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Longitudinal perturbations in thermospheric atomic oxygen concentrations observed at mid-latitudes by the Wind Imaging Interferometer compared with the Canadian Ionosphere and Atmosphere Model

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The Canada/France WIND Imaging Interferometer (WINDII) made measurements from NASA's Upper Atmosphere Research Satellite from 1991 to 2003. The observations were of upper atmospheric winds in the altitude range 80 to 300 km from Doppler shifts of the visible region emissions from a number of species. Altogether the atomic oxygen O(1S) 557.7 nm and O(1D) 630.0 nm emissions along with lines in the OH (8,3) band, and O2 Atmospheric band at 760 nm were observed. As well, emission from the O+(2P) emission at 732 nm was included. This excited ion is produced by solar photoionization from the ground state atomic oxygen and so from the observed emission the concentration of atomic oxygen [O] can be retrieved, but it is only recently that this has been accomplished. In plots of [O] at 250 km versus latitude and longitude acquired during March 1993, a region of depleted [O] near 40 S latitude and 100 W longitude was evident. The GUVI (Global Ultra Violet Imager) far ultraviolet observations of [O] taken ten years later, in March 2003, showed the same feature, but it is not seen in the Canadian Ionosphere and Atmosphere Model. Further preliminary investigations showed that this depletion was the negative portion of a wave 1 in longitude, at that latitude, stationary in local time, and further that this feature appears to have an annual variation. It has also been observed in mass density variations with the CHAMP (CHAllenging Minisatellite Payload). Further investigations are in progress, including the possibility of coupling associated with the "springtime transition"observed with WINDII in the O(1S) 557.7 nm night airglow emission near 100 km and in ground-based observations. One plausible origin is the change in winter to summer circulation. The presentation will include a review of the observations, and possible interpretations.

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