RADAR STUDIES
OF
ATMOSPHERIC
GRAVITY WAVES

by

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SUMMARY

The thesis is concerned with the dynamics of the upper mesosphere and lower thermosphere (i.e. the height region between 60 and 100km). Two methods of investigation using radio waves at MF have been used. These are the Spaced Antenna (SA) and Doppler Radar Techniques.

The Doppler radar technique was the main method of investigation used in this research, and because of this, its reliability as a means of determining winds in the D-region at a frequency of 2 MHz was established by comparison with the much tested and proven SA method.

Once this had been done, measurements of mesospheric gravity wave horizontal wavelengths and phase velocities were obtained using a Doppler radar with dual beams and a new analysis technique over a period of two years and over a range of heights, typically 80-94km.

This method also allowed the mesospheric momentum fluxes $\overline{u'w'}$ and $\overline{v'w'}$ to be obtained. From the vertical profile of $\overline{u'w'}$ values of F (the zonal wave drag) were computed and compared with the zonal acceleration due to the Coriolis torque acting on the mean meridional circulation. The comparisons show that gravity waves play a major role in determining the mean zonal circulation in the mesosphere.

Vertical velocities were also obtained from the same observations. The mean velocities are much larger than those predicted by theory, and appear to be downward for most of the year.