The Role of the Network for the Detection of Atmosphric Composition Change (NDACC) Measurements in Assessing Past Changes in the Vertical Distribution of Ozone

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The evolution of atmospheric ozone throughout the 21st Century falls into two main focus areas: (1) long-term ozone changes associated with declining concentrations of ozone depleting substances and with increasing concentrations of greenhouse gases; and (2) short-term ozone changes associated with events such as volcanic eruptions, QuasiBiennial Oscillation, or El Niño/Southern Oscillation, each of which can moderate the longer-term changes.

Long-term changes have both scientific and policy relevance, whereas interest in shorter-term ozone changes is primarily scientific in nature and associated with improving our understanding of atmospheric processes. For both, accurate knowledge of the altitude, latitude, and seasonal structure of the ozone changes is required. The address of long-term questions requires a stable suite of measurements extending over decades. Addressing the short-term questions requires measurements with good spatial and temporal coverage. Critical to both issues are measurements of known high quality so that unequivocal documentation of the changes can be made and an understanding of the forcings associated with them can evolve.

During the 1990s, ozone profile trends deduced from satellite and ground-based instruments showed substantial discrepancies. Thus, a SPARC/IO3C/Global Atmosphere Watch Assessment of Trends in the Vertical Distribution of Ozone was organized and its findings were published in 1998. Since then, the end of certain satellite records has limited our observations of global changes in the vertical distribution of ozone. In an effort to improve our knowledge and understanding of the past changes in the vertical distribution of ozone, a new SPARC/IO3C/IGACO/NDACC (SI2N) initiative has been organized. Under this initiative satellite, ground-based, and airborne measurements are being critically analyzed, as are methods of preparing combined data sets. This presentation will highlight the role of two decades of ground-based measurements under the NDACC in determining recent trends in the vertical distribution of ozone.

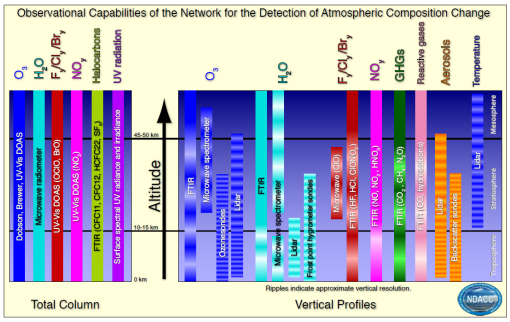

Figure 1. NDACC Observational Capabilities Chart. The Chart shows how different classes of atmospheric constituents and parameters are measured with different measurement techniques. The left panel shows total column measurements and the right panel shows vertically resolved measurements.

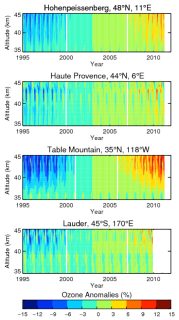

Figure 2. Lidar ozone response to the Ozone Depleting Gas Index over mid-latitude sites. The increase of ozone in the upper stratosphere as a direct response of the Montreal Protocol is observed over mid-latitude sites. Different steps are observed: 1) Ozone decrease slow down stop earlier at higher latitude than lower latitude. 2) Ozone recovery started later at higher latitude compared to lower latitude. From Kirgis et al.