Four Decades of Ozonesonde Measurements Over Antarctica

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Ozonesonde observations from Syowa and the South Pole over more than 40 years reveal a remarkable amount of agreement, supporting and extending the understanding gained from either individually (Figure 1). Both sites reveal extensive Antarctic ozone losses in a relatively narrow altitude range from about 14 to 24 km in October, consistent with temperature-dependent chemistry involving chlorine on polar stratospheric clouds as the cause of the ozone hole. Observations at both locations show that some ozone depletion now occurs during much if not all year. The maximum October ozone losses at higher altitudes near 70 hPa appear to be transported to lower levels near the tropopause on a time scale of a few months, which is likely to affect the timing of the effects of ozone depletion on possible tropospheric climate changes. Both sites also show greater ozone losses in the lowermost stratosphere after the volcanic eruption of Mt. Pinatubo, supporting the view that surface chemistry can be enhanced by volcanic perturbations and that the very deep ozone holes observed in the early 1990s reflected such enhancements. Data from the Syowa station also suggest that enhanced ozone losses due to the El Chichon eruption in the early 1980s contributed to the beginning of a measurable ozone hole. Correlations between temperature and ozone and the variability of the data also provide new insights into ozone losses, including its non-linear character and will be shown to represent a new tool to assist the search for ozone recovery.

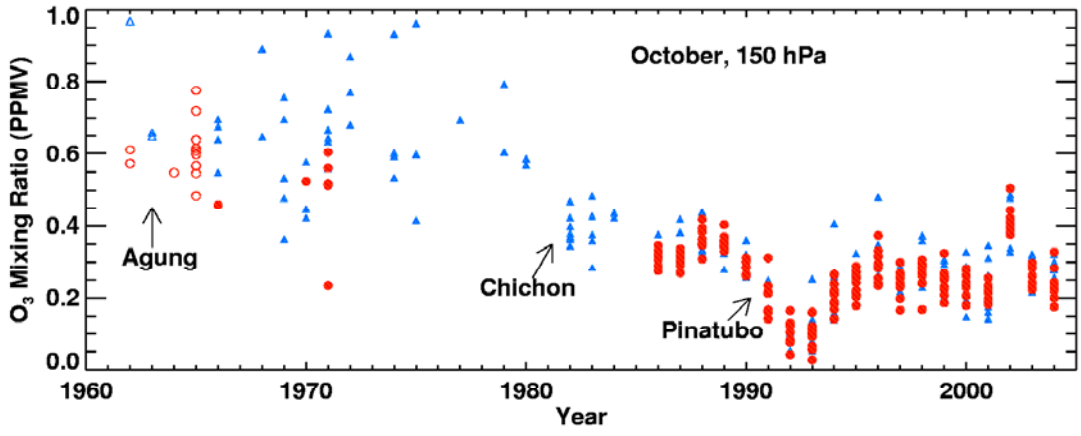

Figure 1. Observations of ozone mixing ratios at 150 hPa over Antarctica in October. The electrochemical measurements from South Pole and Syowa stations are shown as red and blue squares and triangles. Regener data obtained in the early 1960s from South Pole and Hallett stations are depicted as red and blue circles. The years of the known major volcanic eruptions since 1960 are also indicated.