EFFECTS OF METEOR SHOWERS ON THE MARTIAN IONOSPHERE: RESULTS FROM THE 2007 MARSIS OBSERVATIONS. J. R. Espley[1], W. Farrell[1], J. Vaubaillon[2], J. Grebowsky[1], D. D. Morgan[3], J. Plaut[4]
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Meteor showers have long been observed to have significant effects on ionospheres. In particular, the ablated meteoric materials are expected to produce temporary layers of metallic ions. These layers would then increase the total ion content of the ionosphere. This increase in total ion content could then absorb or attenuate radar signals propagating through the ionosphere. The MARSIS radar experiment onboard Mars Express operates at frequencies that might be expected to be affected in such a manner.

Detailed modeling shows that dusty debris from comet (D/1978 R1) Haneda-Campos could have plausibly produced a meteor shower at Mars in late June through early July of 2007. The figure shows the expected distribution of dust fluxes within the ecliptic plane as the comet track passes near Mars' orbit. The numbered dots are the locations of Mars on particular days (using the convention that the day of month is listed first and the month after the slash). Thus we might expect unusual signals in the MARSIS data from the time period of June 28 to about July 4. However, we find no such signals and see that instead the surface sounding mode observations are quite clear for those days.

A number of interpretations are plausible to explain this result. It is possible that the comet's trajectory has been perturbed since it was last observed. It is possible that the relative velocity of the dust was insufficient to produce sufficient ablation. Assuming that the shower did occur as predicted and since the MARSIS attenuation was not seen, we can calculate upper limits for ion densities for given altitude profiles. We discuss the implications of these different interpretations and discuss the possibilities for future observational opportunities.

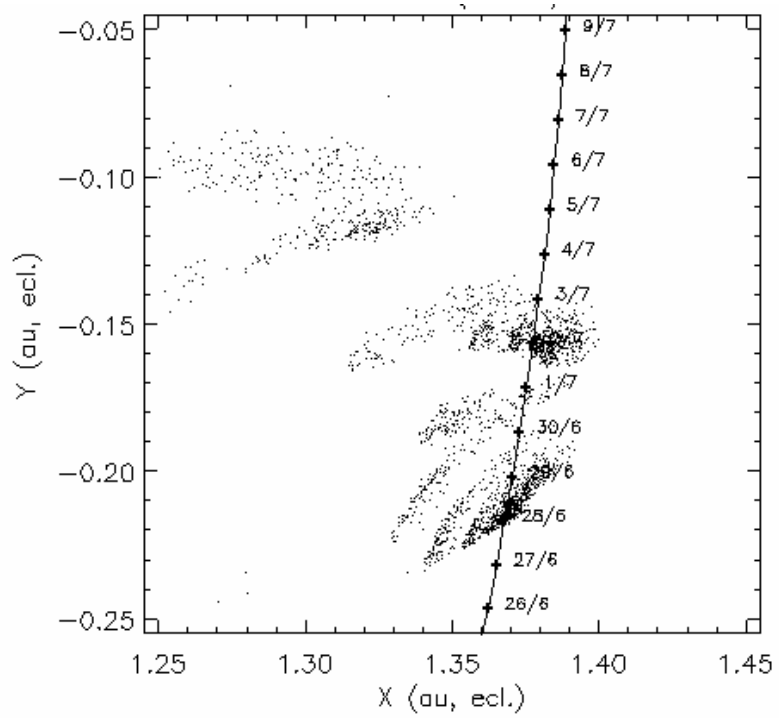

Figure 1. The expected distribution of dust fluxes within the ecliptic plane as the comet track passed near Mars' orbit. The numbered dots are the locations of Mars on particular days (using the convention that the day of month is listed first and the month after the slash)