circuit of the globe. This scenario probably requires that the dust supply in Hellas was adequate to provide for a large daily removal during the two-week period that it takes for these storms to encircle Mars. It may be that storms that died out earlier did so because there was not enough dust in Hellas at that time.

Hellas is a traditional name for a bright albedo feature now known as Hellas Planitia. Not everyone is aware, however, that this area is not always bright, and sometimes is not even lighter than its surroundings. Hellas was bright during the Viking and Mariner 9 missions, which, of course, took place during dust-storm years. During Mariner 9 and after the global storm, the basin floor was covered with so much dust that almost no detail showed. In recent years, during which no encircling storms have been observed, Hellas has become less prominent and smaller as an albedo feature. We assume that this means that it contained less dust and possibly not enough to support a runaway dust storm. The albedo of this basin should be closely monitored, especially during the season of the south polar cap's recession.

Predicting major dust storms seemed easier when we knew less about them. We can probably expect this trend to continue. The possible indicators of impending storms discussed above may be helpful, however, and perhaps should be taken seriously in the event that all signs are positive at once.

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References: [1] Zurek R. W. and Martin L. J. (1993) *JGR, 98,* 3247–3259. [2] Martin L. J. and Zurek R. W. (1993) *JGR, 98,* 3221–3246. [3] Martin L. J. and Richardson M. I. (1993) *JGR, 98,* 10941–10949. [4] Martin L. J. et al. (1992) *LPI Tech. Rpt. 92-02,* 99–100.

STUDIES OF ATMOSPHERIC DUST FROM VIKING IR THERMAL MAPPER DATA.

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Following earlier work to map the dust opacity of the Mars atmosphere [1], a number of separate studies have been performed employing the radiometric measurements of the Viking IR Thermal Mappers: (1) extension of global opacity mapping to the entire Viking mission period; L_s 84° in 1976 until L_s 210° in 1979—a span of 1.36 Mars years—with 5° L_s resolution [2]; (2) isolation of opacity behavior at the inception of the two major storms 1977a and 1977b [2]; (3) determination of the effects of topography on the opacities [3]; (4) computation of the mass of dust raised by both local and global dust events [4,5]; and (5) mapping of local dust storm opacity using individual IRTM sequences to provide "snapshots" [5].

These efforts have resulted in a new perspective on the atmospheric dust distribution during the Viking mission, as well as quantitative measures useful in the modeling of likely behavior at other times, and improved boundary conditions for circulation models of Mars. Among the significant findings are these: (1) Confirmation of the persistent dust present in Hellas, as seen frequently in Earthbased observations. A new storm was detected there prior to the 1977a event; however, Hellas seemed less obscured during the 1977a storm than its surroundings. (2) Opacity mapping confirms other evidence that the 1977a and 1977b storms commenced in southern midlatitudes and grew laterally. (3) Minimal opacity increases at the southernmost latitudes provide evidence against significant poleward dust transport during the major 1977 storms. (4) Continued high opacity in equatorial latitudes during later stages of the 1977b storm, consistent with findings from Mariner 9, supports the hypothesis that dust is lofted by diurnal tides [6]. (5) Dust raising appears to be ubiquitous in high northern latitudes during northern spring and summer. This is evidence for significant surface wind stress. (6) Considerable differences in opacity exist between the first and second Mars years observed by Viking, with clearer conditions in the latter. (7) As expected, topography influences observed opacities during relatively clear periods, but the correlation disappears during major storms. (8) Approximately 10^{12} kg of dust were raised at the peak of the 1977b storm, corresponding to 800 kg/km^2. The variation of atmospheric dust loading can be portrayed by computing total dust mass as a function of time from the set of 5° L_s opacity maps (see Fig. 1). (9) The well-known L_s 226° (1977) local dust storm raised about 1.6×10^8 kg of dust.

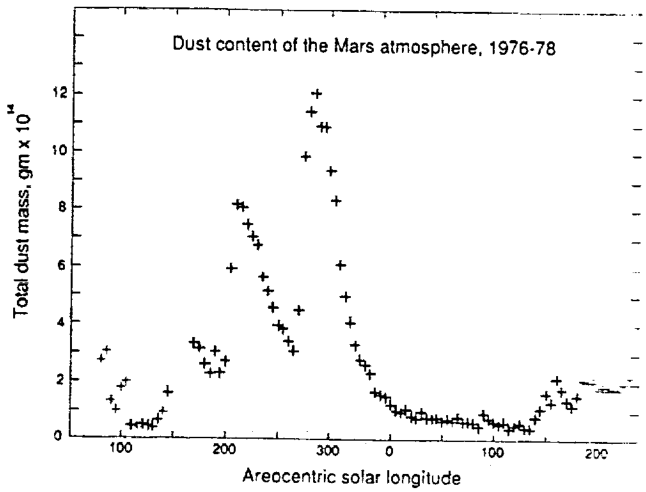

Fig. 1.

While the temporal and spatial coverage of the mapping was not ideal for tracking the development of dust storms, the opacities derived from IRTM data offer good characterization of the general character of martian atmospheric changes. The value of doing both synoptic "snapshots" and systematic coverage is demonstrated.

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References: [1] Martin T. Z. (1986) *Icarus, 66,* 2. [2] Martin T. Z. and Lachin A. (1992) *Bull. AAS, 24,* 1009. [3] Martin T. Z. and Richardson M. I. (1993) *JGR, 98,* 10941. [4] Martin T. Z. (1993) *LPI Tech. Rpt. 93-05,* in press. [5] Martin T. Z. and Lachin A. (1993) *Bull. AAS,* in press. [6] Anderson E. and Leovy C. (1978) *J. Atmos. Sci., 35,* 723.