Ozonesonde Minimum Record Nearly Falls at South Pole Station during the 2006 Ozone Hole

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Total column ozone of just 93 Dobson Units (DU) measured on October 9, 2006 (Figure 1) was one of the lowest observed in the 21 year ozonesonde record from Amundsen Scott South Pole Station. Vertical profiles of ozone and temperature have been measured at South Pole using balloon-borne electrochemical concentration cell (ECC) ozonesondes. Balloon flights are done each week during the entire year, with 2 to 3 per week flown during the ozone hole period in September and October. The record minimum of 89 DU was measured on October 6, 1993. During the middle of September 2006, ozonesondes were showing a typical depletion pattern. By late September, NOAA National Centers for Environmental Prediction reported the largest ever observed ozone hole from satellite observations. However, ozonesonde data showed depletion continuing into October, especially in the main ozone layer from 14 to 21 km. This layer dropped from 125 DU in late July to a record low of 1.2 DU (99% depletion) in early October. The severity of ozone depletion over Antarctica depends on effective chlorine concentrations in the stratosphere, wintertime stratospheric temperatures, and the stability of the polar vortex. Atmospheric chlorine concentrations have been on a slow decline since 1995 (ESRL GMD HATS), but this year's record low ozone indicates that chlorine levels remain high enough that severe depletion largely depends on the year to year variability in stratospheric temperatures. The ozonesonde data showed very cold (-85 to -90 C) temperatures in the 20-24 km layer late into late September.
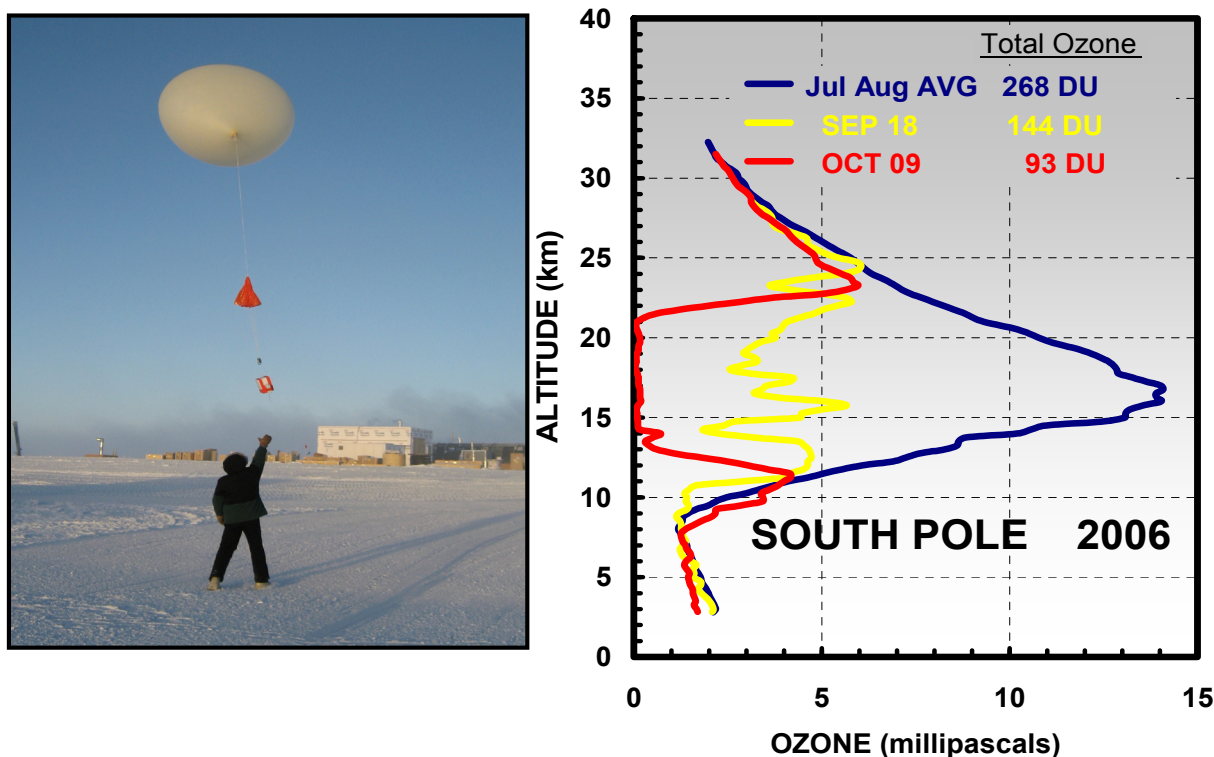

Figure 1. South Pole ozonesonde launch and three selected ozone profiles of altitude (kilometers) versus ozone concentration. Blue is the average pre-ozone hole profile. Red is the minimum observed.