

Spectral analysis of atmospheric energy of Mars using MGS TES infrared radiances

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Wavenumber spectra of the atmospheric potential energy of Mars at mesoscales (wavelengths of 61-949 km for the low and mid-latitudes, 61-474 km for the high latitudes) were obtained as a function of latitude, season, and Martian year, using infrared radiance data obtained by MGS TES. The calculated spectra seem to be represented by the superposition of two components with different spectral slopes. The steeper one at large scales has spectral slopes from -2 to -3, while the flatter one at smaller scales has slopes flatter than -1.

The spectral power is relatively enhanced in the high latitudes in winter and equinoxes, suggesting that eddies are generated preferentially in baroclinic zones. At each latitude, on the other hand, seasonal variations in the power are obscured by large interannual variability. The spectral densities near large-scale end range from 0.1 to 3 times the terrestrial equivalent, while those near small-scale end are more variable and range from 0.1 to 100 times the terrestrial value. Enhancement in the spectral power was observed around the storm tracks in the winter in the southern hemisphere.