
Dust Trail of *Stardust* Cometary Sample Return Mission Target:
81P/Wild2

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We have succeeded in detecting a dust trail along the orbit of the short period comet 81P/Wild 2, target of the Stardust mission, which will fly by 81P/Wild 2 in 2004 January. This is the first discovery in optical wavelengths for which an IR counterpart (such as from IRAS) has not been reported. The detected trail extends from the nucleus to a point 2.3 degree (0.14 AU) back along the orbit. Its width is 9" (1.4×10^4 km) near the nucleus. Based on a comparison between models and the observed properties of the dust trail, it is likely that the trail is composed of dust particles with a diameter of ~ 1 mm (corresponding to 0.5 mg in mass). During the fly-by phase of the Stardust spacecraft, it is likely that the spacecraft will experience impacts of such particles along the comet's orbit as well as from smaller grains in the cometary coma. With an impact velocity of trail particles of 6.1 km/s, the impact fluence of 0.5 mg trail particles onto the Stardust spacecraft will be ~ 0.80 day⁻¹ inside the dust trail. However, the Whipple bumper shields should prevent physical disruption of the spacecraft by impacting particles of up to 1 cm in size. Thus, unless the 1 mm trail dust impacts cause severe attitude control problems for the spacecraft, they may not be critically hazardous to the mission but instead may provide a unique opportunity for the first in situ flux measurement of a comet dust trail, using Whipple bumper shield dust flux monitors.