A DETERMINATION OF THE NUCLEAR SIZE OF COMET HALE-BOPP (C/1995 01)

Z. SEKANINA

Jet Propulsion Laboratory, California Institute of Technology, Pasadena, Calif., U.S.A.

A deconvolution technique, described in Sekanina (1995), has been applied to six images of the near-nucleus region of this comet, obtained with the Hubble Space Telescope's (HST) WFPC-2 in the PC mode (0.0455' arcsec per pixel) between 23 October 1995 and 17 October 1996. From five images in the period of October 1995--September 1996, the $R_{Cousins}$ nuclear magnitudes, reduced to opposition and to 1 AU from Earth and the Sun using a phase coefficient of 0.035 mag/deg and an inverse square distance law, are found to average 9.46 ± 0.09. This result becomes 9.50 ± 0.08, if the nucleus signal on the October 1995 image consisted of combined contributions from two unresolved nuclear components (cf. Sekanina 1998). In either scenario, no systematic variations are apparent in the nuclear brightness with time, which suggests the absence of any significant contamination by the ambient coma. From the October 1996 image, the $R_{Cousins}$ nuclear magnitude is derived to be 10.13. Assuming a geometric albedo of 0.04, the corresponding effective diameter is 72 ± 3 km (formal error) from the October 1995-September 1996 images and 53 km from the October 1996 image. These numbers substantially exceed the size estimates published by Weaver et al. (1997), which are based on only the October 1995 observation and a different reduction, method. The runs in" which a power law for the extended source was assumed to be valid down to a small fraction of a pixel from the peak brightness yielded distinctly inferior solutions.