ANALYSIS OF THE BREAKDOWN OF THE ANTARCTIC CIRCUMPOLAR VORTEX USING TOMS OZONE DATA

Kenneth P. Bowman
University of Illinois

Climatological analysis of data from the Total Ozone Mapping Spectrometer (TOMS) on the Nimbus 7 satellite has shown that the annual cycles of ozone are very different in the Arctic and Antarctic (Bowman and Krueger, 1985). The annual cycle in the Arctic is a relatively smooth annual sine wave; but in the Antarctic the circumpolar vortex breaks down rapidly during the southern hemisphere spring (September through November), producing a rapid rise in total ozone and a sawtooth-shaped annual cycle. The evolution of the Antarctic total ozone field during the vortex breakdown has been studied by computing areally-integrated ozone amounts from the TOMS data. This technique avoids substantial difficulties with using zonally-averaged ozone amounts to study the asymmetric breakdown phenomenon. Variability of total ozone is found to be large both within an individual year and between different years.

During the last decade monthly-mean total ozone values in the Antarctic during the springtime vortex breakdown period (especially October) have decreased dramatically. The ozone-area statistics indicate that the decrease has resulted in part from changes in the timing of the vortex breakdown and resultant ozone increase, which have occurred later during recent years. Analysis of the spatial scales involved in the ozone transport and mixing that occur during the vortex breakdown is now underway. Reliable calculation of diagnostic quantities like areally-integrated ozone is possible only with the high-resolution, two-dimensional, daily coverage provided by the TOMS instrument.

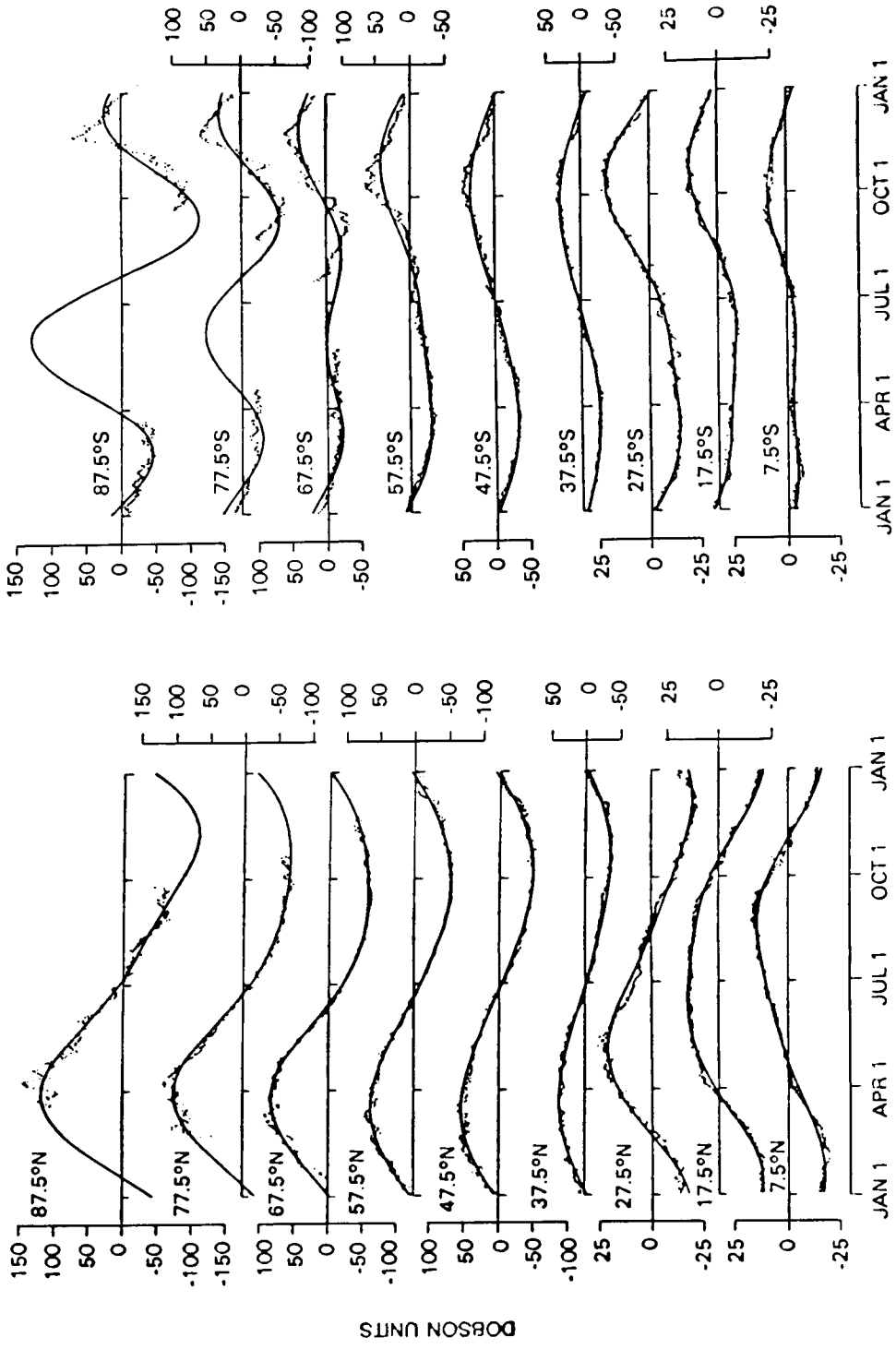
DOBSON UNITS
87.5°N
77.5°N
67.5°N
57.5°N
47.5°N
37.5°N
27.5°N
17.5°N
7.5°N
87.5°S
77.5°S
67.5°S
57.5°S
47.5°S
37.5°S
27.5°S
17.5°S
7.5°S
JAN 1
APR 1
JUL 1
OCT 1
JAN 1

Figure 1.