

## Three-dimensional distribution of temperature disturbances in the northern hemisphere of Mars

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We have analyzed the atmospheric temperature data retrieved from Mars Global Surveyor (MGS) Thermal Emission Spectrometer (TES) nadir spectra, and made latitude-longitude maps of the disturbance amplitude at 0, 10, 20, 30, and 40 km altitudes spanning three Mars years. Additionally, we made maps of latitudinal temperature gradient in a similar way. Temperature disturbance depends heavily on latitude and season, and is strongest at northern high latitudes in winter. This disturbance zone lies on the latitude of approximately 55 degrees north just above the ground, and shifts toward higher latitude with altitude, then reaches the latitude of 65 degree north at altitude of 40 km. It was also found that this disturbance zone is located on the edge of the arctic polar vortex occurring in winter, where the latitudinal temperature gradient is large. This suggests that temperature disturbance is generated in large part by meridional displacement of air in the area where latitudinal temperature gradient is large. We found that the zonal area where disturbance amplitude and latitudinal temperature gradient are large meanders latitudinally. This meandering pattern appears almost the same for three Mars years with equatorward excursions at longitudes of 150 and 345 degrees every year. Besides, the amplitude of temperature disturbance and the latitudinal temperature gradient vary with longitude, and both of them increase at longitudes of 150 and 345 degrees for three Mars years. This indicates that the atmospheric thermal structure in the northern hemisphere has the same pattern every year and that the meandering pattern of disturbance relates in any way to longitudinal variation of latitudinal temperature gradient. Moreover, considering the existence of flat lowlands around the longitudes of 150 and 345 degrees in the northern hemisphere, these longitudinal structures may be generated under the influence of the topography.