



The 2007 Antarctic Ozone Hole Summary: Monday 15 October 2007

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Instrumentation and new corrected Earth Probe TOMS data for 1996-2005

The new EP TOMS ozone record has been released and the data will be re-analysed by CSIRO over coming weeks for the standard metrics we report on, namely: ozone hole area; ozone minima; ozone deficit; and average ozone amount within the hole.

The 2007 ozone hole

The OMI data show that the ozone minimum dropped below 220 DU at the beginning of August, about the same time as in 2006 and 2005, and, by the beginning of October, the ozone minimum in the Antarctic ozone hole had dropped to about 106 DU, very similar to 2005. The 2007 ozone hole is now filling in, with the current minimum (12 October) at 118 DU (Figure 1, top panel). The similarity to the 2005 ozone hole is obvious.

By 12 October, the ozone hole area had fallen to about 18-19 million km² (Figure 1, bottom panel), having reached a peak of 25 million km² during the second week of September. Apart from the 'warm' ozone holes of 2004 and 2002, this may be the smallest ozone hole since 1991.

Figure 2 (top panel) shows the estimated daily ozone deficit. By 12 October, the deficit had fallen to 22 million tonnes, after reaching a peak of 32 million tonnes during the last week of September. This is significantly lower than the maximum ozone deficit observed in 2005 and 2006 (36 and 43 million tonnes respectively).

The average ozone amount in the hole (averaged column ozone amount in the hole weighted by area, Figure 2 bottom panel) reached a minimum of 155 DU in early October, significantly higher than in 2005 and in 2006 (148 DU and 144 DU respectively) and by 12 October had risen to 165 DU, currently tracking the 2005 hole.

Figure 3 shows SH ozone from 1 October to 12 October. The major feature of the distribution of ozone over the Southern Hemisphere this spring is the persistent ridge of high ozone (up to 500 DU) at relatively high latitudes (50°S to 70°S), from 60°E to 150°W (longitude), resulting in the Antarctic coast south of Australia being consistently outside the hole. This ridge started to weaken on 3-4 October and moved eastwards. By 12 October this ozone maximum had diminished significantly in size and was in the eastern half of the Pacific Ocean at 60°S. The ozone hole briefly became symmetrical on 7-8 October, covering most of the Antarctic continent, but then distorted again on 11-12 October, as the ozone minimum again moved off the pole and the Antarctic coast south of Australia was again outside the ozone hole.

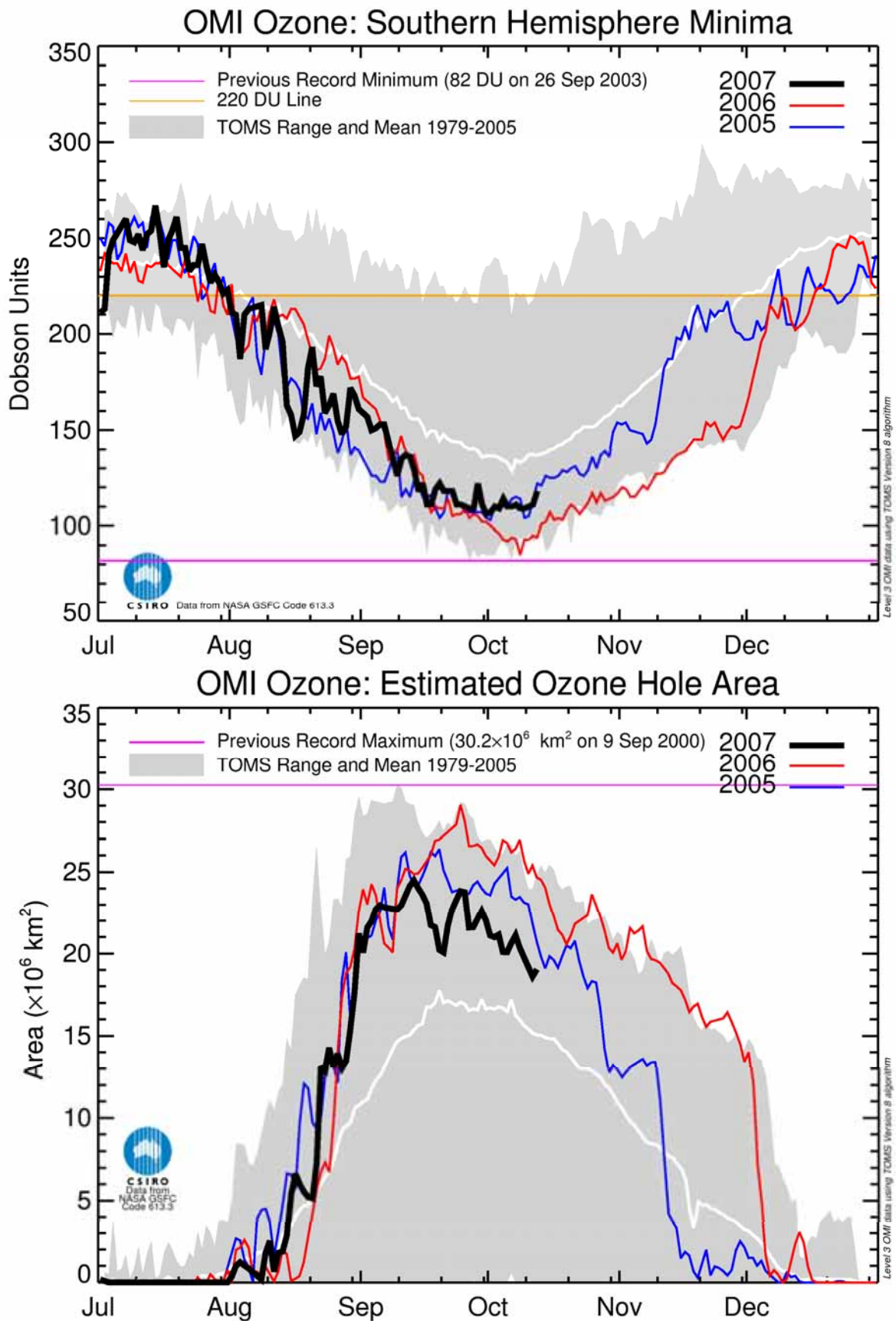
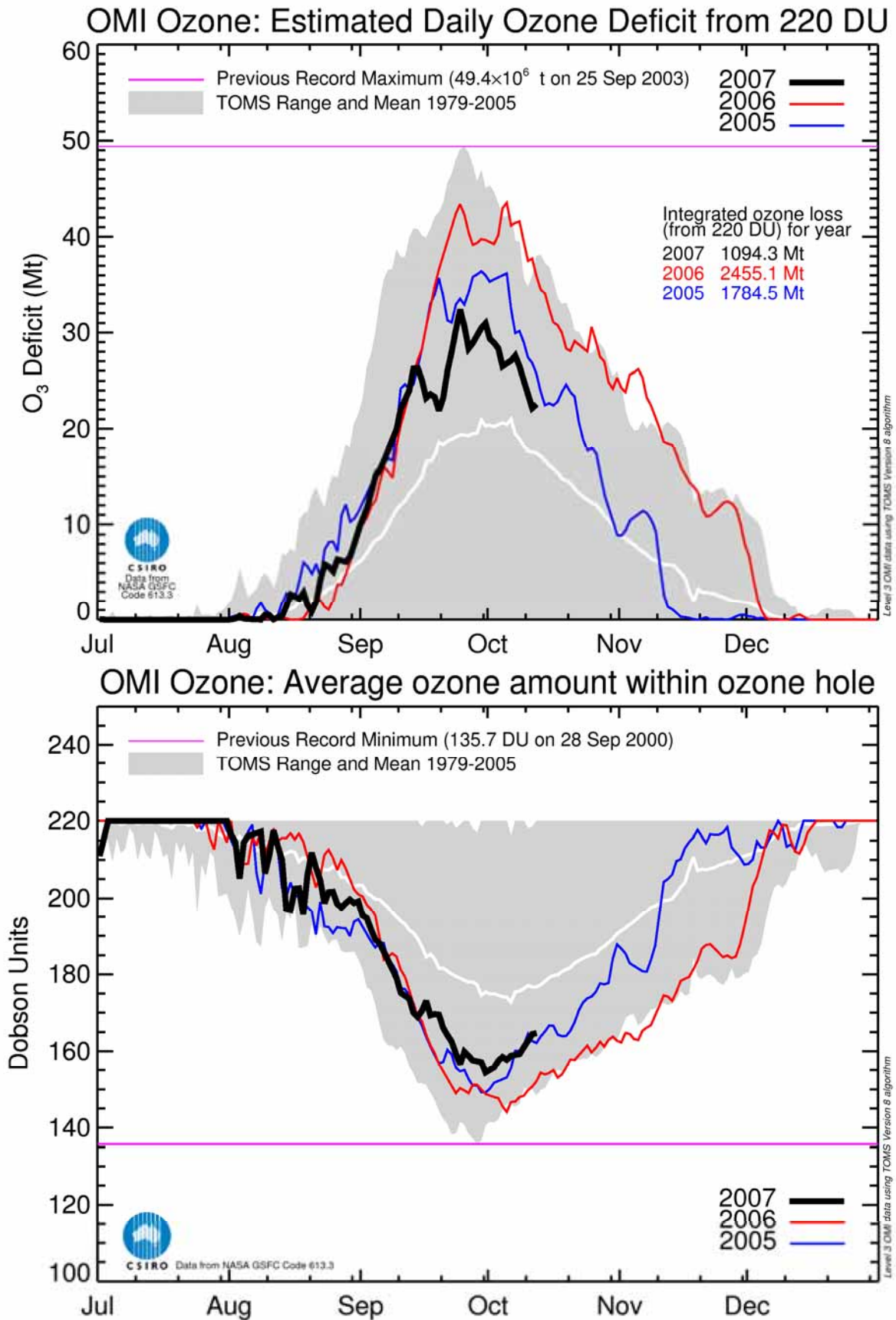


Figure 1: Ozone hole depth (top panel) and area (bottom panel) based on OMI satellite data, as of 12 October 2007.



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Figure 2: Estimated daily ozone deficit (top panel) and average ozone amount within the ozone hole (bottom panel) based on OMI satellite data, as of 12 October 2007.

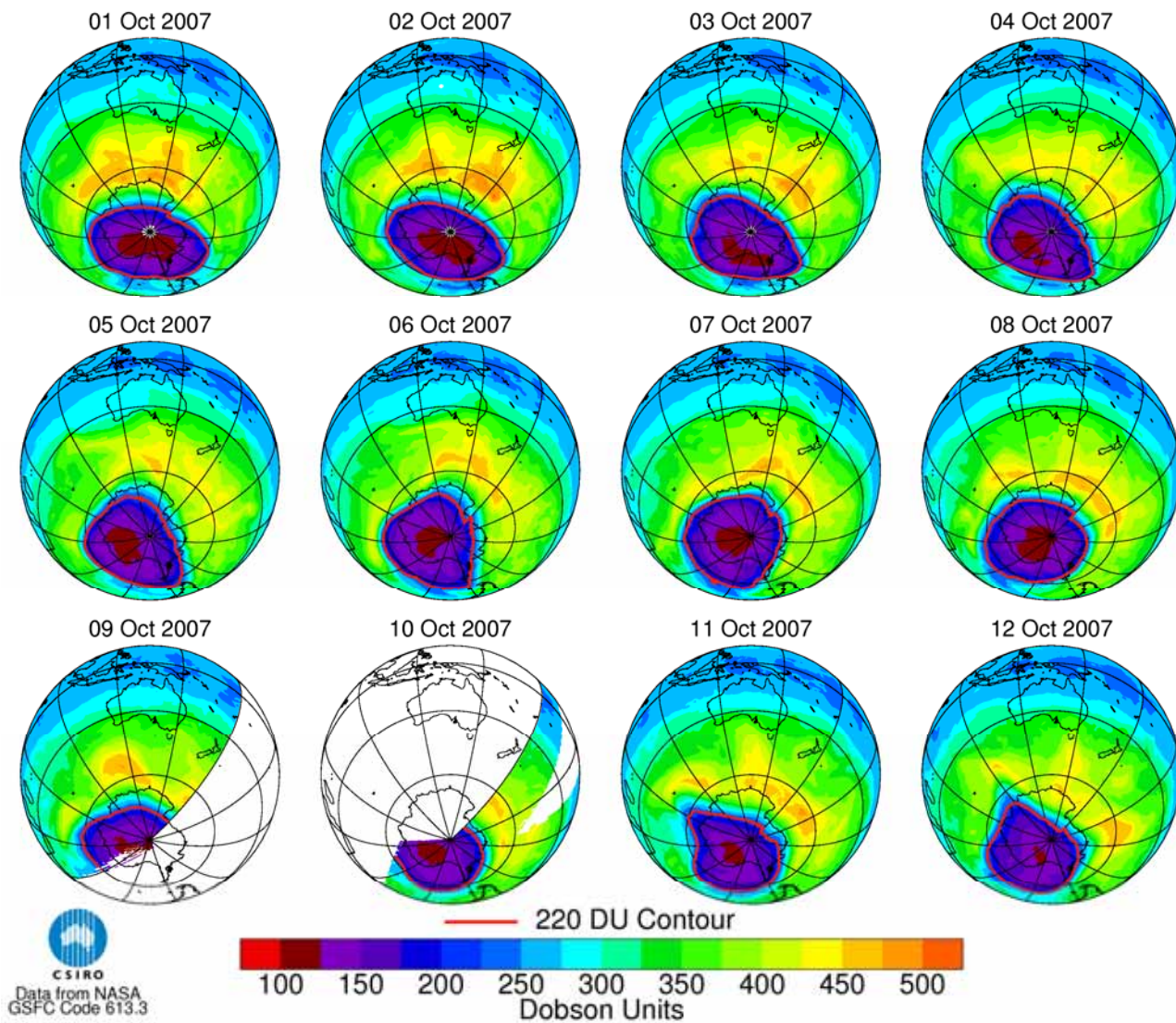


Figure 3: OMI ozone hole images for 1-12 October 2007; the ozone hole boundary is indicated by the red 220 DU contour line. The white area over Antarctica is missing data and indicates the approximate extent of the polar night. The OMI instrument requires solar radiation to the earth's surface in order to measure the column ozone abundance.

Definitions

CFCs: chlorofluorocarbons, synthetic chemicals containing chlorine, once used as refrigerants, aerosol propellants and foam-blowing agents, that break down in the stratosphere (15-30 km above the earth's surface), releasing reactive chlorine radicals that catalytically destroy stratospheric ozone.

DU: Dobson Unit, a measure of the total ozone amount in a column of the atmosphere, from the earth's surface to the upper atmosphere, 90% of which resides in the stratosphere at 15 to 30 km.

Halons: synthetic chemicals containing bromine, once used as fire-fighting agents, that break down in the stratosphere releasing reactive bromine radicals that catalytically destroy stratospheric ozone. Bromine radicals are about 50 times more effective than chlorine radicals in catalytic ozone destruction.

Ozone: a reactive form of oxygen with the chemical formula O_3 ; ozone absorbs most of the UV radiation from the sun before it can reach the earth's surface.

Ozone Hole: ozone holes are examples of severe ozone loss brought about by the presence of ozone depleting chlorine and bromine radicals, whose levels are enhanced by the presence of PSCs (polar stratospheric clouds), usually within the Antarctic polar vortex. The chlorine and bromine radicals result from the breakdown of CFCs and halons in the stratosphere. Smaller ozone holes have been observed within the weaker Arctic polar vortex.

Polar night terminator: the delimiter between the polar night (continual darkness during winter over the Antarctic) and the encroaching sunlight. By the first week of October the polar night has ended at the South Pole.

Polar vortex: a region of the polar stratosphere isolated from the rest of the stratosphere by high west-east wind jets centred at about $60^\circ S$ that develop during the polar night. The isolation from the rest of the atmosphere and the absence of solar radiation results in very low temperatures (less than $-78^\circ C$) inside the vortex.

PSCs: polar stratospheric clouds are formed when the temperatures in the stratosphere drop below $-78^\circ C$, usually inside the polar vortex. This causes the low levels of water vapour present to freeze, forming ice crystals and usually incorporates nitrate or sulphate anions.

TOMS & OMI: the Total Ozone Mapping Spectrometer & Ozone Monitoring Instrument, are satellite borne instruments that measure the amount of back-scattered solar UV radiation absorbed by ozone in the atmosphere; the amount of UV absorbed is proportional to the amount of ozone present in the atmosphere.

UV radiation: a component of the solar radiation spectrum with wavelengths shorter than those of visible light; most solar UV radiation is absorbed by ozone in the stratosphere; some UV radiation reaches the earth's surface, in particular UV-B which has been implicated in serious health effects for humans and animals; the wavelength range of UV-B is 280-315 nanometres.

Acknowledgements

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