Dynamics and constituent measurements with the Waves Michelson Interferometer

W.E. Ward (1), D.Y. Wang (1), M. Kowalski (2), W.A. Gault (3) and A. Bell (4)

(1) Department of Physics, University of New Brunswick, Canada, (2) University of Ontario Institute of Technology, Oshawa, Canada, (3) D-B Reflections Associates, Oakville, Canada, (4) COM DEV Ottawa, Ottawa, Canada.

The Waves Michelson Interferometer (WaMI) is an imaging Michelson interferometer designed to provide altitude profiles of wind, temperature, ozone, atomic oxygen and density from the stratopause to the lower thermosphere. This is accomplished through simultaneous measurements of the Doppler shifts, line widths and irradiance of emission lines in airglow emissions (O2 IR atmospheric band, OH and O(1S)). These measurements are crucial to an understanding the behaviour of the upper stratosphere and mesosphere and its role in the middle atmosphere. Observations in this region are complicated by observational issues and subtleties in the dynamical forcings. Amplitudes of gravity waves and tides are substantial and as a result temperatures and winds exhibit strong variability. In addition, vertical and horizontal displacements associated with these waves are significant so that the interpretation of constituent signatures becomes difficult. By providing simultaneous profiles of a number of quantities of dynamical interest, WaMI has the potential to resolve a number of these observational issues and to provide insights into the dynamics and constituent transport in this region. These measurements would be most valuable if they were part of a multiple satellite mission, tentatively termed the D-Train (D for dynamics), each satellite of which sampled a different local time. In this talk the measurement and inversion approach being developed for WaMI is described. The importance of these measurements for interpreting the behaviour of the atmosphere in the upper stratosphere and mesosphere are discussed and the need for a D-train presented.