DUST PROPERTIES OF COMETS 55P/TEMPEL-TUTTLE AND 103P/HARTLEY 2. M. Fomenkova, R. Sokolov, J. Sarmecanic, M. Wang, and B. Jones, Center for Astrophysics and Space Sciences, 0424, University of California San Diego, La Jolla CA 92093-0424.

Cometary bodies consist of ices intermixed with dust grains and are thought to be the least modified solar system objects remaining from the time of planetary formation [1]. Studies of the structure and composition of cometary dust grains confirm the view that cometary solids are among the most primitive, unaltered solar system materials.

Imaging of comets in the thermal IR wavelength range (10-20 μm) is a valuable tool for studying the morphology of cometary comae, the properties of dust and of the nuclei. We observed comets 55P/Tempel-Tutle and 103P/Hartley 2 with the UCSD mid-IR camera "Golden Gopher" at the 1.5-m telescope of Mt. Lemmon Observatory. The data were acquired during seven nights in January 1998 through the 8.7, 10.3, 11.7, and 12.5 μm filters.

Comet 55P/Tempel-Tuttle is a Halley-family comet with a period of about 33 years. It is the parent comet of the prominent Leonid meteor stream. We observed this comet pre-perihelion when the heliocentric distance decreased from 1.16 to 1.11 AU while the geocentric distance increased from 0.40 to 0.53 AU. Comet 103P/Hartley 2 is a Jupiter-family comet with a period of about 7 years. This comet was observed post-perihelion when the heliocentric distance increased from 1.09 to 1.12 AU while the geocentric distance was 0.7 AU.

It is known from spacecraft measurements of comet Halley that silicate and carbonaceous materials are the two major constituents of cometary grains [2]. We found that quasi-simultaneous multiwavelength observations in the mid-IR wavelength range provide a convenient tool for studying the proportion of solid organics in comets [3]. The ratios of the thermal fluxes measured through our filters are strong functions of particle size, and put limits on the size for a given composition. A comparison of these ratios with model Mie scattering calculations yields the sizes of the predominant grains of each constituent, and the relative mass fractions of these constituents can be determined. Parameters of cometary dust obtained from the best fit to the January 24, 1998 data are given in the Table. Note that we cannot fit the data using a single grain composition. We will present the best fits for other nights and discuss the variability of cometary emission.

Cometary comae are optically thin in the mid IR range, so that the nucleus is seen "through the coma". The size of the nucleus can be estimated by calculating a contribution to the total thermal flux from the dust grains (i. e. extended source) and attributing the residual flux to the nucleus (i. e. point source) [4]. We will attempt to estimate the size of the nucleus for both comets. For comet 55P/Tempel-Tuttle we will also discuss the connections between our results and the properties of the Leonids meteor stream.

REFERENCES

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TABLE
Best Fit Parameters of Cometary Dust

	Tempel-Tuttle	Hartley 2
Temperature, K	300	260
Superheat *	15%	0
Mass loss rate, kg/s	30	45
Silicate excess, mag	0.4	0
Average size of silicate grains, μm	2	
Average size of carbonaceous grains, μm	5.5	
Mass fraction of silicate grains	40%	

* - Superheat is the ratio of $(T_{comet} - T_{bb})/T_{bb}$, where T_{bb} is the blackbody temperature corresponding to a given heliocentric distance