WMO Antarctic Ozone Bulletin #1/2004

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1. **Background information:** The early meteorological conditions in the Antarctic stratosphere found during late July and early August of each year, set the stage for the annually occurring ozone hole. Low temperatures activate chemical processes, which in the presence of sunlight, result in rapid ozone depletion. Temperatures must be sufficiently low to form polar stratospheric clouds (PSCs) and initiate these chemical conditions. Threshold temperatures of -78 C can produce PSCs, while lower temperatures (below –85 C) can further accelerate the chemical processing. The Antarctic polar vortex is a region with high velocity winds in the stratosphere that generally circle the Antarctic continent. This vortex region (the vortex and the area poleward) includes the lowest temperatures and the largest ozone losses that occur anywhere in the world. During early August, measurements of meteorological parameters, and ozone measurements from ground stations and satellites can provide some insights into the development of the ozone hole. For more background information see: http://www.wmo.ch/web/arep/O3_summaries/ozone_background_sum.html
2. **Meteorological conditions:** Meteorological data show daily minimum stratospheric temperatures over Antarctica have been well below –85 C threshold since early June. Although temperatues are not as low as in the past two years, the minima this year are very similar to those observed in Winter 2001, a year when the ozone hole was a record size. During the past two weeks, temperatures low enough for PSC formation have covered an area of 25 to 30 million square kilometres, or about 75% of the vortex area. Based upon the historical meteorological record it is expected that the extent and frequency of PSC occurrence will begin to decrease now as the sun rises over Antarctica, although the vortex will gradually increase in size throughout most of August. Presently the vortex is circular, stable and centred over the pole.
3. **Ozone observations:** Most of Antarctica remains under total darkness, so the average rate of ozone loss there remains relatively low. North of the Antarctic and into the mid-latitudes, satellite data reveal that average column ozone during July was well below the pre-ozone hole norm period of 1964-76. Satellite observations and ground based stations on or near the perimeter of Antarctica have reported column ozone values near norms during August, although a few reports outside the polar vortex are 20-30% below norms.
4. **Ozone hole:** Temperatures are sufficiently low within the polar vortex to maintain the chemical processes required for the formation of the annually occurring Antarctic ozone hole. The ozone hole is not evident in column ozone values during early August, however, as the sun rises over Antarctica during the coming weeks the ozone hole is expected to again form. The intensity of the ozone loss will be dependent upon prevailing meteorological conditions in the stratosphere, particularly during September and October. As we observed in September 2002 when the ozone hole unexpectedly split and then dissipated, the meteorological conditions in the stratosphere strongly influence the extent and persistence of the ozone hole. This situation is expected to continue as long as the stratosphere contains an excess of ozone depleting chemicals.
5. **The Secretariat of the World Meteorological Organization (WMO)** distributes Bulletins providing current Antarctic ozone hole conditions beginning mid-August of 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 is 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.
6. **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), Uruguay (Salto) 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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