WIDE-FIELD INFRARED SURVEY EXPLORER (WISE) OBSERVATIONS OF COMET 65P/GUNN.

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Introduction: The Wide-field Infrared Survey Explorer (WISE), launched in December, 2009, completed its cryogenic-phase survey of the whole sky at the end of September, 2010. During this period it observed dust emission from many comets and their debris trails. WISE observes in four spectral bands (W1, W2, W3, W4) centered at 3.4, 4.6, 12, and 22 μm [1], the latter two bands being particularly sensitive to thermal emission from dust in the inner solar system.

This paper discusses observations of the short period comet 65P/Gunn. The comet, shown in Figure 1, exhibits a bright coma and tail structure, and a narrow trail of debris leading it in its orbit. The debris trail is observed by WISE to extend more than 20° behind the coma. Studies of comet debris trails [2], [3], and [4] have given us new insight into the nature of the composition of comets and their role in the formation and maintenance of the zodiacal cloud.

Figure 1. A three-color composite of WISE images of 65P/Gunn (4.6 μm is blue, 12 μm is yellow, and 22 μm is red). The field is 47' square.

This paper discusses the morphology of 65P/Gunn, its nucleus, dust production rate, ejected dust velocities, particle size distributions, and dynamical models of the coma and its infrared brightness distribution. W1 and W2 are used to constrain the thermal continuum while W3 constrains the contribution to the coma from hot small grains such as those observed in Hale-Bopp. W1 is dominated by dust scattered light. W2 also includes emission from the CO2 ν3 vibration band at 4.26 um, and the CO 1-0 fundamental band at 4.67 um. We discuss the implications of these bands for an infrared coma model.

Coadding pixels at common delta mean anomalies parallel to the orbit, we measure the trail radiance profile as a function of delta mean anomaly and derive: (1) the velocity of the grains normal to the plane of the orbit, and the distribution of grains along the plane of the orbit, (2) the temperature and optical depth of the grains, (3) the mass of the trail interior to the total delta mean anomaly of the observations, (4) the size and age of the trail particles, (5) the comet mass loss rate due to trail debris, and (6) the dust to gas mass ratio.

References:

[1] Wright, E.L., et al. (2010) *A.J.*,140,1868-1881.
[2] Sykes, M.V. et al. (1992) *Icarus* 95, 180-210.
[3] Sykes, M.V. et al. (1986) *Science*, 232, 115-117
[4] Reach,W.T. et al. (2007) *Icarus*, 191, 298-322

Additional Information:

This publication makes use of data products from the Wide-field Infrared Survey Explorer, which is a joint project of the University of California, Los Angeles, and the Jet Propulsion Laboratory/California Institute of Technology, funded by the National Aeronautics and Space Administration. This publication also makes use of data products from NEOWISE, which is a project of the Jet Propulsion Laboratory/California Institute of Technology, funded by the Planetary Science Division of the National Aeronautics and Space Administration.