

# Optical properties of the Martian aerosols as derived from Imager for Mars Pathfinder midday sky brightness data

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## Abstract

The Imager for Mars Pathfinder (IMP) obtained data on the midday sky brightness in filters centered at 443.6, 481.0, 670.8, 896.1 and 965.3 nm. Useful data sets were returned on sols 27, 40, 56, 65, 68, 74, and 82 (Table 1).

**Table 1.** IMP Data Sets Obtained With the Imaging Sequence S0283

Sol	Number of Images	LST		Sun elev. [°]	
		Start	Stop	Min	Max
27	60	1213:52	1241:40	76.81	79.65
40	42	1201:49	1230:32	75.74	77.67
56	60	1201:37	1230:25	72.43	74.12
65	60	1213:20	1242:02	68.92	70.50
68	60	1208:11	1237:12	69.42	69.78
74	60	1203:31	1232:23	68.04	68.36
82	48	1203:07	1231:55	65.80	67.16

Data from sol 56 (Figure 1) were fitted with multiple scattering radiative transfer calculations, to extract the size distribution, optical properties and shape of the aerosols suspended in the atmosphere [1]. The derived effective radius of the particles was found to be  $1.71+0.29/-0.26\mu\text{m}$  with an effective variance of  $v_{\text{eff}}=0.25+0.05/-0.1$ . The derived single scattering phase function was more compatible with plate (clay) like particles rather than equal dimensional particles. The analysis by [1] assumed a simple single-component dust atmosphere. The data-model

residuals exhibited, albeit weak, wavelength dependence (Table 2). This dependence can be interpreted as an indication that during the time the analyzed images were taken, the dust particle distribution was bimodal or that the Martian atmosphere contained a second component, possibly submicron ice particles, in the aerosol's population. Here we will present analysis of the data from the remaining 5 sols.

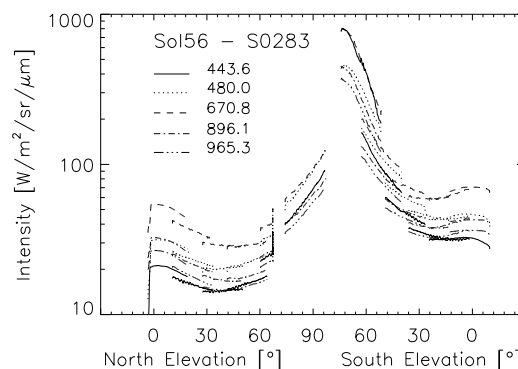


Figure 1: The complete set of pre-calibration data from S0283 obtained on sol 56. Curves are labeled by center wavelength of the filter.

## References

- [1] Markiewicz et al., JG, Planets, 104, 9009-17, 1999.

**Table 2.** The Optical Depth and Single Scattering Properties Derived from Sol 56 Data

$\lambda$ $\mu\text{m}$	$\tau$	$r_{\text{eff}}$	$v_{\text{eff}}$	$b$	$\theta_{\text{min}}$	$n_i$	$Q_{\text{ext}}$	$Q_{\text{sca}}$	$\langle \cos \theta \rangle$
443.6	0.56	1.45	0.28	0.042	170	0.015	2.80	2.09	0.77
481.0	0.60	1.66	0.30	0.051	140	0.009	2.84	2.30	0.75
670.8	0.59	1.60	0.15	0.052	160	0.0032	3.00	2.80	0.73
896.1	0.61	1.85	0.25	0.046	220	0.0038	3.10	2.89	0.74
965.3	0.60	2.00	0.26	0.044	230	0.0024	3.20	3.07	0.72