

# WMO Antarctic Ozone Bulletin #7/2004

Issued on 23 November 2004

**Meteorological conditions:** As usual for this time of the year, the Antarctic vortex has continued to weaken and decrease in area from its maximum during September of near 35 million square kilometres ( $M \text{ km}^2$ ), to its present size of about  $20 \text{ M km}^2$ . Daily minimum stratospheric temperatures in the Antarctic lower stratosphere have increased to levels that are too warm for the formation of polar stratospheric clouds (PSCs) at all levels. This year, the temperatures sufficiently low for the formation of PSCs ended about 2 to 3 weeks earlier than in most recent years.

**Ozone and UV observations:** Most of the WMO Global Atmosphere Watch (GAW) Antarctic stations (Arrival Heights, Belgrano, DuMont d'Urville, Halley, Rothera, South Pole, Syowa, Vostok, and Zhong Shan) have reported column ozone values during early or mid November that were 40% to 50% below the 1964-76 pre ozone hole norms. The remaining Antarctic stations (Marambio, Mirny, Novolazarevskaya, San Martin, and Vernadsky) have reported more moderate ozone depletions, which in some cases remained near the norms. During the past few days, all stations have reported values no more than 20% below their respective norms. These ground-based observations are confirmed by satellite measurements that show the area more than 30% below norms abruptly decreased during the last week and has nearly disappeared. The GAW stations that are near Antarctica (Kerguelen Island, Macquarie Island, and Ushuaia) have all reported ozone values within about 10% of their norms. As usual when the vortex is weakening, the process begins at the upper altitudes and progresses over time to the lower altitudes. This progression is evident from balloon borne ozone sondes launched during the past week at Belgrano, Marambio, Neumayer, and Syowa stations, as substantial increases in ozone at the upper altitudes. UV levels at all Antarctic network sites were similar to or slightly below their average values of the past decade.

**Ozone hole:** The ozone hole started its seasonal decrease in size during mid-September, losing more than 50% of its area in the following 5 weeks. However, during the next three weeks (by 12 November), the ozone hole had surprisingly increased in area by more than 30%. This slow increase was followed by a rapid decrease in area that ended on 17 November, when the ozone hole disappeared. We reported in the last Bulletin that until late October, the ozone hole was generally much smaller than the average size over the past decade. Similar to September 2002 when intense wave activity in the stratosphere split the ozone hole, meteorological conditions in the stratosphere during mid October limited the depth and size of the ozone hole this year. Unlike 2002, stable meteorological conditions that promote the persistence and intensity of the ozone hole replaced the earlier less stable conditions and permitted the gradual growth of the ozone hole into mid November. A measure of the total mass of ozone destroyed in the region of the ozone hole is the "ozone mass deficit" (OMD), and is estimated from the daily column ozone data available from satellites and ground based measurements. Since mid September the OMD has been higher than most years in the past decade and is presently more than 55 million tons of ozone, the highest on record for the month of November.

**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 ([www.wmo.ch/web/arep/ozone.html](http://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.

**Acknowledgements:** These Bulletins use provisional data from the WMO Global Atmosphere Watch (GAW) stations operated within or near Antarctica by: Argentina (Comodoro Rivadavia, Ushuaia), Argentina/Finland (Marambio), Argentina/Italy/Spain (Belgrano, San Martin), Australia (Macquarie Is), China/Australia (Zhong Shan/Davis), France (Dumont D'Urville and Kerguelen Is), Japan (Syowa), New Zealand (Arrival Heights), Russia (Mirny, Novolazarevskaya, Vostok), Ukraine (Vernadsky), UK (Halley, Rothera), and USA (South Pole, McMurdo). Satellite ozone data are provided by NASA/TOMS, NOAA/TOVS and NOAA/SBUV/2. 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 are provided by the U.S. National Science Foundation's (NSF) UV Monitoring Network.

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