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MLT and Thermospheric F Region Observations and Modelling

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MLT (mesosphere lower-thermosphere) and thermospheric F region (upper thermosphere and embedded ionosphere) observations have been made by operating the MU radar (35N, 136E) in alternate meteor and incoherent scatter modes. The continuous observations, each lasting more than a week, provide simultaneous zonal and meridional wind velocities at MLT altitudes (80-95 km), meridional wind velocity in the upper thermosphere (220-450 km), and electron density and peak height in the ionosphere with a time resolution of 1.5 hours. The data from the observations in October 2000 and March 2001 are used to compare the mean winds, tides and waves under magnetically quiet equinoctial conditions. The MU radar data are also compared with those modelled using a Coupled Mesosphere and Thermosphere model (CMAT). In addition, the 24-hour and 12-hour tidal amplitudes and phases obtained from the MU radar data are compared with those predicted by the Global Scale Wave Model (GSWM). The study seem to suggest that the upper atmospheric regions could be dynamically coupled through mean winds, tides and waves. The MU radar data also show large differences between the two equinoxes in mean winds, tides and waves in the MLT region. The GSWM-02 model qualitatively predicts the observed growth of the tides with altitude but does not predict the 12-hour tide becoming stronger than the 24-hour tide at altitudes above mesopause at September equinox.