

8.6 LONG-TERM VARIATIONS IN MIDLATITUDE SOUTHERN HEMISPHERE MESOSPHERIC WINDS

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This paper presents the monthly mean zonal winds and semidiurnal tides at 80 and 90 km, in January and July, at Christchurch (44°S) for the period 1978-1986. There are significant trends but evidence for solar control of the mean zonal wind and the semidiurnal tide is not conclusive.

OBSERVATIONS

LOCATION: Christchurch 44S 173E

RADAR: Medium frequency partial reflection spaced antenna mode

TIME-SPAN: 1978 - 1986 (no instrumental changes)

MONTHS: January (summer) July (winter)

HEIGHTS: 80 and 90 km
(with supplementary information from other heights)

Note: Summer night-time noise level restricts
summer tidal analysis to above 85 - 87 km

Models for comparison:

THE MEAN ZONAL WIND:

1. Ageostrophic analysis (C.J.Marks,1988) of
Barnett and Corney (1985) satellite model
2. Koshelkov (1985) rocket data for 40S and 50S

THE SEMIDIURNAL TIDE:

Forbes and Gillette (1982)

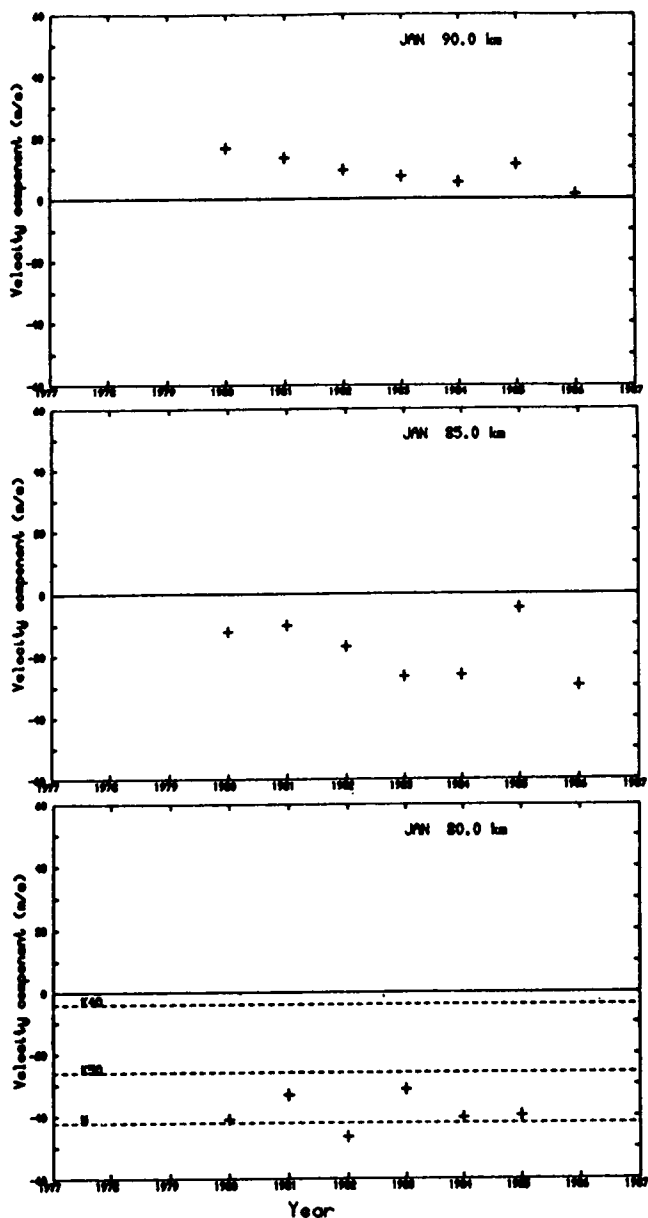


Figure 1. Monthly mean zonal winds in January (summer). At 80 km there is little variation between 1980 and 1986, and agreement with the ageostrophic satellite winds and the 50 S rocket model is good. At 90 km there is a decreasing zonal wind but comparison with 85 km suggests that it may be an increasing easterly trend rather than a decrease in magnitude.

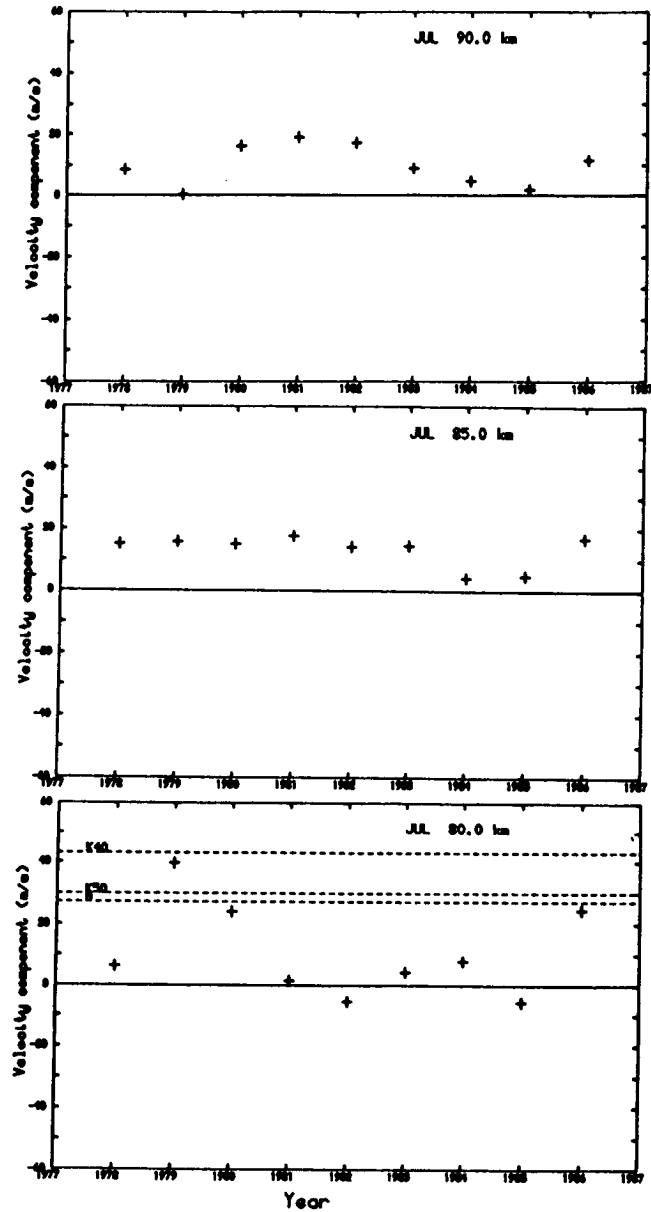


Figure 2. Monthly mean zonal winds for July (winter). At 80 km the winds are variable and agree with the models in only three of the nine years. At 90 km there is a quasi-oscillatory variation with minima in 1979 and 1985. The decreasing trend from 1981 to 1985 resembles that at 90 km in January (Figure 1). At 85 km there is little variation over the nine years apart from the decreases in 1984 and 1985.

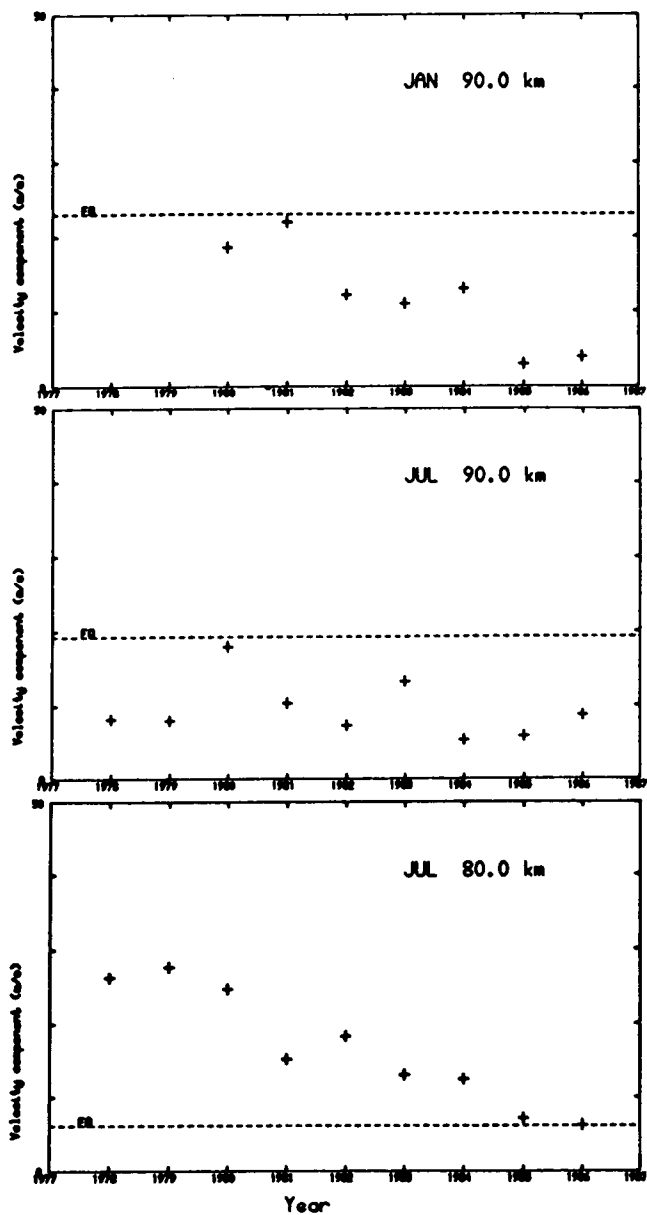


Figure 3. The January semidiurnal tidal amplitude. All three graphs show a general decrease in tidal amplitude over the period studied, to a lesser extent at 90 km in July.

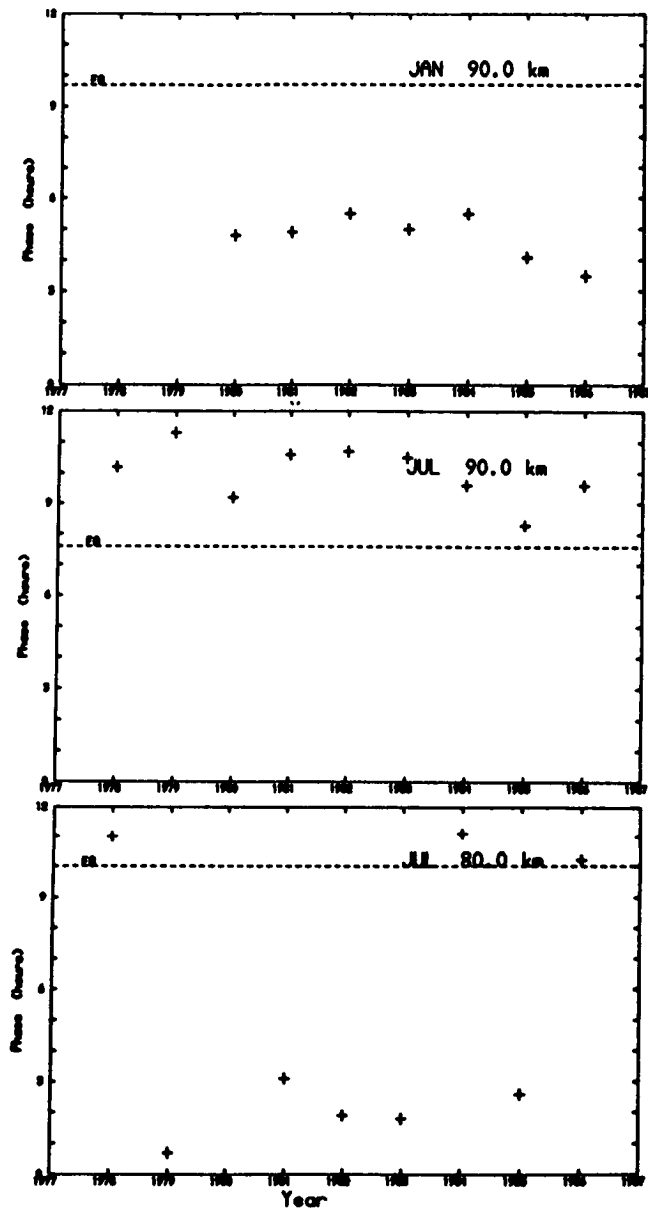
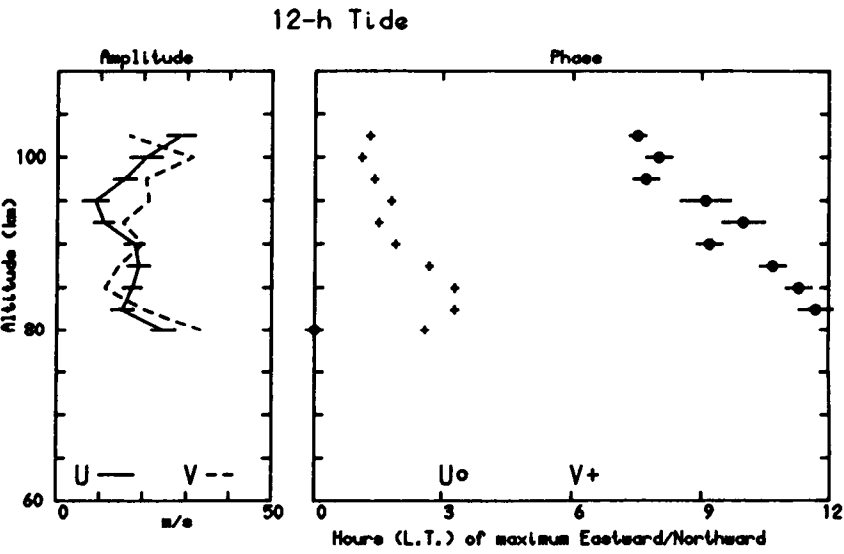


Figure 4. There is no significant trend in tidal phase, in contrast with that observed in the amplitudes (Figure 3).

CHRISTCHURCH 1980 JUL 2 TO 1980 JUL 31



CHRISTCHURCH 1986 JUL 1 TO 1986 JUL 31

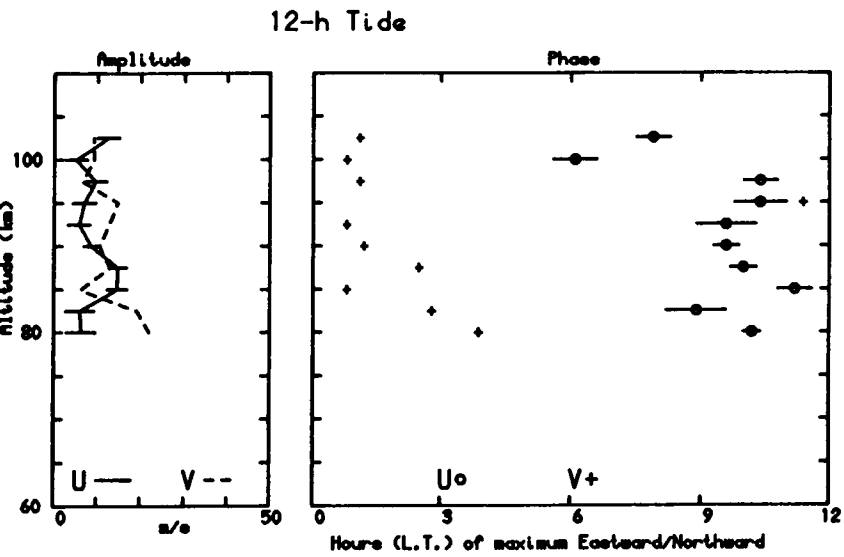


Figure 5. Tidal profiles for July 1980 and 1986. These confirm that the 1986 tides are much weaker than the 1980 tides as shown by the smaller amplitude and fluctuating phase.

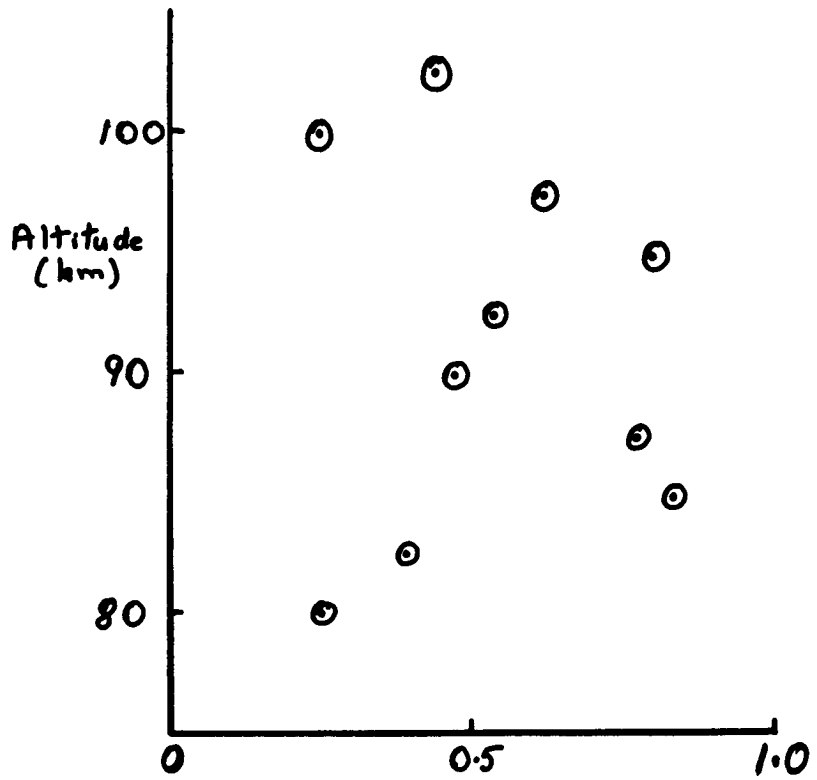
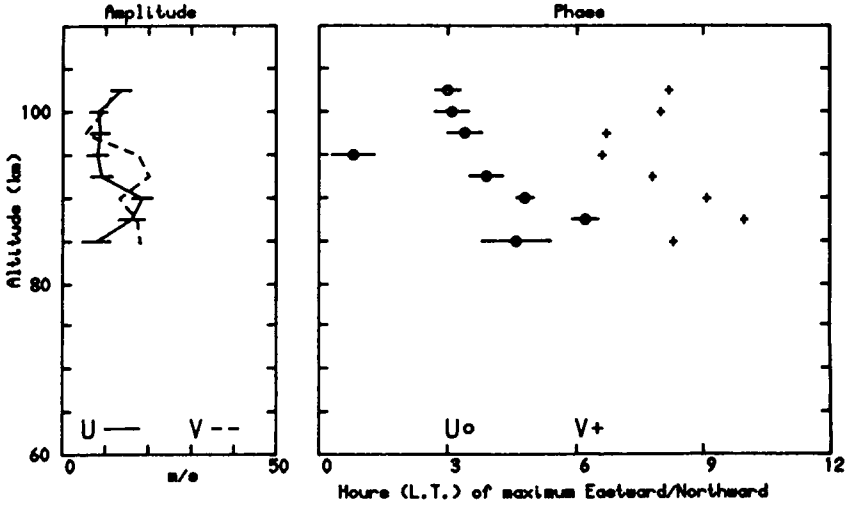


Figure 6. The decrease in amplitude at all heights in July is confirmed by the ratio of 1986 to 1980 amplitudes, taken from the previous diagram. There is some scatter but all the ratios are less than 1.

CHRISTCHURCH 1980 JAN 1 TO 1980 JAN 31

12-h Tide



CHRISTCHURCH 1986 JAN 1 TO 1986 JAN 17

12-h Tide

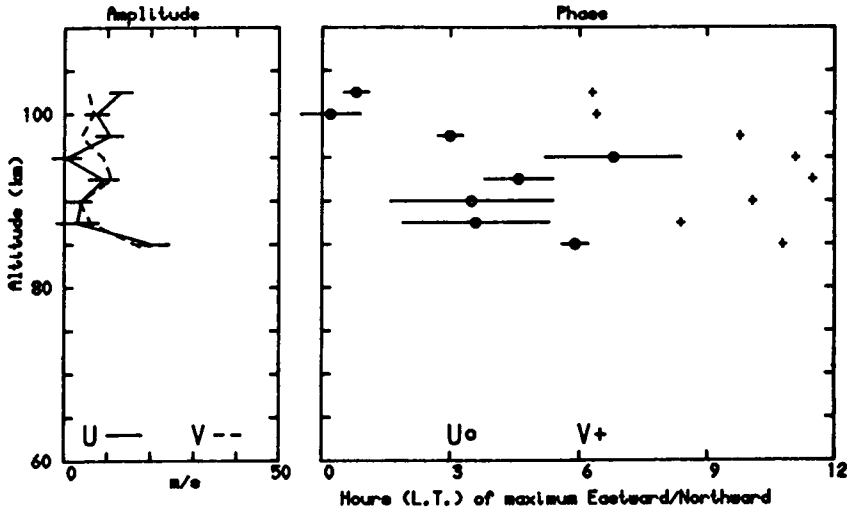


Figure 7. Comparison of the tidal profiles in January is more difficult because the 1986 observations only cover 1 - 17 January and there also are some missing days in that interval. The inadequate nighttime data restricts useful observations to above 85 - 87 km. Within these limitations there is no obvious reduction in tidal amplitude.

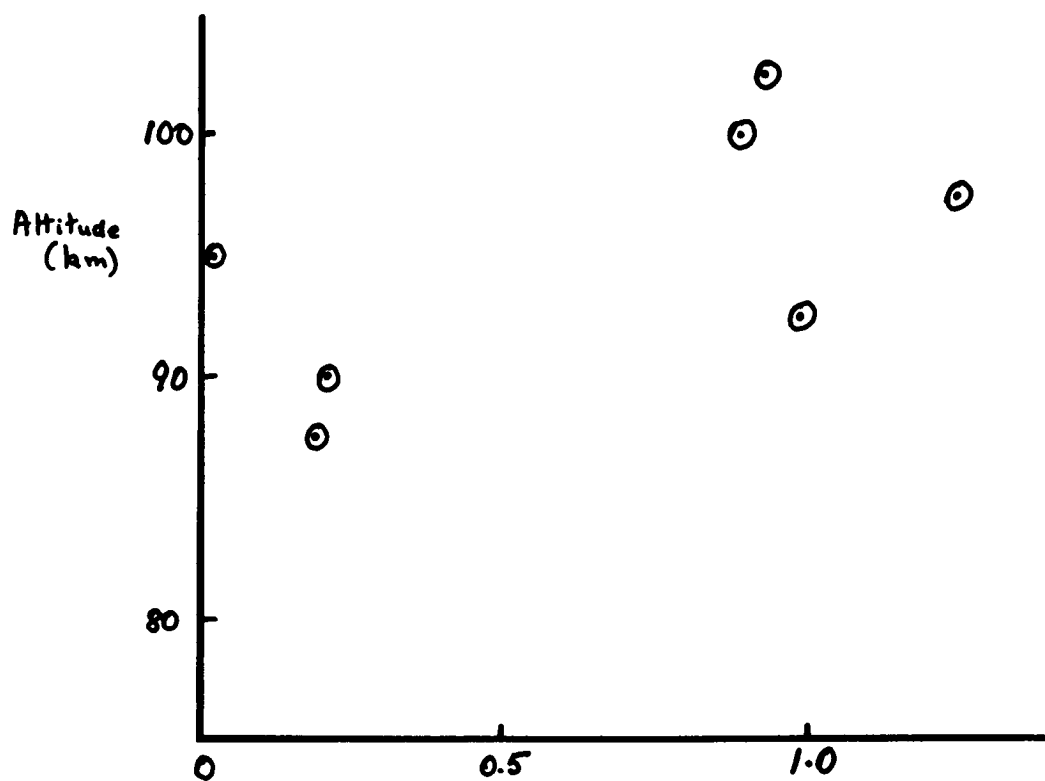


Figure 8. The observational scatter and lack of an obvious trend in January are supported by this plot of the amplitude ratio for 1986 and 1980.