

TES Observations of the South Pole

The recession of the south polar cap has been observed telescopically and from spacecraft in both the visible and thermal regions. Although a simple cap-edge versus time plot has commonly been used, without regard as to the longitude of measurement, Mariner 9, Viking, and HST observations clearly show that the retreating edge is irregular and asymmetric.

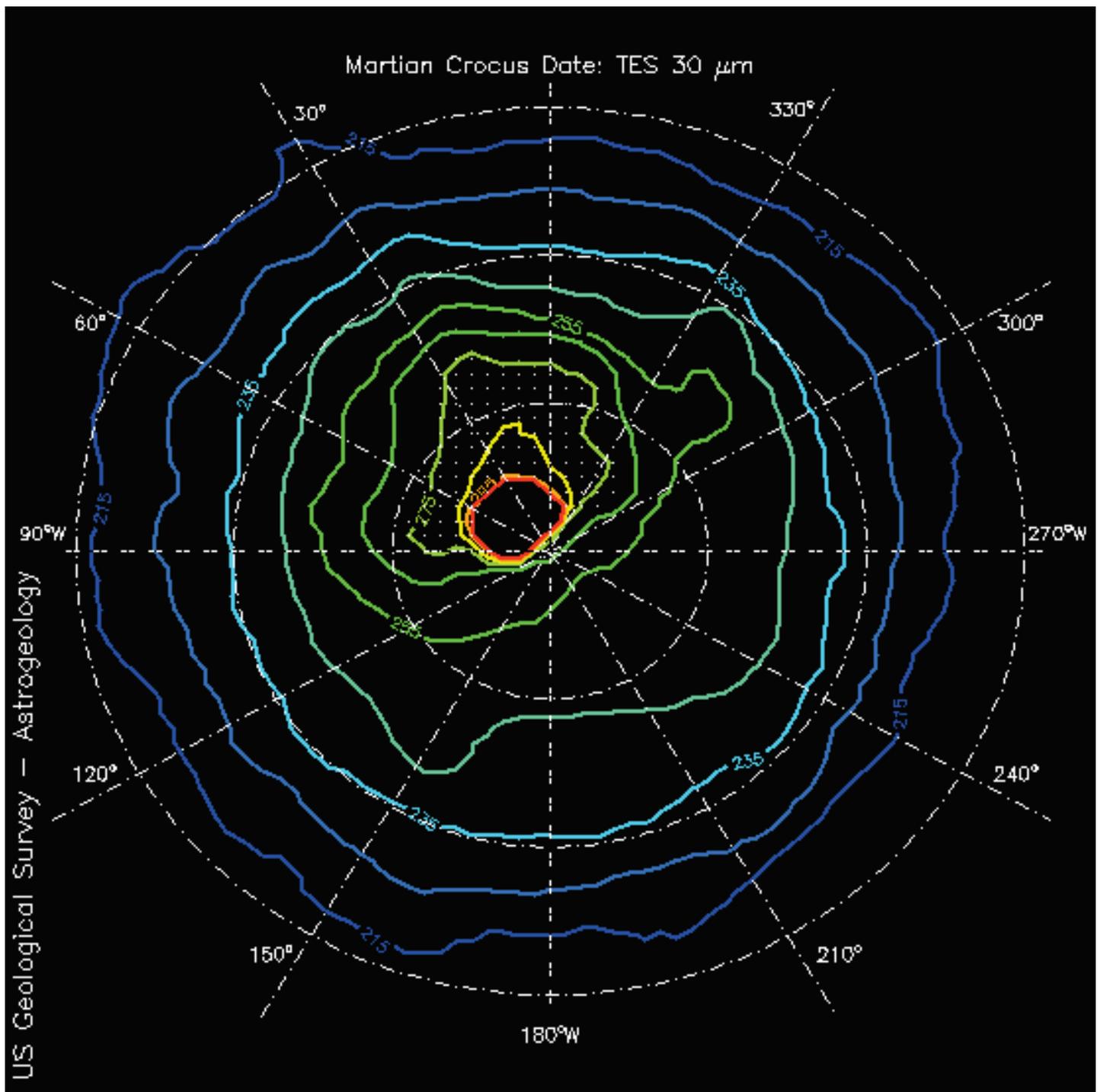
The data used in this analysis is from the Mars Global Surveyor (MGS) Thermal Emission Spectrometer (TES). Repeated TES coverage over the period Ls 185 through Ls 270 acquired much of the cap recession.

During this period of time, TES was taking data in the array normal spin (ANS) mode, scanning across the planet as the satellite made one complete roll every 100 minutes. Therefore, the data was irregularly sampled in both space and time. Also, because of the changes in the spacecraft orbit, the spatial resolution of the data is variable, ranging from 25 to 125 kilometers.

We have constructed a map of the south polar region that contains the date when the last CO₂ sublimates, hereafter called the crocus date. The crocus date is based on sliding a representative temperature - versus - time curve along the observations for each location in the polar region and selecting the season of maximum temperature change.

Recessions in the classic area “Mountains of Mitchell” are delayed significantly, disappearing approximately at Ls 260. High resolution (26 Km) brightness temperature data at Ls 244 confirms that solid CO₂ is the dominant cold component.

One region (approx. 72-80 S, 180-250 W) within the annual polar cap became dark long before the temperatures begin to rise; in comparison with most areas that showed a gradual increase in brightness until a rapid darkening as the temperature rose well above CO₂ frost value. This dark region, here after called the Cryptic region, appears to be a major contributor to the asymmetric polar recession. The cause of the Cryptic region's unexpected behavior is currently under study.



This plot shows the cap edge as a function of season. The data used was 30 μ mpre-mapping TES data. The contour lines are spaced at 10 degrees of L_s , starting with 215 as the dark blue contour. A small region between L_s 275 and L_s 295 has been *shaded* to indicate that this region has a large error in our estimate of the cap edge. A table below has been provided so that you can easily convert L_s into a Earth calendar date.

CONVERSION TABLE FROM L_s TO EARTH CALENDAR DATE

L_s	Last Martian Year	This Martian Year
215	Nov 10, 1997	Sep 28, 1999
225	Nov 26, 1997	Oct 14, 1999
235	Dec 12, 1997	Oct 30, 1999
245	Dec 28, 1997	Nov 15, 1999
255	Jan 13, 1998	Dec 1, 1999
265	Jan 29, 1998	Dec 17, 1999
275	Feb 14, 1998	Jan 2, 2000