WMO Antarctic Ozone Bulletin #6/2002

Issued on 24 October 2002

1. **Meteorological conditions:** Following the separation of a large mass from the Antarctic vortex during late September and early October, the vortex has become more circular and has stabilised in size. Although this year's vortex was initially small, and it lost an additional 35% of its area during the vortex separation, it has maintained its area at about 15-18 million square kilometers since 10 October. During most years, the vortex begins to reduce in size by mid-September and finally dissipates during November or December. However, the timing of the separation event and the resulting large decrease in vortex area were unexpected. Accompanying this decrease in size has been an unusual increase in temperatures within the vortex that has practically eliminated polar stratospheric clouds (PSCs). Typically, 20-50% of the lower vortex area remains sufficiently cold to produce PSCs during mid-October. As pointed out in the last Bulletin, unusual patterns in the atmospheric circulation surrounding the vortex region have contributed to these unusual vortex conditions.
2. **Ozone observations:** Ground-based column ozone measurements in Antarctica have continued to show considerable station-to-station variability. During the past 2 weeks, the 5 stations at Arrival Heights, Belgrano, Halley, South Pole, and Vernadsky have reported that they were within the ozone hole some of the time, while the other 6 Antarctic stations have not. Other high latitude stations (Kerguelen Is and Ushuaia) have reported near normal ozone values since the beginning of October. Satellite measurements show that the area with ozone more than 30% below pre-ozone hole norms has increased substantially during the past 2 weeks and that ozone values about 50% below norms have reappeared in mid-October after their disappearance earlier in October. Clearly, ozone loss is still underway although it is more limited in extent than observed in recent years.
3. **Ozone hole:** The small size of the vortex this year is matched by a small ozone hole. Although the hole has increased in size during October, it has remained below 10 million square kilometers, much smaller than the vortex itself and about half the ozone hole area observed during October each year since 1988. As the size of the ozone hole has recently increased, so has its depth as measured by the "ozone mass deficit" (OMD), a daily measure of the mass of ozone that has been destroyed within the ozone hole region and an indication of continued ozone loss. Expressed in millions of tons (Mt) of ozone, the OMD during early October first dropped to less than 15 Mt from its late-September high of 34 Mt, but more recently increased to about 25 Mt. Since the very weak ozone hole in 1988, with an OMD of about 20 Mt, the OMD during October has been typically 35 to 55 Mt. The size, depth and persistence of the ozone hole are expected to vary substantially from year to year, and as we have emphasised, are strongly influenced by corresponding natural meteorological variability. Whether the small and shallow ozone hole this year will persist and perhaps continue to grow cannot be confidently predicted.
4. **The Secretariat of the World Meteorological Organization (WMO)** distributes Bulletins providing current Antarctic ozone hole conditions during August-December each year. Bulletins are distributed via the WMO-Global Telecommunication System (GTS) and are also available through the Atmospheric Research and Environment Programme web page at www.wmo.ch/web/arep/ozone.html. In addition to the National Meteorological Services, the information in these Bulletins should be made available to the national bodies representing their countries with UNEP and that support or implement the Vienna Convention for the Protection of the Ozone Layer and its Montreal Protocol.
5. **Acknowledgements:** These Bulletins use provisional data from the WMO Global Atmosphere Watch (GAW) stations operated within or near Antarctica by: Argentina (Comodoro Rivadavia, San Martin, Ushuaia), Argentina/Finland (Marambio), Argentina/Italy/Spain (Belgrano), Australia (Macquarie Is), France (Dumont D'Urville and Kerguelen Is), Germany (Neumayer), Japan (Syowa), New Zealand (Arrival Heights), Russia (Mirny), Ukraine (Vernadsky), UK (Halley, Rothera), and USA (South Pole). Satellite ozone data are provided by NASA/TOMS, NOAA/TOVS, NOAA/SBUV/2 and ESA/GOME. Potential vorticity maps are provided by ECMWF and their ERA-15 and daily T106 meteorological fields are analysed by the Norwegian Institute for Air Research (NILU) Kjeller, Norway, to provide vortex extent and extreme temperature information (http://www.nilu.no/projects/nadir/o3hole). Ozone data analyses are prepared in collaboration with the WMO World Ozone and Ultraviolet Data Centre (WOUDC) in Toronto, Canada through the co-operation and support of the Meteorological Service of Canada (http://exp-studies.tor.ec.gc.ca/cgi-bin/selectMap). UV data is provided by the U.S. National Science Foundation's (NSF) UV Monitoring Network.

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