COMMISSION 22 - METEORS AND INTERPLANETARY DUST
(METEORES ET LA POISSIERE INTERPLANETAIRE)

Report of Meetings, 20 and 22 December 1985

PRESIDENT: O.I. Belkovich. SECRETARY: C.S.L. Keay.

20 November 1985

I. OFFICERS AND MEMBERSHIP

The President reported that he had received no communication for a very considerable time from the current Vice-President, D.E. Brownlee. As it has been customary for the Vice-President to proceed to Presidency of the Commission, the President sought the guidance of the Meeting. Following discussion of the situation it was agreed that P.B. Babadzhanov, who had been nominated for incoming Vice-President by the Organising Committee, should be nominated as President for the coming term. This recommendation was endorsed without dissent.

Nominations for the other Officers of the Commission were proposed and endorsed as follows: Vice-President, C.S.L. Keay; Organising Committee: W.J. Baggaley, O.I. Belkovich, W.G. Elford, H. Fechtig, M.S. Hanner, I. Hasegawa, J.A.M. McDonnell, J. Stohl, K. Tomita.

The President announced the names of 11 new members: F. Akira, G. Cevolani, I. Kapisinsky, C. Koeberl, U. Marvin, D. Meisel, K. Nakazawa, J.A. Nuth, P. Pecina, K. Yamakoshu, J. Zvolankova. Consultants appointed for the next term are: G.V. Andreev, K.B. Hindley, F. Herz, B. Lokanadham, V.G. Kruchinenko, J.W. Mason, Y. Obrumov, D. Ohlsson-Steel, M.S. Rao, G. Schwehm, Y. Yabu.

The President noted with regret the deaths of seven members of the Commission since the last meeting: C.L. Hemenway, L.A. Katasev, A. Kizilirmak, E.L. Krinov, D.W.R. McKinley, E. Opik, A.N. Simonenko.

II REPORT OF THE COMMISSION

The President tabled the Report and thanked those members who prepared the specialist sections.

III PROJECTS AND WORKING GROUPS

1. International Halley Watch

P.B. Babadzhanov reported that the International Halley Watch Committee is anxious that as many radar observations and and meteor spectra as possible should be obtained for the Eta Aquarid and Orionid meteor streams during 1986. It is particularly important to have observations of meteor rates that are continuous in longitude.

The meeting was advised that three further meteor observatories wish to participate in the I.H.W. program. They are at Hyderabad and Waltair in India, and Adelaide in Australia.

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2. GLOBMET Project

C.S.L. Keay reported that the First GLOBMET Symposium held in Dushanbe, U.S.S.R., in August 1985, had been very successful, attracting about 130 participants. Some 80 scientific papers were presented covering all of the the objectives of the GLOBMET Project, which is concerned with improving measurements and modelling of meteor distributions, influx and interaction with the atmosphere.

3. Canadian Fireball Network

The meeting noted with dismay the recent closure of the MORP network in Canada despite the Resolution recommending its continuation passed by the previous meeting of Commission 22 and endorsed by the I.A.U.

IV SCIENTIFIC PRESENTATION

K. Tomita: Japanese Observations of the Giacobinids.

In the early evening of 1985 October 8 meteors of the Giacobinid stream were observed in the north-eastern part of Japan. At the Dodaira station of the Tokyo Astronomical Observatory, eight meteors were detected during the period from 1040h to 1130h UT by a SIT TV camera. One of them, recorded on the 11th frame (one frame corresponding to 1/30th second), was a stationary meteor and its position was at RA = 17h 57.5m, DEC = $+55^{\circ}$ 10' (1950.0).

Many amateur observers visually recorded the meteors, among them K. Gomi at Nagano, who commenced observing at 0930h UT and counted 128 meteors during ten minutes. According to his observations, the maximum rate is estimated to have occurred before 0930h UT, and is therefore 0.15 of a day earlier than had been predicted.

22 November 1985

I MEMBERSHIP

In addition to the 11 new members announced at the previous meeting, two addtional names were recorded as new members: A. Carusi and A.C. Levassuer-Regourd. The membership was now 93, plus 11 consultants.

II PROJECTS

1. I.A.U. Meteor Data Center, Lund, Sweden

The I.A.U. draft budget for 1986-1988 did not include funding for the Meteor Data Center. The President and Secretary were invited by the General Assembly Finance Committee to argue the case for the continuation of the annual maintenance grant toward the operation of the Data Center. They reported that members of Commission 22 were strongly of the opinion that the Data Center should continue in operation and drew attention to the Report of the Director (Dr B.A. Lindblad) in the I.A.U. Information Bulletin 54 which stated that requests for data from Czechoslovakia, Great Britain, U.S.A. and the U.S.S.R. had been processed during 1984. (The Finance Committee subsequently approved continuation of I.A.U. support at the rate of 1000 Swiss francs per annum until 1988).

2. Symposium

Plans were announced for a Symposium at Tucson, Arizona, U.S.A., during May 19 - 22, 1987, on the Subject of Interplanetary Matter and Meteoroids.

III GENERAL BUSINESS

The retiring President thanked all those members of the Commission who had assisted him in his work and extended his best wishes for success to the incoming Officers.

IV SCIENTIFIC PRESENTATIONS

P.B. Babadzhanov and Yu. V. Obrubov: Dynamics of Meteor Streams.

The results of investigations of the evolution of the Geminid and Quadrantid meteor streams show that under the influence of planetary perturbations the streams may be flat, but they may thicken as well depending on the range of variation of orbital inclinations. Eventually, due to planetary perturbations, a meteor stream may take such a shape that it gives rise to several active meteor showers at different solar longitudes. Thus the Geminid stream is also associated with the Canis Minorids and the daytime Sextantids as well as a Delta Leonid stream which has not yet been observed. Likewise the Quadrantids have evolved to produce the Carinids and the North and South Delta Aquarids as well as the daytime Arietids and Alpha Cetids. The calculated and theoretical values of geocentric radiants and orbital elements are in good accord with observations.

I. Hasegawa: Draconid (Giacobinid) Meteors in 1985.

Just after evening twilight on 1985 October 8, a strong appearance of the Draconid meteor shower was observed in Japan. During the ten minutes from 1000h UT, the corrected hourly rate of visual meteors probably exceeded 180-200. The rates clearly decreased during the period of observation, so the maximum seems to have occurred before 1000h UT (mean solar longitude 194.57°, equinox of 1950.0). No Draconid meteors were observed after 1300h UT. The magnitude distribution exhibited a maximum at nearly 3.

D. Ohlsson-Steel: Meteor Research at Adelaide, Australia.

Meteor-related research at Adelaide is proceeding on a number of fronts:

1. Radar meteors - experimental

a. The height distribution to radio magnitude +7 has been determined at a frequency of 2 MHz where the echo ceiling is inconsequential. As expected, the results contradict measurements at shorter wavelengths: the peak is found at ~104 km, with many meteors seen to at least 130 km. This suggests that missing mass is present as a faint, dense, high-velocity, high-altitude component.

b. To confirm the above result it is planned to make observations in 1986 at 6 MHz, and simultaneously at 6 and 54 MHz.

c. A further possibility is to attempt to use a 54 MHz tropospheric scatter radar to measure radiants (narrow beam) and velocities (high Doppler shifts) using the head echoes from meteors moving radially towards the station: decelerations and good orbits are hoped for.

d. The Jindalee over-the-horizon radar in central Australia is also being used for meteor observations via forward scatter, back scatter, and multiple bounces

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from the ground and F-region.

2. Meteors - Theory

a. The lifetimes of meteoroids against catastrophic collisions with zodiacal dust particles have been calculated for characteristic orbits.

b. Planetary close encounters have been shown to account for the production of sporadic meteors from streams.

c. The theory of the separation of electrons and ions during the diffusion of underdense trains may explain some peculiarities of radar meteors.

3. Asteroids

The impact rates of asteroids upon the terrestrial planets have been reported to Commission 15.

V.V. Andreev and O.I. Belkovich: The Distribution of Meteoroidal matter at the distance of 1 au from the Sun.

In order to minimise the influence of observational selectivity a new combined method was proposed for deriving a mathematical model of the sporadic meteor distribution in the vicinity of the Earth's orbit. The method combines measurements of the Fresnel velocity distribution vs. elongation angle and determinations of the radiant distribution over the celestial sphere by the rotating antenna technique. The method is based on transformation of the three-dimensional distribution of radiant coordinates and velocities into the distribution of any three orbital elements that are related to the meteor orbits intersecting the heliocentric sphere of radius 1 au. The best first approximation of the inclination distribution of meteor orbits was found to be:

$$p(i) = \begin{cases} 6.33 \exp(-i/23) \sin i & 0^{o} < i < 90^{o} \\ 0.059 \exp(i/118) \sin i & 90^{o} < i < 180^{o} \end{cases}$$

The concentrations of perihelion distances near to the orbits of the three innermost planets have been established for meteor orbits having small inclinations.

R.H. Giese: Three-dimensional Models of the Zodiacal Cloud.

Present models of the three-dimensional distribution of interplanetary dust derived from the zodiacal light are based on the assumption of a flattened zodiacal cloud having homogeneous physical properties. Number density n can be expressed by a decrease according to a power law (-1.3) with solar distance r, and concentration towards the plane of symmetry by a factor f which is a function of ecliptic latitude only. Models assuming a bimodal function of f suggesting a second population of dust particles concentrated in high inclination orbits can be definitely excluded by obvious discrepancies with respect to observations of brightness along circles of low (15) elongation about the Sun. The other models - although different in detail - show a monotonous decrease of n above the ecliptic (symmetry) plane, typically to one half of the density within less than 0.3 au near the Earth's orbit. If the questionable assumption homogeniety is abandoned, the isodensity surfaces of n are modified. Taking the hypothetical example that the decrease of particle albedo with r would follow a power law (-0.5), as claimed by some recent publications, then n would decrease with r according to a power law of 0.8 only. Therefore the isodensity surfaces should be squeezed towards the Sun inside 1 au and stretched out outside. Such modifications modifications are not negligible, however more information on spatial changes f of dust properties is needed to justify advanced modelling.

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