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The Canadian Arctic Atmospheric Chemistry Experiment (ACE) Validation Project: Overview and results from ten years of ACE operations

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As of February 2014, the Canadian-led Atmospheric Chemistry Experiment (ACE) satellite mission has been making measurements of the Earth's atmosphere for ten years. As ACE operations have extended beyond the initial two-year mission, there is a continuing need to validate the trace gas data products from the ACE-Fourier Transform Spectrometer (ACE-FTS) and the Measurement of Aerosol Extinction in the Stratosphere and Troposphere Retrieved by Occultation (ACE-MAESTRO) instruments. Ground-based measurements provide critical data for the validation of satellite retrievals of trace gases and for the assessment of long-term stability of these measurements. In particular, validation comparisons are needed for ACE during Arctic springtime to understand better the measurements of species involved in stratospheric ozone chemistry.

To this end, eleven Canadian Arctic Atmospheric Chemistry Experiment (ACE) Validation Campaigns have been conducted during the spring period (February - April in 2004 - 2014) at the Polar Environment Atmospheric Research Laboratory (PEARL) in Eureka, Nunavut (80°N, 86°W). This period coincides with the most chemically active time of year in the Arctic, as well as a significant number of satellite overpasses. A suite of as many as 12 ground-based instruments, as well as frequent balloon-borne ozonesonde and radiosonde launches, have been used in each campaign. These instruments include: a ground-based version of the ACE-FTS (PARIS - Portable Atmospheric Research Interferometric Spectrometer), a terrestrial version of the ACE-MAESTRO, a SunPhotoSpectrometer, two zenith-viewing UV-visible grating spectrometers, a Bomem DA8 Fourier transform spectrometer, a Bruker 125HR Fourier transform spectrometer, a Systeme d'Analyse par Observations Zenithales (SAOZ) instrument, and several Brewer spectrophotometers. In the past several years, these results have been used to validate the measurements by the ACE-FTS and ACE-MAESTRO instruments on SCISAT as well as the OSIRIS instrument on Odin. This presentation will focus on an overview of the measurements made by the ground-based, balloon-borne and satellite-borne instruments during the recent ACE Arctic Validation campaigns. Preliminary results from the 2014 campaign will also be discussed.