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Dobson Network Observes Longest Antarctic Ozone Hole in History !

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Most Persistent Hole Ever !

The annual occurence of an ozone hole above Antarctica is well documented, and the chemistry and physics underlying the phenomenon is well understood. A key component for hole formation is the presence of a polar vortex. The Antarctic polar vortex is a cold air mass formed each winter as air above the region cools and descends. During the austral spring of 2015 the Antarctic stratosphere was unusually cold, and the vortex was unsually stable. This resulted in the lingering presence of polar stratospheric clouds (PSC's) which catalyzed ozone destruction well into December, and resulted in the longest lasting ozone hole ever recorded. The event was observed by NOAA scientists John (Johan) Boothand Christine Schultz stationed at the South Pole.

The vortex

Figure 1.shows the zonal mean teperature between 60 and 90 degress south for the year of 2015. The X axis represents time. The Y axis is altitude, and colors represents temperature. The white portion in the middle is essentially the polar vortex. Stratospheric air begins to cool in May, it descends in June and July, and lingers until early November. For comparison figure 2. shows the same plot for 2014.

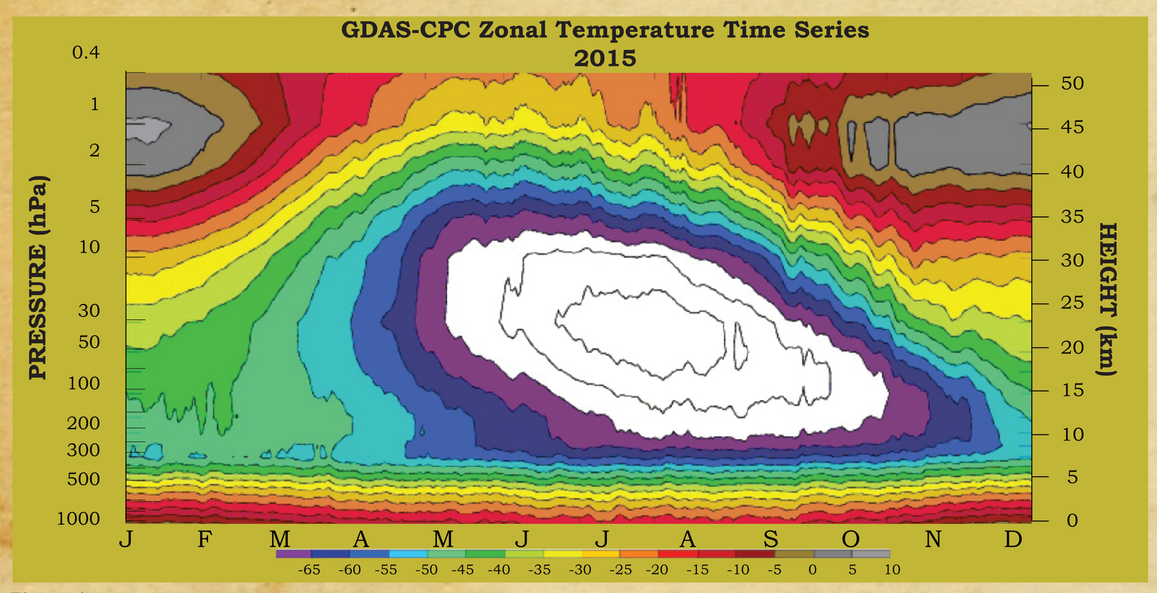

Figure 1

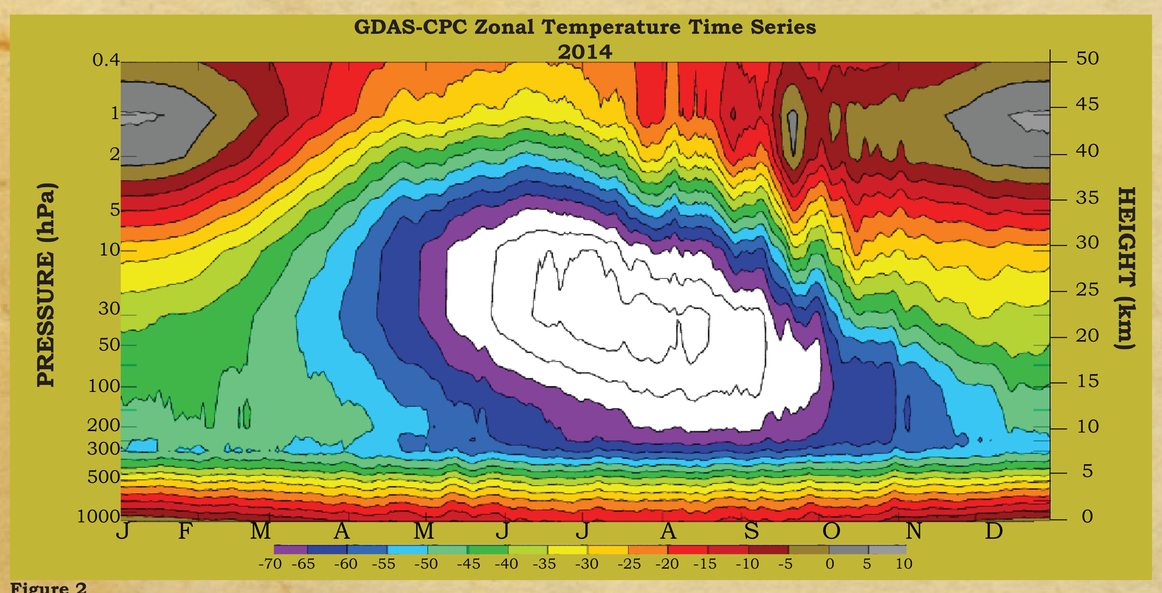

Figure 2

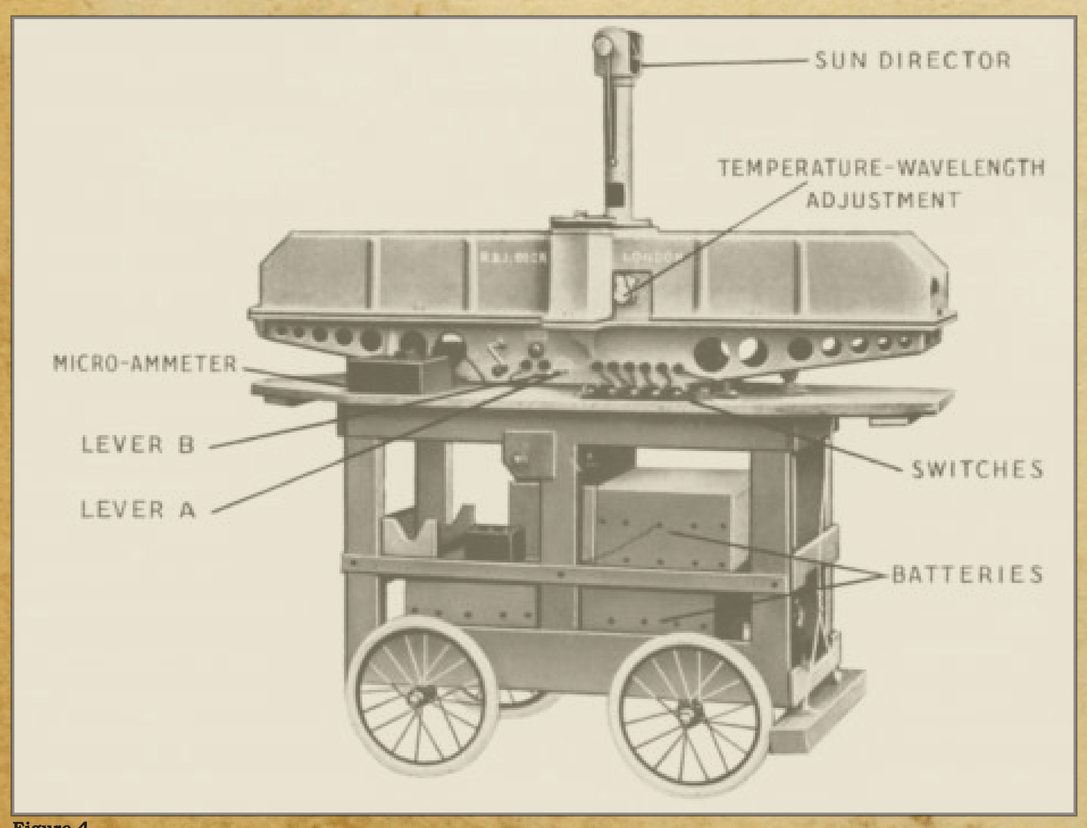

Figure 4
An image of a Dobson spectrometer as it appeared c.a. 1935 above and as it appears today below.

Polar Stratospheric clouds

As the name implies, Polar Stratospheric Clouds (PSCs) form in the stratosphere. They present surfaces that greatly enhance the chemical reactions responsible for ozone destruction. There are two main types of PSCs. The first type called PSC I clouds, are composed mostly of nitric and sulfuric acids, and they begin to form when the temperature's near -78 C. The sceond type, PSC II clouds form when temperature drops to -88 C. Figure 3. shows the minimum yearlytemperature above Antarctica for various periods. The red line showshow the 2015 temperatures remained coldermuch longer than usual.

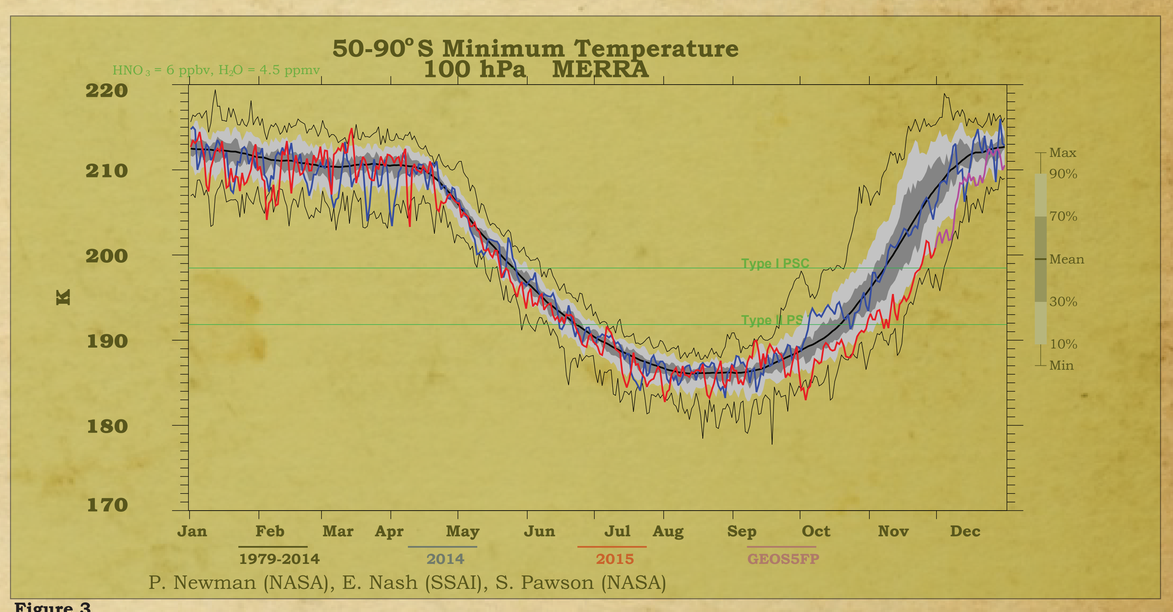

Figure 3

NOAA scientists at Amundsen-Scott Base Antarctica have measured the thickness of the ozone layer using a Dbson spectrometer since 1961. This year the measurements the latest ozone hole recovery ever recorded. Figure 5.

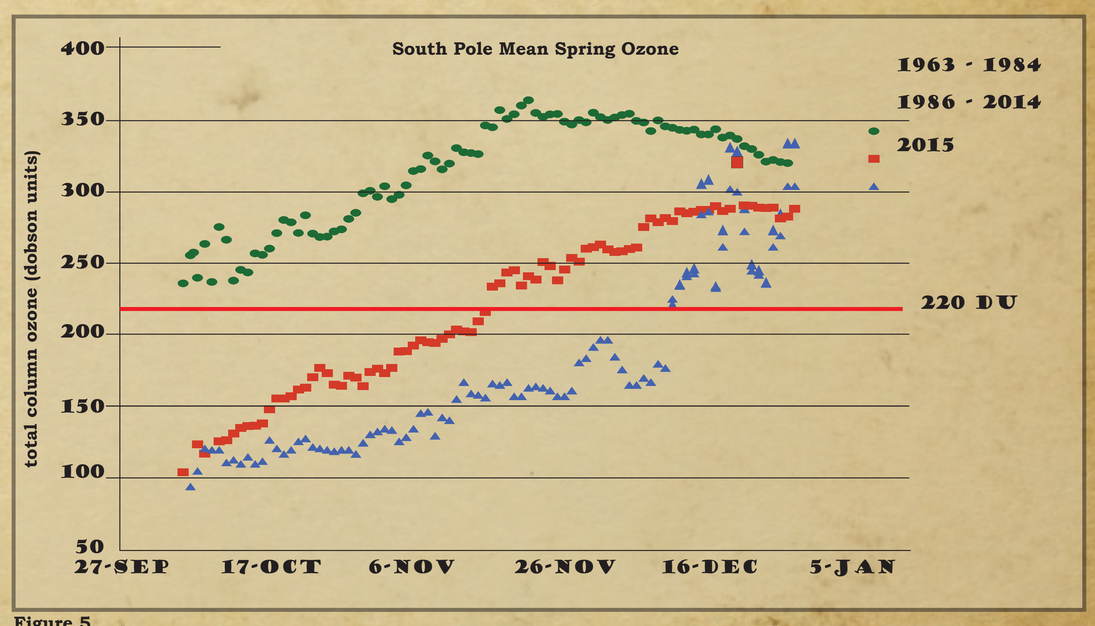

Figure 5.
Green circles show the average daily values of ozone during the Antarctic spring prior to the discovery of the ozone hole. Red squares show the average TCO hole between 1986 and 2014. The blue triangles show the 2015 TCO

The Dobson Spectrometer

The Dobson spectrometer is a state of the art instrument for measuring the thickness of the ozone layer. It was developed in the late 1920's and uses the principle of differential absorption. Despite its age Dobson spectrometers are still widely used throughout the world. In fact the ozone hole was first shown to exist with a Dobson