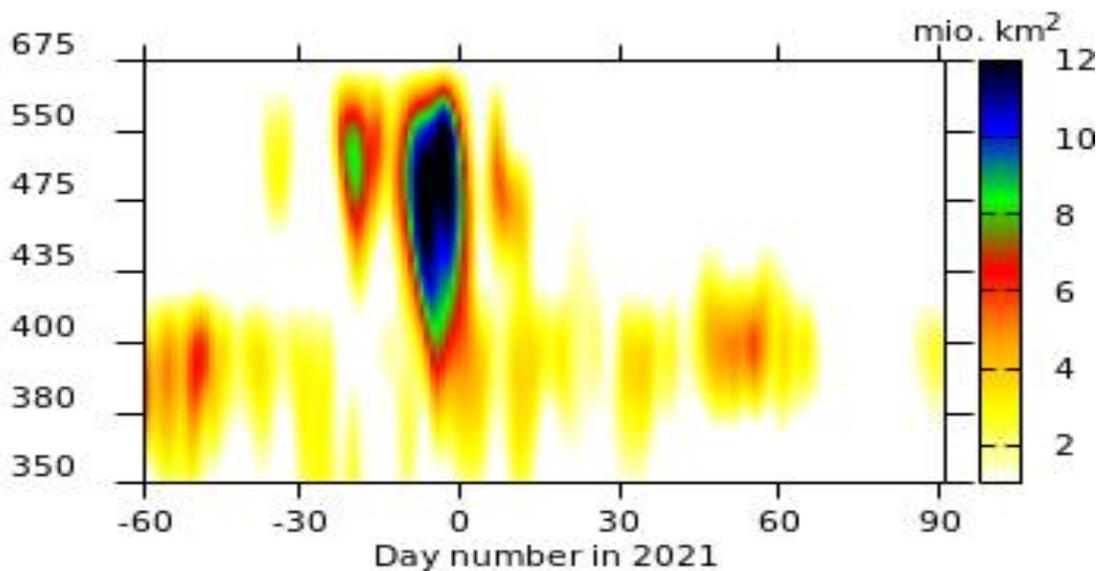
Ozone measurement in Kangerlussuaq 2020. Brown dots are Saoz measurements whereas black dots are Brewer measurements. The depletion event in March and April is clearly visible.



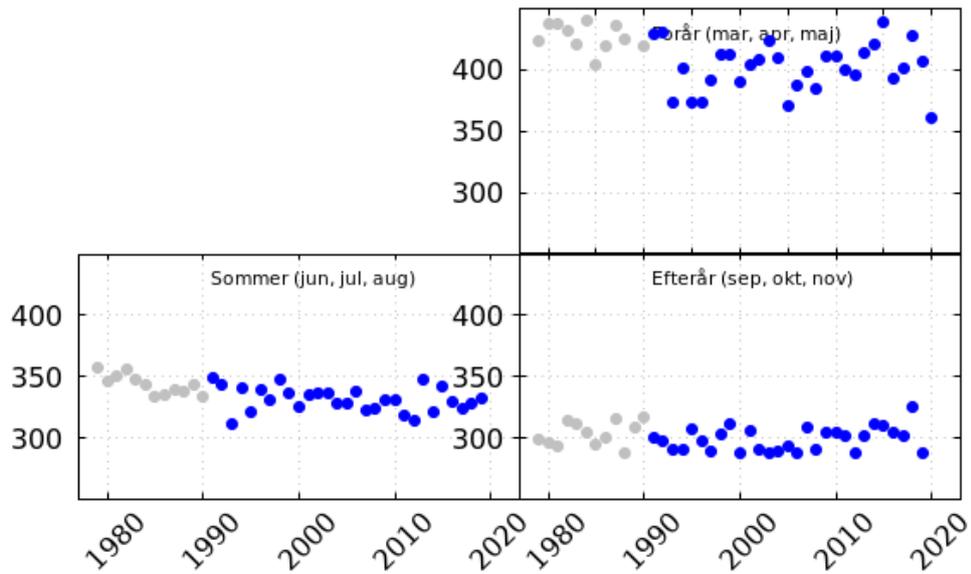
The Ozone measurements in Ittoqqortoormiit 2020. Black dots are Saoz measurements and red dots are ozonesoundings (total column value). The depletion event in March and April is clearly visible. Unfortunately the computer running the Saoz broke down and due to corona it was impossible to replace it.



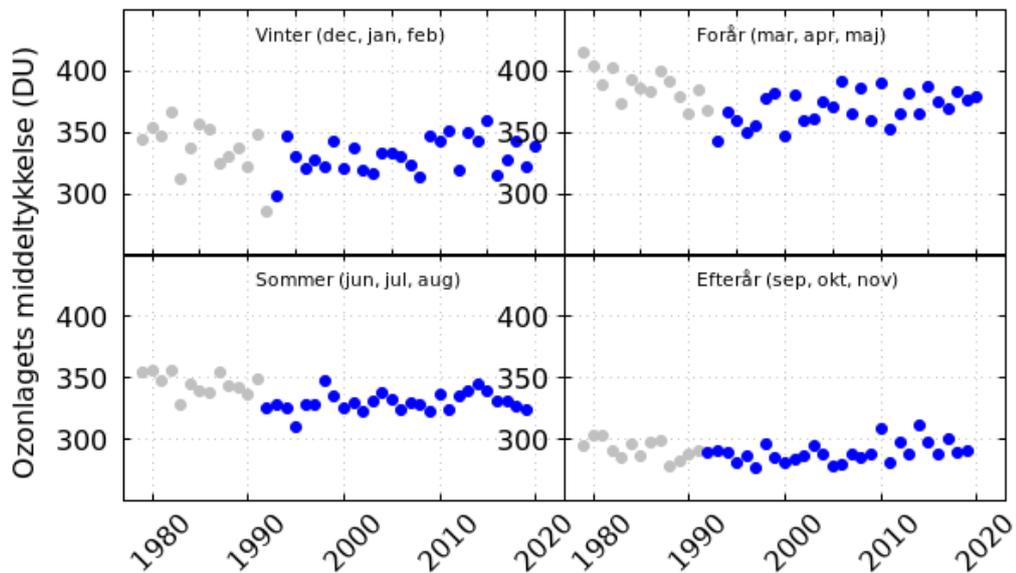
This figure shows the calculated area of the PSC's in the Winter and Spring of 2020. To include all of the winter the Day number in 2020 starts at -60 corresponding to 1st of November. Usually the PSC's disappear in the early spring but in 2020 they kept going until April. As the ozone depletion process takes using PSC's as a catalys the overall depletion was larger than ever seen before.



To compare the area of PSC's in 2021 were much smaller as may be seen in the figure. This is the more usual situation.



To be able to judge any trends in the total ozone column the yearly averaged ozone values are depicted season by season. The above Figure is from Kangerlussaq which is slightly North of the Polar circle so (apart from moon measurements) just a few valid ozone measurements are achieved in the period from November to February. Therefore only three seasons are included. The grey dots are values obtained from the TOMS instrument on Nimbus-7. No significant trends can be found.



This is the similar figure from Copenhagen. In this case also no significant trend may be detected.