

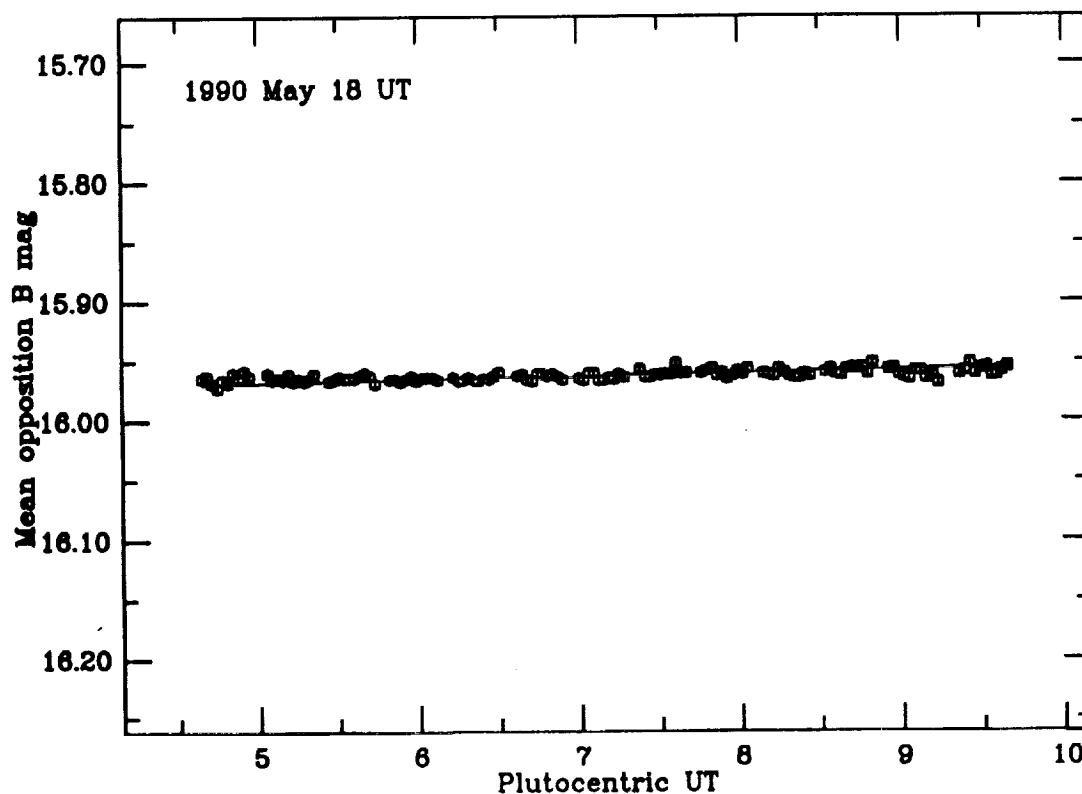
N92-12889

1990 Marks End of Pluto-Charon Mutual Event Season D. J. Tholen

From late 1984 until late 1990, the orbit of Pluto's satellite Charon was sufficiently close to an edge-on configuration, as seen from Earth, to produce transit, occultation, and eclipse events involving the two objects. The systematic observation of these events, each of which offers a unique geometry of Pluto, Charon, and shadow, has been used to directly measure several parameters of the system.

With data now available from the entire mutual event season, reliable values for the radii of Pluto and Charon can be derived. Pluto's radius is 0.05860 ± 0.00031 , in units of Charon's mean orbital radius, and Charon's radius is 0.03019 ± 0.00066 , in the same units. The best available orbital radius for Charon is 19,640 km, thus the values above become 1151 ± 6 km and 593 ± 13 km, respectively, although Charon's orbital radius is uncertain by about 1.6 percent, which raises the uncertainty in the objects' true radii to about 20 km in both cases. The mean density of the system is 2.029 ± 0.032 grams per cubic centimeter, implying a bulk composition of about 70 percent rock and 30 percent water ice.

The figure below shows data obtained close to Pluto's opposition in 1990. On this night, the shadow of Charon was extremely close to last contact with Pluto's disk, while the disk of Charon was also extremely close to first contact with Pluto for the 1990 opposition. These data therefore represent an extremely sensitive edge detection experiment. If either Pluto or Charon are slightly larger than indicated by the values given above, a detectable dip in overall system brightness would have occurred. The photometric resolution for these data is highest



yet achieved (0.0025 magnitudes per 72 second integration), limited entirely by photon counting statistics. The data were obtained with the University of Hawaii 2.24-m telescope on Mauna Kea.

With the observations on 1990 September 23 representing the last made during this mutual event season, no more such events will occur for almost 120 years. At that time, Pluto will be near aphelion and almost ten times fainter than it is now.