Wave observations using airglow in the high Arctic

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Observations with the E-Region Wind Interferometer (ERWIN II - a field widened Michelson interferometer) of wind and irradiance using airglow emissions combined with airglow images from an all sky imager are being used to provide information on waves in the polar mesopause region. These instruments are located at the Polar Environment Atmospheric Research Laboratory (PEARL) at Eureka, Nunavut, Canada (80N, 86W). The observation cadence of each instrument is of the order of a minute and the mesospheric airglow emissions observed include the oxygen green line, the O2 atmospheric band, hydroxyl and sodium. ERWIN II has a wind precision of 1-2 m/s which is sufficient for vertical motion associated with gravity waves to be diagnosed.

In this presentation, wave observations on temporal scales ranging from days to minutes will be discussed. Vertical motions in most cases are correlated with airglow variations for resolved gravity waves. Cases where the horizontal and vertical wind components and the irradiance can be resolved will be presented and interpreted in terms of gravity wave polarization relations. Time series of the amplitudes of the longer temporal scales waves will be summarized and compared to the corresponding wind fields of CMAM30 (a nudged model run). Together these observations provide new insights into the wave fields at these heights and their characteristics.