

WMO Antarctic Ozone Bulletin #4/2004

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Meteorological conditions: Meteorological data show that the 2004 Antarctic vortex continues to be of moderate size when compared to those of the past decade, remaining at about 33 million square kilometres (M km²). The circumpolar vortex that was reported in earlier bulletins, changed character during the past two weeks, and became generally elongated and skewed toward the tip of South America. This was the result of strong stratospheric wave activity impinging on the vortex a week to 10 days ago. Daily minimum stratospheric temperatures during the last half of September continue to be somewhat higher than observed in most recent years. This is consistent with meteorological observations indicating fewer polar stratospheric clouds (PSCs) than usual for late September, and an early disappearance of PSCs at the upper levels of the ozone hole.

Ozone observations: During the past two weeks, all but one of the reporting ground-based Global Atmosphere Watch (GAW) Antarctic stations have measured ozone values well below the 1964-76 pre-ozone hole norms. Belgrano, Marambio, Rothera, and San Martin all on the South American side of Antarctica reported values more than 40% below norms, while Arrival Heights, Syowa, and Zhong Shan stations reported slightly higher values. Only Dumont d'Urville, around the opposite side of the continental perimeter from South America reported ozone values never more than 20% below norms. Balloon ozone sonde measurements at South Pole also reveal the very low column ozone values and show that the 15 to 20 km altitude layer is almost completely depleted in ozone. McMurdo station balloon ozone measurements indicate there is less depletion there than at the South Pole. Satellite measurements of total column ozone indicate that the area with values more than 30% below norms is presently about 22 M km², while an area less than 4 M km² has been depleted by 50% in ozone.

Ozone hole: Presently, most of the Antarctic continent remains under the ozone hole. During the past two weeks, the size of the hole was between 20 and 23 M km² compared to 25 to 28 M km² for the same period in 2003. A measure of the depth of the ozone hole is the "ozone mass deficit" (OMD), the mass of ozone destroyed within the ozone hole region each year, and is expressed in millions of tons (Mt) of ozone. OMD is estimated from the daily column ozone data available from satellites and ground based measurements. Although the size of the hole this year is less than most recent years, the OMD has remained relatively high, generally above 50 Mt. Measured levels of UV radiation at the Antarctica stations of McMurdo, Palmer, and South Pole remain low, due to low sun elevations at high latitudes in early Spring. However, from 19 through 23 September, the ozone hole extended over the Argentine city of Ushuaia, a city on the southern tip of South America. Ozone values more than 35% below norms were reported during this period, and the resulting measured UV levels exceeded those of previous years except 1992 and 2000, when they were similarly high. Nevertheless, UV intensities are low when compared to typical summer-time values in Ushuaia. The size, depth and persistence of the ozone hole, along with the UV radiation within and near Antarctica are expected to vary substantially from year to year, and as we have emphasised, these variations are strongly influenced by variations in the meteorological conditions in the stratosphere.

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). 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), 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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