THE IAU METEOR DATA CENTER IN LUND

B.A. Lindblad
Lund Observatory
Box 43, S-221 00 Lund
Sweden

ABSTRACT. The purpose of the IAU Meteor Data Center in Lund is to archive, document and disseminate information on meteoroid orbits. At present some 6 000 photographic double-station orbits and 60 000 radio determined orbits are archived.

1. Introduction

Information on photographic meteoroid orbits is widely scattered in the scientific literature and often in publications with a limited circulation. Information about (individual) radio meteoroid orbits has only been available on internal observatory listings or tapes. In the absence of key scientific personal much of this information was in the 1970's lost. A major effort has in the last few years been made to retrieve this data. At the 1976 IAU General Assembly it was proposed by Commission 22 that a meteor data center be established at the Lund Observatory, Sweden, for the archiving of meteor observations by photographic and radio techniques. The decision was confirmed by the 1982 IAU General Assembly. The archived data are two-station photographic and vidicon orbits or multi-station radio orbits. For a preliminary description of the data see Lindblad (1987a). In the present paper only the photographic data will be discussed.

For most photographic meteors both orbital and geophysical data are available. The first file record contains the identification no., time of appearance, orbital elements, mass and shower classification; the second, geophysical, record contains identification no. and time plus earth encounter data such as magnitude, heights, radiant coordinates and velocities. An information pamphlet is available on request.

2. Photographic Orbits

The Harvard Super-Schmidt program in New Mexico, which operated from February 1952 to January 1959, recorded some 6 000 doubly photographed meteors. About 3 200 Super-Schmidt orbits have been reduced to date. About 2 300 meteoroid orbits have been obtained in various other photographic programs in the USA, Canada, Czechoslovakia, the USSR, Japan and elsewhere. These programs have in the literature rather arbitrarily been referred to as "small camera" programs. Table 1 summarizes the photographic orbit catalogues which presently are included in the IAU file. For references and a more detailed discussion of the data see Lindblad (1971, 1987a, 1987b).

The largest number of orbits has been obtained in the Harvard photographic meteor

A.C. Levasseur-Regourd and H. Hasegawa (eds.), Origin and Evolution of Interplanetary Dust, 311–314.

program. In the reduction of the Harvard Super-Schmidt data the same meteor was often measured by several investigators using different techniques. Hence, one should note that there is considerable overlap between the various Harvard catalogues.

The second largest contribution comes from the USSR stations in Dushanbe, Kiev and Odessa. A comprehensive catalogue of the Odessa data has recently appeared (Kramer, Shestaka and Markina, 1986). The USSR data have been collected over several decades and thus represent a valuable random sample - in contrast to the published Super-Schmidt data which were mainly obtained in the period 1952-54.

A photographic meteor program in New Mexico was operated in 1974-1977 by the New Mexico State University (NMSU) and the NASA Langley Research Center. This program produced 45 double-station meteor orbits (Harvey and Coffey 1976, Tedesco and Harvey 1976). For 25 of these meteors accurate timing was available. The main emphasize was to obtain simultaneous spectral - and orbital information on meteors.

A recent addition to the photographic file is 285 orbits obtained in the Czechoslovakian meteor program 1953-85. I am indebted to Dr. Z. Ceplecha and the Director of the Ondrejov Observatory for kind permission to include this data. The Czechoslovakian data are of high precision and they represent a random sample collected over many years.

Orbits obtained in three major fireball/meteorite recovery programs: Prairie Network, MORP and the European Network are included in the IAU file. The author is indebted to Drs. R. McCrosky, I. Halliday and Z. Ceplecha for kind permission to include unpublished material.

Some 450 photographic meteoroid orbits have been obtained in various amateur programs. See reports by Betlem (1985), Betlem and de Lignie (1990), Ochiai (1984, 1985), Koseki (1990) and Koseki, Sekiguchi and Ohtsuka (1990). The meteors have mostly been recorded with short focus 35 mm cameras. Studies by the present author (see these proceedings) indicate that the precision of the data is fully adequate for scientific applications. These orbits are presently being included in the IAU file.

3. Accuracy of Catalogue Data

It is difficult to assess the quality of the orbital data obtained at a particular station or by a particular investigator. An investigator may select only the very best photographic images for reduction, or study a random sample of the data, or analyze the available data in full. In fireball-meteorite-recovery programs the emphasis is on reducing photographic trails of meteors with low terminal heights. Fireballs from well known meteor showers are often not reduced. In the early Harvard studies the time of appearance of the meteor was not recorded, and the mid-exposure time was used with resulting loss of accuracy. Some investigators give a measure of the relative accuracy of each orbit. This index is included in our records. When no index of relative accuracy is given by the original investigator, various other measures of orbital accuracy have been introduced. For a discussion see Lindblad (1973). The early small-camera orbits were reduced using simple desk calculators, in which case computational errors are not uncommon. Some inconsistencies or misprints in the published data have been corrected after correspondence with the original investigators. At the Data Center the photographic meteoroid orbits are routinely checked for internal consistency. (For details see another paper by the author in this volume).These checks revealed some inconsistencies in the orbital elements. The author is corresponding with the original investigators in order to clarify these matters. An independent study of the errors in the photographic orbital data has been made by Koseki (1986). A preliminary list of errors from this study can be supplied on request.

Table 1. List of photographic meteor orbit catalogues

Station	Years	No. of orbits	Authors
Harvard (Mass.)	1936-52	139 (144)	Whipple
" "	1951-52	27	Whipple unpubl.
" (New Mex.)	1952-54	413	Jacchia and Whipple
" " "	1952-54	313 (359)	Hawkins and Southworth
" " "	1956-59	353	Posen and McCrosky
" " "	1956-59	253	McCrosky and Shao, unpubl.
" " "	1952-54	1801 (2529)	McCrosky and Posen (Graph. red.)
NMSU (New Mex.)	1975-76	12 *	Harvey and Tedesco
" "	1976-77	13 *	Drummond, Hill and Beebe
Prairie Network	1963-75	334 (336)	McCrosky, Shao and Posen
MORP "	1971-84	218 *	Halliday, Griffin & Blackwell (and unpubl.)
Dushanbe 1	1940-55	73	Katasev
" 2	1957-59	181	Babadjanov and Kramer
" 3	1960-63	72	" " "
" 4	1964	77	Babadjanov et al.
" 5	1965-66	15 (18)	Babadjanov and Getman
" 6	1968-77	44	Babadjanov et al.
" 7	1965-67	20 *	Babadjanov and Getman
Odessa 1	1957-59	133	Babadjanov and Kramer
" 2	1960-61	92	" " "
" 3	1961-65	122 (124)	Kramer and Markina
" 4	1962-72	50	" " "
" 5	1973-83	62 *	Kramer et al.
Kiev 1	1957-66	100	Benyukh et al.
" 2	1967-76	70 *	Sherbaum et al.
Ondrejov 1	1955-59	109	Ceplecha et al. (and unpubl.)
" 2	1947-89	176	Ceplecha et al. (and unpubl.)
NMS (Japan)	1964-89	325	Koseki, Sekiguchi and Ohtsuka

* An asterisk indicates that geophysical (encounter) data is partly or entirely missing. A number in parentheses gives the total number of orbits listed in a catalogue (including overlapping catalogue data and/or later rejected orbits). For detailed references see Lindblad 1987a.

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