WMO Antarctic Ozone Bulletin #4/2003

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1. **Meteorological conditions:** The polar vortex continues to be at or near its maximum size with an area of about 34 million square kilometres (M km^2), and it remains nearly centred over the Antarctic continent. Typical minimum stratospheric temperatures over Antarctica have warmed in the past two weeks from –90° C to –88° C, continuing the gradual increase expected during early spring. Importantly, temperatures continue to remain sufficiently low to produce polar stratospheric clouds (PSCs) over nearly 25 M km^2 of the lower vortex.
2. **Ozone observations:** The past two weeks have been a period of rapid ozone destruction, with a continued decrease in ozone observed at the WMO Global Atmosphere Watch (GAW) Antarctic stations and by satellites. The GAW Antarctic stations of Arrival Heights, Belgrano, Dumont D'Urville, Halley, Novolazarevskaya, Rothera, San Martin, South Pole, Syowa, and Vernadsky have all reported ozone values 50-60% below the pre-ozone hole norms (i.e. ozone typical of the pre-ozone hole period of 1964-76), while the city of Ushuaia, Argentina, located on the southern tip of South America, was under the ozone hole for 5 of the last 10 days in September. Integrated satellite and ground-based measurements show that the area with ozone values more than 30% below norms peaked at 31 M km^2 on 24 September. Remarkably, the area 50% below norms exceeded 15 M km^2 for the first time in history, peaking near 18 M km^2 on 26 September. Balloon-borne instruments at Belgrano, Dumont D'Urville, Marambio, Neumayer, South Pole and Syowa stations all show near complete ozone loss in a 5 km layer of the lower stratosphere.
3. **Ozone hole:** The 2003 ozone hole remains comparable in area to the record size of 28 M km^2 we have reported for 2000. In recent years, as in 2000, the ozone hole has begun to decrease in area during the last half of September. However, this year the ozone hole appears more persistent, having peaked at 28 M km^2 both in mid-September and again in late September, and has varied in area between 25 and 28 M km^2 throughout September. Also unusual is the large area with more than 50% depletion mentioned above. Noting that before 1994 this area never reached 5 M km^2, and has only exceeded 10 M km^2 4 times before this year, it is noteworthy that it has now reached 18 M km^2, an area 2/3 of the size of the ozone hole. Although the large ozone hole is persisting, UV intensity over Antarctica remains low and will remain low until the sun rises higher later in the Southern Hemisphere Spring. It is important to note that recent variations in size, depth and persistence of the ozone hole are due to year-to-year changes in the meteorological conditions in the lower stratosphere over Antarctica, not to changes in the amount of ozone depleting chemicals present in the ozone layer. Note that background information, earlier Bulletins, yearly ozone hole summaries, and "The Scientific Assessment of Ozone Depletion: 2002" are now available at the WMO ozone website given below.
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, Novolazarevskaya), Ukraine (Vernadsky), UK (Halley, Rothera) and USA (South Pole). 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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