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Abstracts of Presented Papers

Session 1

1.1

Current Developments in the Texas Minor Planet Project

Hemenway, P. D., Whipple, A. L., and Duncombe, R. L.
(U. Texas at Austin)

1) We are undertaking a 15 year project to observe minor planets at crossing points to determine systematic corrections to the Fundamental Coordinate System. Observations of 34 selected minor planets are being observed at a rate of about 200 fields/year, which will allow good sky coverage over the half sphere centered on the ecliptic. Ephemeris and orbit correction programs, using DE200, are running which are consistant with DE200 and the Astronomical Almanac to at least 0".01 (the level of precision of the AA). The programs include the usual effects of relativistic retardation, light time, and correction from geocentric to topocentric.

Initial reductions of the Nemausa points show internal exposure-to-exposure consistency of the $\pm 1\mu$ rms. Telescope to telescope consistency is of the order of $\pm 10\mu$ with large systematic differences across the field, probably due to optical distortions. These are being investigated.

Observations of the long focus fields with the CERGA Schmidt are being undertaken to try to improve the local coordinate system on the long focus plates. Observations with long focus reflectors in Spain are being planned to extend the observations in Texas. Other areas of international cooperation will be discussed.

This work has been supported by NSF Grant AST-8412417, which is gratefully acknowledged.

1.2

On the Evolution of Meteoroid Collision Debris in Orbit About Asteroids

A.W. Harris, Jet Propulsion Laboratory, Caltech

The prospect of flying planetary spacecraft past asteroids on their way to other targets has raised concern over the hazard of high speed impacts on the spacecraft by debris surrounding asteroids. It appears that the only likely source of such debris would be from meteoroid collision debris, ejected from the surface of the asteroid into elliptical, barely bound orbits about the asteroid, where solar perturbations could raise the periapse of the orbit above the asteroid surface in a single orbit. Subsequent perturbations would either cause reimpact, or eventual escape from the asteroid. The rates of production and depletion of particles in these "Oort cloud" like orbits have been calculated in order to estimate the steady state density of such a debris cloud. Preliminary results indicate that a flux of mass comparable to the meteoroid influx will be trapped into orbits for times up to a few thousand years, leading to an enhanced density of debris in the space surrounding the asteroid (out to about 200 radii) of a factor of about 1 - 10 above the background level in free space in the asteroid belt. Such a level might be detectable, and be of scientific interest, but does not appear to be a significant threat to close flybys of asteroids. This research was supported at the Jet Propulsion Laboratory, Caltech, under contract from NASA.

1.3

Earth-Asteroid Collision Rates

D.K. Yeomans (JPL)

For Earth-approaching asteroids discovered prior to 1986, G. Hahn (1986 Uppsala Astr. Obs. Report No. 38) gives the circumstances of Earth-asteroid close approaches during the 20th century. For asteroids brighter than absolute magnitude 18, a sample of 66 approaches to within 2500 Earth radii was analyzed using the method employed by Sekanina and Yeomans (1984 Astr. J. 89,154) for comets. After applying average correction factors for a slight excess of events in the northern hemisphere and for individual capture cross sections, the resulting average collision rate of Earth-approaching asteroids is 0.5 collisions per million years. This rate is a factor of 20 larger than for active comets and is comparable with the Earth-asteroid collision rates derived from the lunar cratering record over the last 3.3 billion years. Hence the asteroid collision rate derived here for the recent past is consistent with the 3.3 billion year average rate; no evidence exists for a recent increase in the population of Earth crossing objects.

1.4

Evidence for an Offset Between the Center of Light and the Center of Mass of Comet Halley

P.W. Chodas and D.K. Yeomans (JPL)

After Comet Halley emerged from solar conjunction in February 1986, its observation residuals exhibited a systematic positive trend, particularly in right ascension. One possible explanation for this drift was an offset between the comet's center of light and its unseen center of mass caused by preferential outgassing towards the sun. It was assumed that the center of light is displaced radially towards the sun by a distance varying as the inverse square of the heliocentric distance. The expected observational bias produced by such an effect would be in the positive direction and primarily in right ascension. Although the application of this correction in the orbit solution did nothing to improve the residuals from the 1910 and 1835 apparitions, it did remove the systematic trend in the 1986 residuals, and furthermore yielded a solution more consistent with *in situ* observations of the nucleus from spacecraft. The optimum size of the center of light offset was found empirically to be about 1100 km when the comet was 1 AU from the Sun.

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