8.2 ASYMMETRIES IN TIDAL STRUCTURE BETWEEN ADELAIDE AND KYOTO

R. A. Vincent

Physics Department, University of Adelaide
Box 498, Adelaide 5001, Australia

Continuous radar measurements of the wind oscillations caused by the solar diurnal and semidiurnal tides in the 80 - 110 km region of the atmosphere at the geographically conjugate stations of Adelaide (35°S, 138°E) and Kyoto (35°N, 136°E) are compared for the period 1983-1985. At the solstices it is found for both the 24- and 12-hr tides that the NS and EW oscillations tend to be in-phase and out-of-phase, respectively, behavior which indicates strong tidal asymmetries. The asymmetries in the 12-hr tide are consistent with a strong contribution from the (2,3) mode while the asymmetries in the 24-hr tide are ascribed to the effects of mean winds and dissipation acting to distort the (1,1) mode as it propagates up through the middle atmosphere.

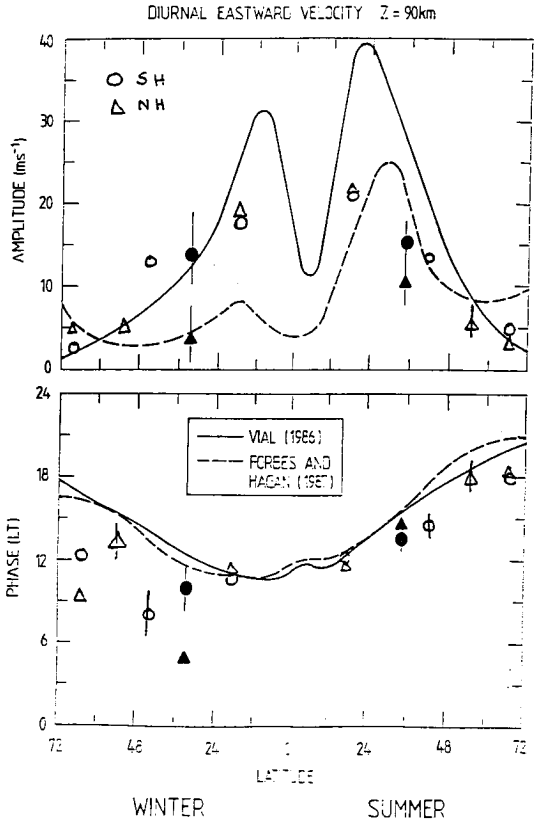

Figure 1. Amplitude and phase of zonal component of diurnal tide at selected stations at solstice compared with recent theory.

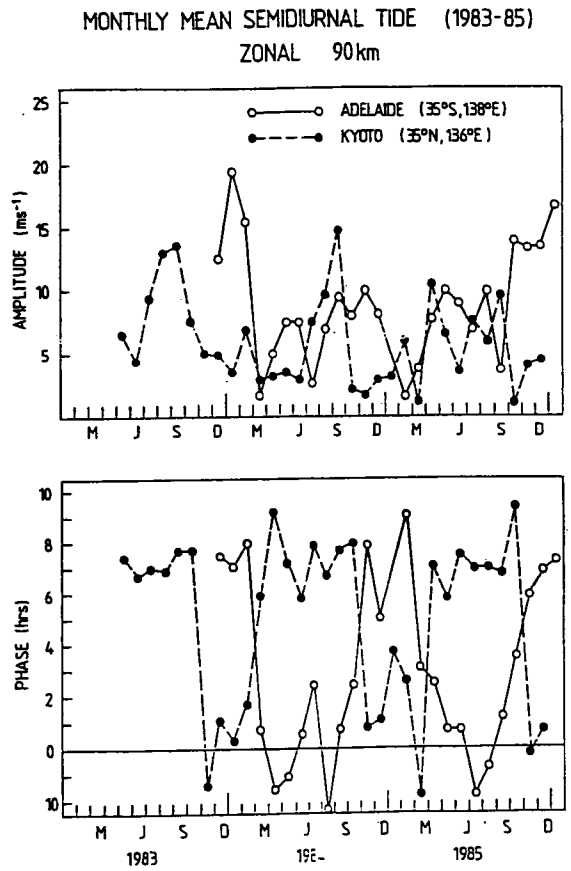

Figure 2. Monthly mean amplitude and phase variations at Adelaide and Kyoto at 90 km.

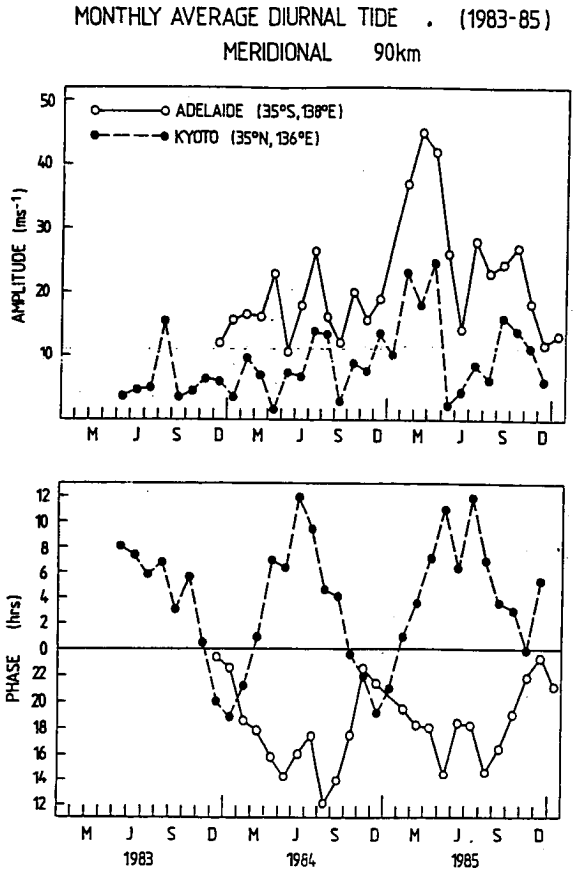

Figure 3. Monthly mean amplitude and phase variations at Adelaide and Kyoto at 90 km.

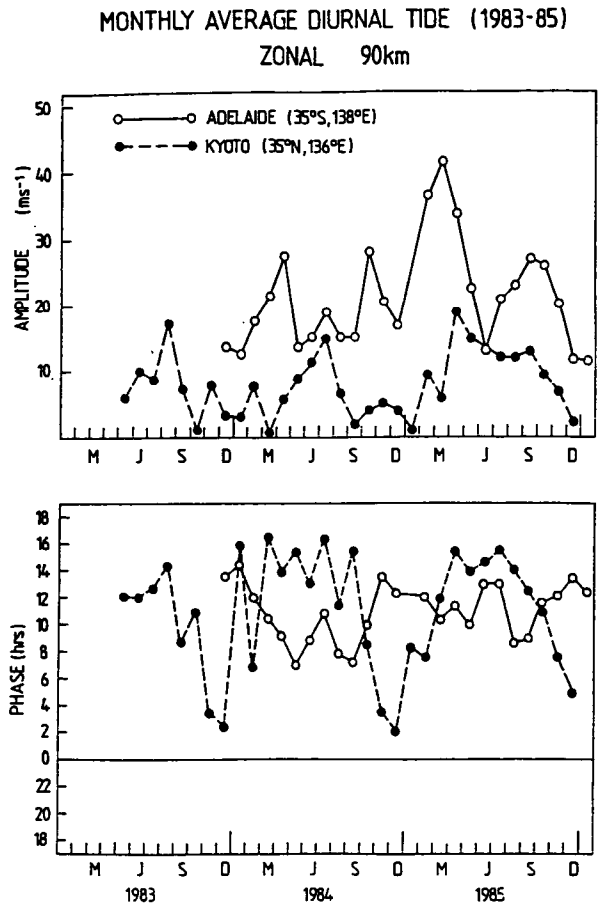

Figure 4. Monthly mean amplitude and phase variations at Adelaide and Kyoto at 90 km.

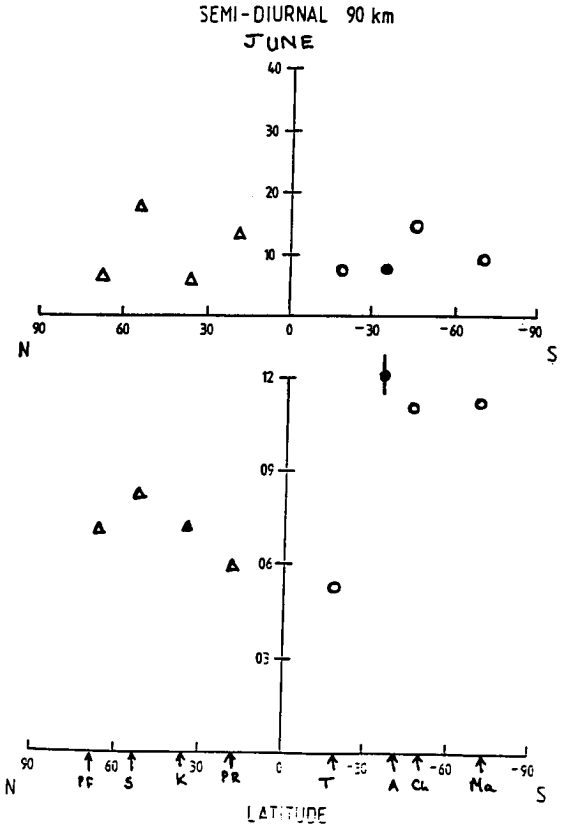

Figure 5. Amplitude and phase of zonal component of semidiurnal tide at selected stations for June solstice.

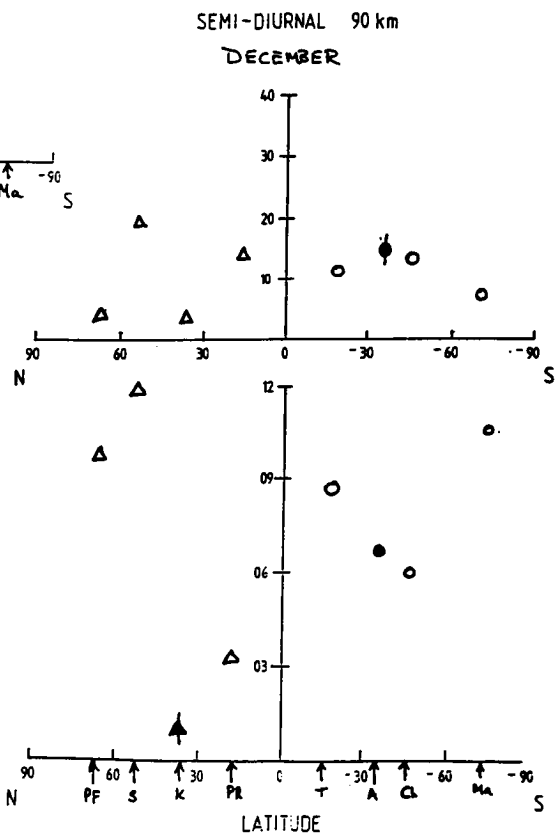

Figure 6. Amplitude and phase of zonal component of semidiurnal tide at selected stations for December solstice.

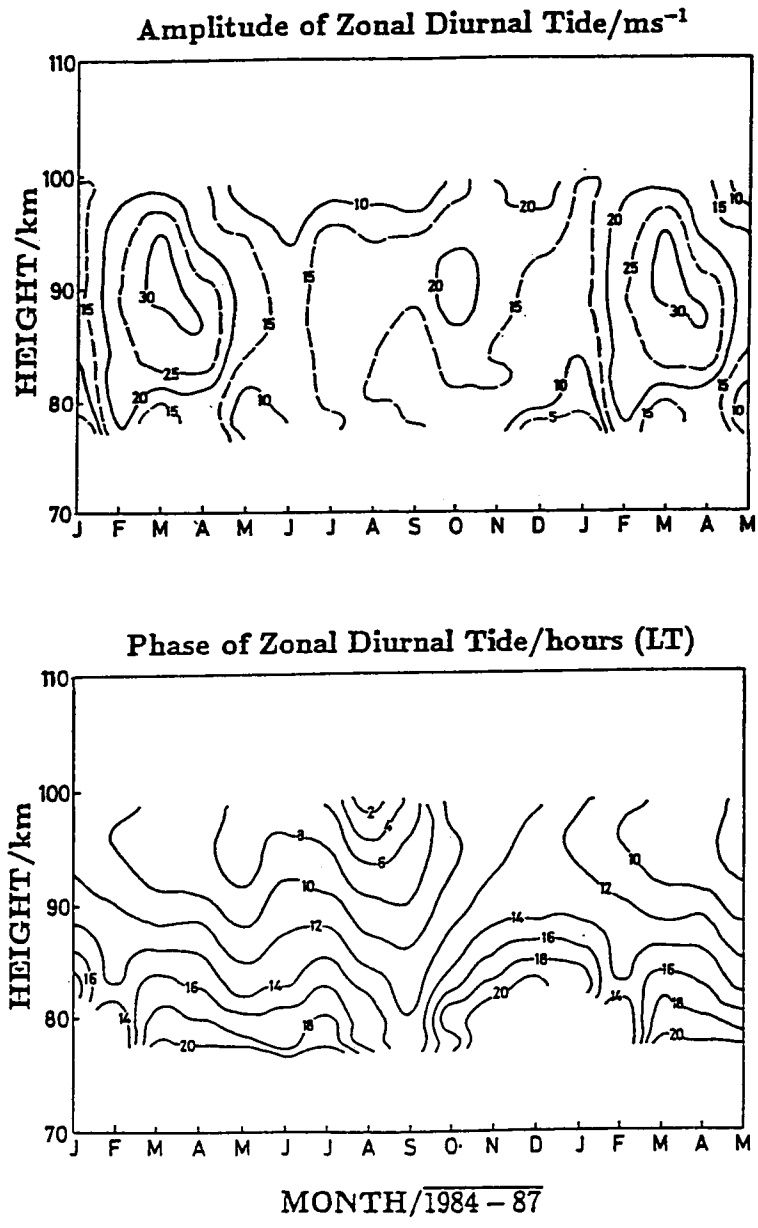

Figure 7. Height-time contour plots of the amplitude and phase of the diurnal tide in the zonal wind component at Adelaide.

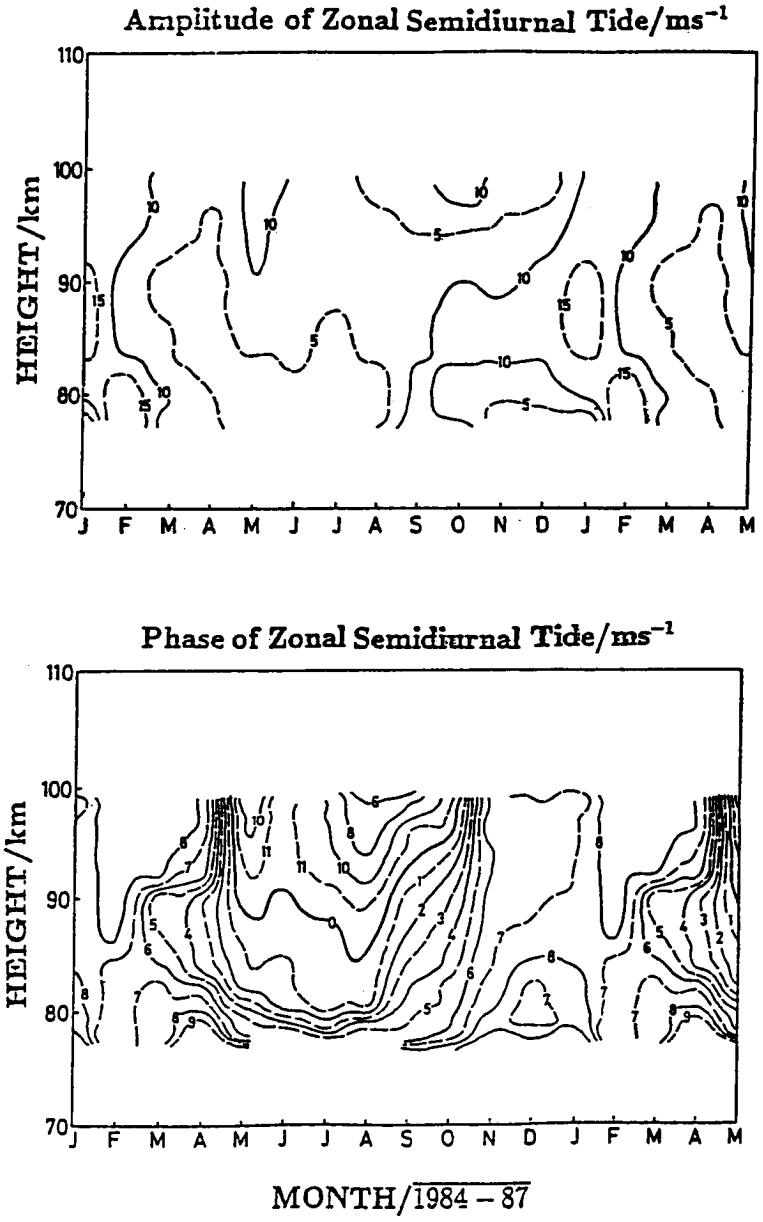

Figure 8. Height-time contour plots of the amplitude and phase of the semidiurnal tide in the zonal wind component at Adelaide.

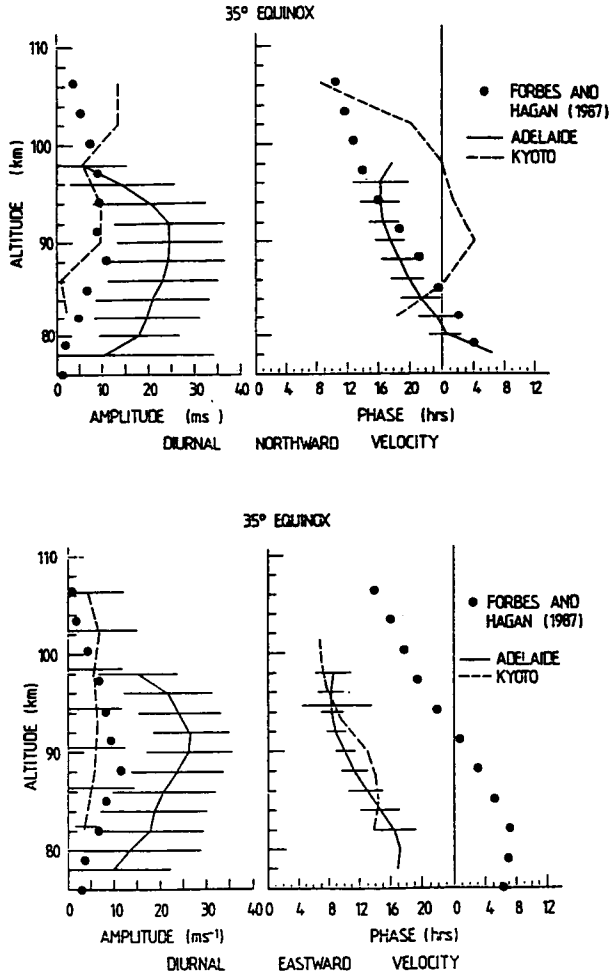

Figure 9. Height profiles of amplitudes and phases.

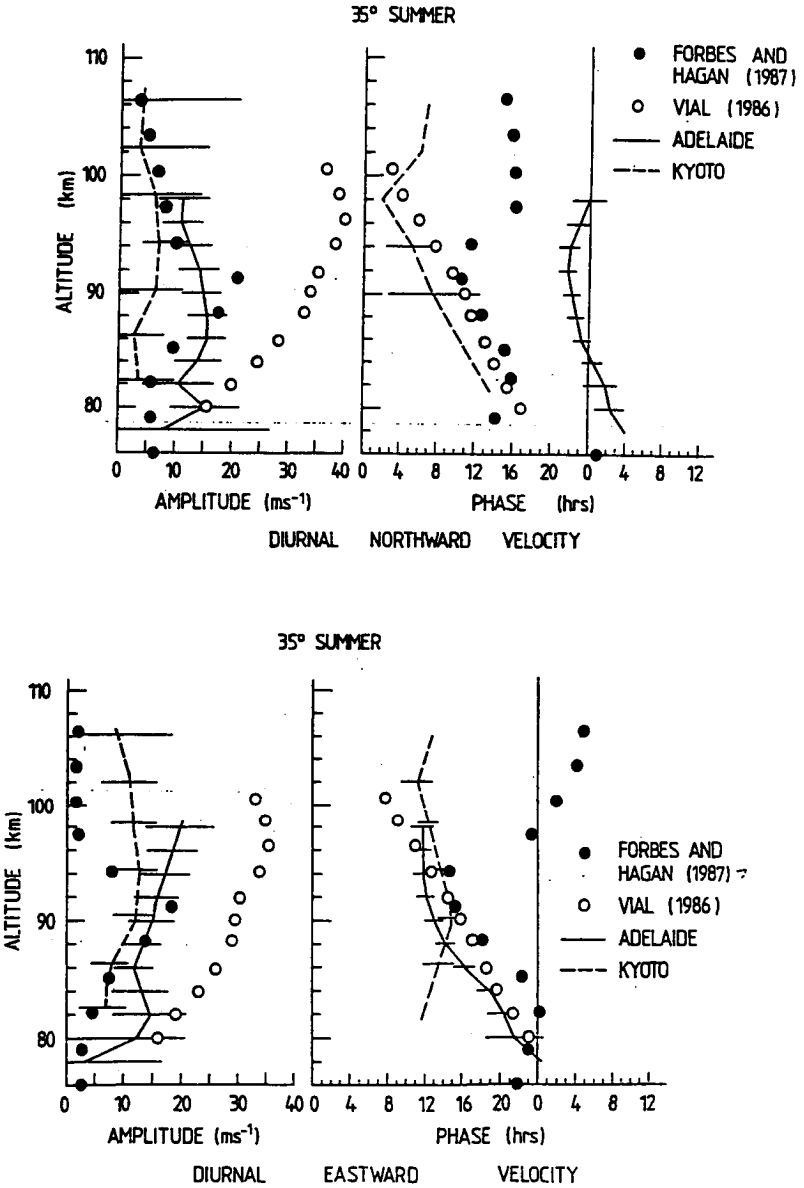

Figure 10. Height profiles of amplitudes and phases

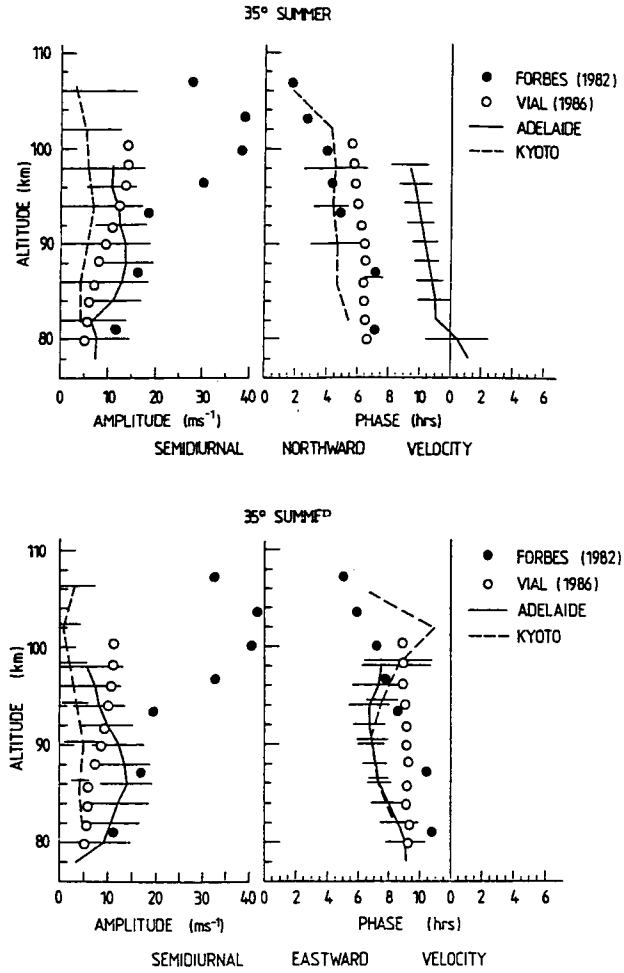

Figure 11. Height profiles of amplitudes and phases.

CONCLUSIONS - DIURNAL TIDE

*Significant phase differences in EW winds

*Amplitudes 2 - 3 times larger at Adelaide
(Lower dissipation in SH?)

*Comparisons with other station pairs gives reasonable agreement with theory

(Mawson, 68°S, Poker Flat 65°N)
(Christchurch 44°S, Saskatoon, 52°N)
(Adelaide, 35°S, Kyoto, 35°N)
(Townsville, 19°S, Puerto Rico, 18°N)

CONCLUSIONS - SEMIDIURNAL TIDE

*EW components out-of-phase

*NS components in-phase

*Vertical wavelengths -
Long in summer
Short in winter

*Phase vs Latitude plots suggest strong asymmetry