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TEMPERATURE MEASUREMENTS INTERCOMPARISON AT OHP USING RAYLEIGH LIDAR AND UARS INSTRUMENTS

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In late eighties, the international Network for Detection of Stratospheric Change (NDSC) was established to provide the earliest possible identification and understanding of anthropogenic changes in the stratosphere, and its long-term impact on the Earth's atmosphere. One of the key measurements planned under NDSC is the continuous monitoring of the temperature in the middle atmosphere. Temperature monitoring is important, as temperature controls the rates of chemical reaction, and thus the ozone abundance. In addition, the temperature structure of the stratosphere itself is controlled by the ozone distribution.

Routine lidar observations since 1979 at the Observatoire de Haute Provence (OHP) (440 N, 60 E), France, provides a large data base to study the long-term trend and the mesoscale variability of the middle atmosphere. This data base can be used for detection of long-term changes due to natural and human activities. The use of Rayleigh lidar has shown that it is a well adapted method to retrieve accurate vertical temperature profiles on a regular basis. Accuracy of the method can further be improved through a better understanding of the sources of error and through profile intercomparison with other instrument. Detection of sources of error and validation is not always possible due lack of instruments of comparable accuracy and ability. One possible solution for further validation consists of comparing temperatures obtained by two lidars operating at the same site and collecting data coincidently (in time).

Under the auspices of the NDSC, the group at NASA Goddard Space Flight Center has developed a mobile, dual- wavelength Rayleigh/Raman lidar system. While it was designed primarily for the measurement of stratospheric ozone, this lidar can also be used to measure temperature and density using the lidar return of the reference channel. The generator-powered lidar system is housed in a 46 ft trailer and is ideally suited to be deployed at any primary NDSC site for instrument validation and intercomparison campaigns. The GSFC mobile lidar was deployed at Observatoire de Haute Provence (OHP), during an Upper Atmospheric Research Satellite (UARS)/NDSC Correlative Measurement Campaign (July-August 1992). The GSFC and OHP lidars were stationed 300 meters apart and made coincident (in time) temperature measurements during the campaign period. This campaign provided the opportunity to compare simultaneous temperature profiles acquired by the two lidar systems. Although, the general agreement between measurements made by each system are quite good, its important, for the detection of long-term changes, to understand even the small existing difference. The separation of errors into two classes, random and bias, is also important when absolute measurements over long period are expected. As there exists some fundamental difference between both

system, it is interesting to see if the observed differences could be explained by our knowledge of the error source. Also the analysis method adapted by both groups have been compared by treating the same lidar returns through two slightly different algorithms. This result will contribute to crucial future prospects for NDSC algorithms intercomparison.

The extension of our knowledge of natural and anthropogenic variability on a more global scale needs to use satellite measurements. A major component of the NDSC is to provide, through high-quality measurements, an independent calibration of satellite sensors. Temperature data derived from several experiments on board UARS were selected to coincide in space and time with lidar measurements. Temperature intercomparisons between UARS instruments such as Microwave Limb Sounder (MLS), Cryogenic Limb Array Etalon Spectrometer (CLAES) and Halogen Occultation Experiment (HALOE); and ground-based instruments (lidars, radiosondes) at NDSC site will be presented.