Validation of the Measurement Of Pollution In The Troposphere (MOPITT) experiment by ground-based infrared solar spectroscopic measurements of carbon monoxide (CO) and methane (CH4)

Progress Report

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Major foci of our activity are as follows:

1. Intercomparison of different CO and CH4 techniques selected for the MOPITT validation, and referencing them to NOAA CMDL standards.
2. In collaboration with the team from NASA Langley DAAC we are working on data archiving and storage.
3. Collaboration with European Union's project "Observations in support of Satellite measurements over Europe (COSE).
4. WEB page was constructed.

1. The Pre-launch MOPITT Validation Exercise (Pre-MOVE) The primary goals of Pre-MOVE were: (1) intercompare measurement techniques and data-processing algorithms by comparing retrieved CO columns and tropospheric profiles from ground-based interferometers and spectrometers with in situ CO profile measurements by the NOAA/CMDL; and (2) test the MOPITT Airborne Test Radiometer (MATR); and (3) develop methodology and protocols for future validation experiments before and after the MOPITT launch in 1999. The was a one week long campaign at the Southern Great Plains (SGP) Cloud and Radiation Testbed (CART) site of the Department of Energy Atmospheric Radiation Measurement (DOE/ARM) program in Lamont, Oklahoma, March 2-6, 1998. Graund-based solar spectroscopic instrumentation was represented by the CART facility instrument Solar Radiance Transmission Interferometer (SORTI). CO profiles were retrieved from ground-based solar absorption FTIR spectra (SORTI instrument with a spectral resolution of 0.013 cm-1) taken on March 3, 1998. The retrievals were carried out by N. Jones of NIWA and N. Pougatchev of CNU (Pougatchev and Rinsland 1995). The agreement with the airborne in situ measurement is within about 10% in the middle troposphere. More details on the Pre-MOVE can be found in The Earth Observer, January/February 1999, Vol. 11 No. 1.

Bad weather and short period of the campaign did not allow us to make definite quantitative conclusions based on the results from Pre-MOVE. Therefore, another, more intensive campaign (Pre-MOVE II) will be conducted in the Boulder/Denver region from July 6-18, 1999. This time, we will test all aspects of MOPITT validation protocols and procedures. This work is coordinated by the MOPITT instrument science team.

2. Data archiving. Archiving of the results of our correlative measurements is one of the most important task in the validation procedure. Numbers representing the measurements must be characterized and documented. Experience with validation of the MAPS instrument [Pougatchev et al. 1998] indicates that sensible validation is impossible without detailed characterization of both satellite and ground-based

measurements. Information such as averaging kernels, atmospheric conditions during the measurements (e.g., temperature and pressure profiles, etc), geometry of observations must be archived along with the validation data, i.e., profiles of CO and CH4. Furthermore, properly archived and documented data can be used by other validation projects and broader scientific community.

The MOPITT data will stored at NASA Langley DAAC. Therefore, we decided that validation data should be stored at the same archive. This position is supported by Lanley's DAAC authorities, and currently we work on technical aspects, e.g., data formats, accessibility through the Internet, etc. During an annual Network for Detection of Stratospheric Change (NDSC) these issues will be discussed with other co-investigators of the project.

3. Collaboration with the COSE project. Validation of the MOPITT measurements requires global validation network. To increase efficiency of our particular project, we established collaboration with European Community's (EC) project "Compilation of atmospheric Observations in support of Satellite measurements over Europe" (COSE). The COSE project includes 15 European partners and will provide some validation data for several European and US/Canadian satellites, e.g., ODIN, GOME/ENVISAT, SAGE III, MOPITT, etc. The COSE data will cover Western Europe and Arctic region. Dr. Nikita Pougatchev is a member of the COSE's project management team. We agreed that CO and CH4 data bases in both projects will be linked to each other what will beneficial for both parts. COSE's data base team is working with Langley DAAC to establish common data base structure, formats, etc.

4. WEB page. Project's WEB page was constructed. Its URL is
http://users.cnu.edu/~mopitt/index.htm
We are continuing to work on the page content and appearance.

5. Miscellaneous. a) In collaboration with the MOPITT science team member Dr. Reichle we explore the possibilities of the Chesapeake Tower for the MOPITT validation. The tower is a large structure in the Atlantic Ocean that currently operates as a lighthouse and meteorological observing station (http://www.ndbc.noaa.gov/images/Stations/chlv2.jpg). CERES is planning to use the Chesapeake Tower as a validation site. The tower could be instrumented with a variety of spectrometers and radiometers that would yield information on both surface and atmospheric, e.g., aerosol loading, properties. CERES is planning aircraft overflights and radiosonde launches.

b) Dr. N. S. Pougatchev made a presentation at the TES science team meeting about validation capabilities of the ground-based infrared solar spectroscopy.