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8.9 MEASUREMENTS OF VERTICAL MOTIONS BY THE SASKATOON MF RADAR (1983-85): RELATIONSHIPS WITH HORIZONTAL WINDS AND GRAVITY WAVES

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The continuing series of horizontal wind measurements by the spaced-antenna real-time-winds (RTW) method was supplemented by a phase-coherent system for two years. Vertical motions are inferred from the complex autocorrelation functions, and an RTW system provides 5 min samples from 60 - 110 km. Comparisons with full interferometric 3-D velocity measurements confirm the validity of this approach. Following comparisons and corrections with the horizontal winds, mean summer and winter (24-h) days of vertical motions are shown. Tidal fluctuations are evident (≤ 1 m/s). In summer the motions are downward, consistent with data from Poker Flat, and the suggestion of Coy et al. [1986] that these represent Eulerian motions. The expected upward Lagrangian motion then results from adding up upward Stokes' drift. The winter motions are more complex, and are discussed in the context of gravity wave fluxes and possible meridional cells. The divergence of the vertical flux of zonal momentum is also calculated and found to be similar to the coriolis torque due to the meridional winds.

Coy, L., D. C. Fritts, and J. Weinstock, *J. Atmos. Sci.*, 43, 2636, 1986.

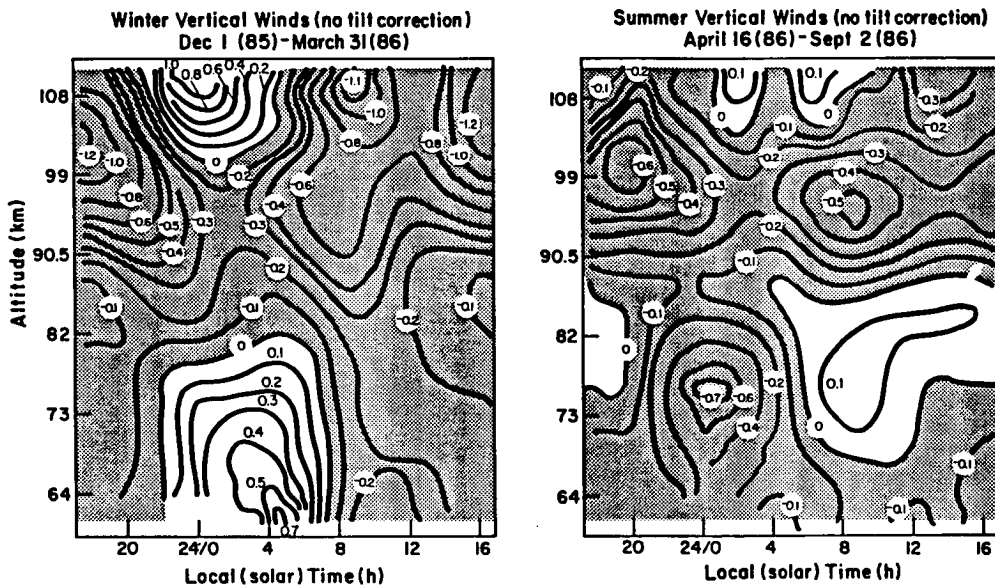


Figure 1. Mean vertical winds: above 99 km, data apply to a 5-km layer near 105 km.

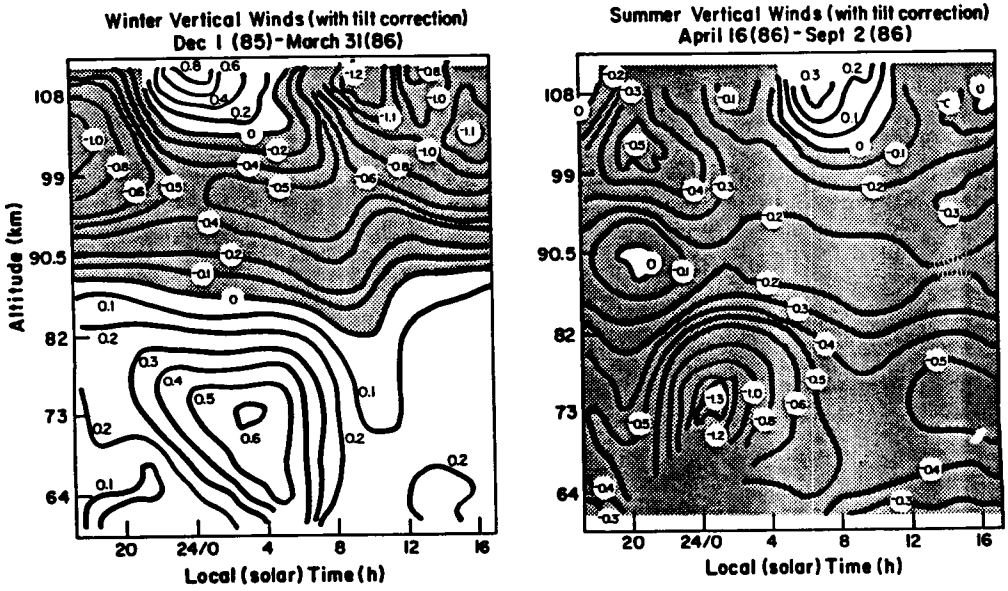


Figure 2. Mean vertical winds: tilt correction applied.

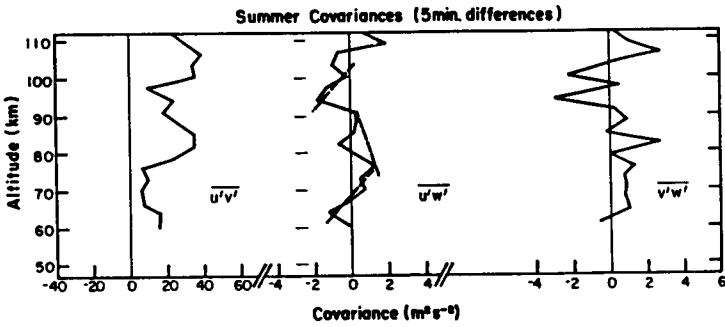


Figure 3. Covariances of wind perturbations ($10 < \tau < 100$ min).

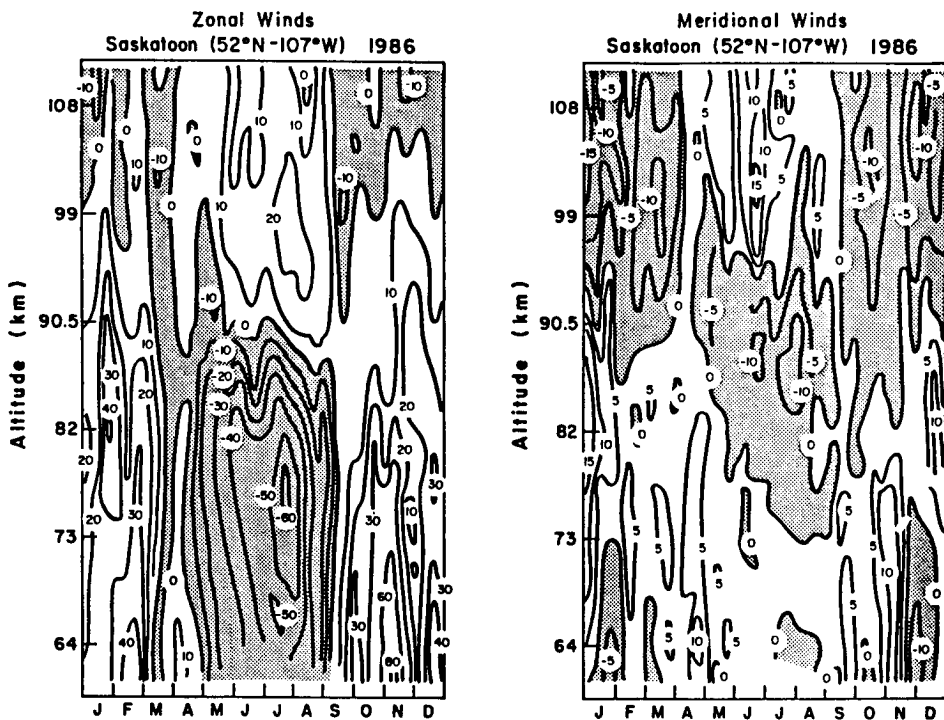


Figure 4. Mean circulation (as for Figure 1).

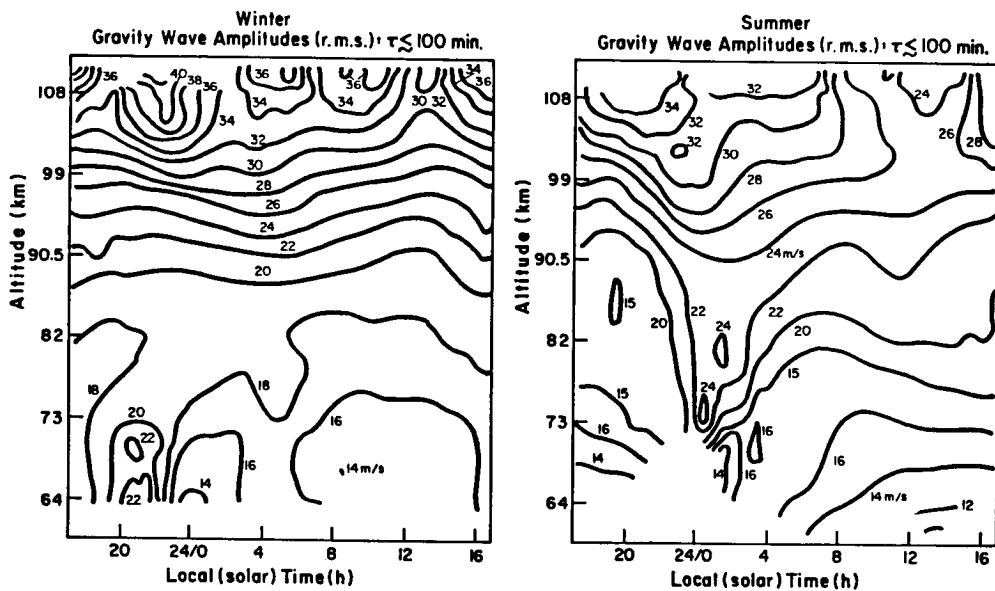


Figure 5. Gravity wave amplitudes 1985/6 (as for Figure 1).