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Waves over the summer southern pole of Mars observed by MGS TES

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The characteristics of temperature anomalies with wavenumber 1 encircling the summertime southern pole of Mars is investigated using the datasets of MGS TES retrieved temperature during MY25-26 funded by the NASA Planetary Data System. An example of the temperature disturbances, which was observed at Ls 258.0° of MY 25, is shown on the 0.5 hPa pressure surface (Figure 1a) and on the longitude-altitude plane along the 80°S latitude circle (Figure 1b). We can see that the disturbance is localized near the pole, and it has a westward phase tilt with height and extends to the temperature anomaly near the surface which has the maximum around 180° E longitude. This is the typical feature throughout Ls 245°-290° in both MY 25 and 26, and it seems to be peculiar to the southern polar region. The phase tilt is indicative of planetary waves: actually, previous studies have revealed structures of planetary waves with westward phase tilt that propagate along the westerly jet in winter and equinoxes (e.g. Banfield et al. 2003). However, they suggest the prevalence of weak easterly wind near the summer pole and the wind may not allow the existence of planetary waves. Then, two questions arise: what generates these disturbances near the surface, and why do they propagate upward with westward phase tilt? Possible answers to the first question are the topographical effect of the polar cap and the thermal effect of the asymmetric poleward regression of the polar cap edge in summer (Kieffer et al. 2000; James et al. 2001). The second question can be answered by considering the possible occurrence of weak westerly wind near the summer pole, which might be driven by the thermal contrast across the polar cap edge (Siili et al. 1997).

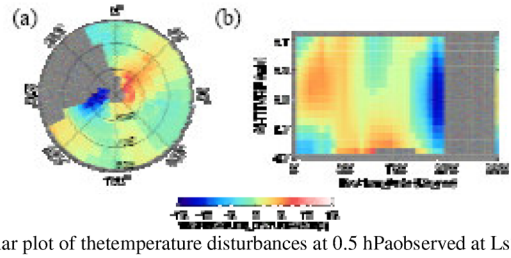

Figure 1: (a) Polar plot of thetemperature disturbances at 0.5 hPaobserved at Ls258.0°of MY25. (b)Longitude-altitude cross section alongthe 80°S latitude.

References

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