Contribution ID: **1157** Type: **Oral (Non-Student) / orale (non-étudiant)**

Spectroscopic measurements of marine atmospheric boundary layer composition in Halifax

Wednesday 15 June 2016 09:15 (15 minutes)

As part of a new research program dedicated to understanding atmospheric composition, we have initiated measurements of marine boundary layer trace gases using the technique of Open-Path Fourier Transform Infrared Spectroscopy (OP-FTIR) deployed in monostatic mode (collocated source and detector) in 2015. The recently acquired system significantly expands the measurement capability of atmospheric trace gases in Halifax and in Atlantic Canada. To date, we have conducted field campaigns in traffic conditions, as well as coastal forest and indoor environments. Trace gas concentrations are derived from atmospheric absorption spectra recorded over one-way atmospheric open paths ranging from 100-400 m. The retrieval process is being optimized to target greenhouse gases (CO2, CH4, N2O), ozone and its precursors (CO, NOx and many VOCs), trace gases implicated in particle formation (SO2, HNO3, NH3), and other IR-active species permanently imprinted in stored absorption spectra. Details of retrievals and detection limits under variable atmospheric conditions (primarily driven by absolute water vapour amounts) will be presented, along with first results from field measurements to date. Progress on long-term plans for incorporating the active-source OP-FTIR system into a diurnal/nocturnal observatory at Saint Mary's University will be discussed. Finally, as the system is planned to remain mobile, planned direct measurements of marine shipping sector emissions in Halifax Harbour will be presented.

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Session Classification: W1-8 Observations In Situ and Remote Sensing I (DASP) / Observations in situ et détection à distance II (DPAE)

Track Classification: Atmospheric and Space Physics / Physique atmosphérique et de l'espace (DASP-DPAE)