

ASTRONOMICAL DATA FILES AT THE U. S. NAVAL OBSERVATORY: STAR
CATALOGUES, EPHEMERIDES, AND OBSERVATIONS

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ABSTRACT

The history, contents, and method of distribution of the astronomical data files of the Naval Observatory are described. Some of the cooperative efforts to deal with the "data explosion" are discussed.

INTRODUCTION

The Naval Observatory began using punched card equipment to produce almanacs in 1940 and began accumulating astronomical data in machine-readable form. The increased use of computers since then by all astronomers has resulted in a great increase in the generation and use of machine-readable data. Simultaneously there has been a continuing program to transcribe older printed observational catalogues into machine-readable form.

DATA AVAILABLE

The Naval Observatory has accumulated the following categories of data files in machine-readable form:

1. ephemerides of the Sun, Moon, planets, satellites, and minor planets;
2. observations of same;
3. observations and catalogues of stars, both from the Naval Observatory and other observatories;
4. precise time comparisons;

5. catalogues of non-stellar or non-optical data;
6. tables and other information of astronomical interest.

These data files have been generated from

1. material produced as part of the regular publication of almanacs;
2. basic material generated for producing the publications;
3. regular time service procedures;
4. regular observing (and reduction) programs;
5. transcription of older observations and catalogues from printed form to machine-readable form;
6. observations or catalogues to be distributed for other institutions;
7. staff research projects.

The data is stored in the form in which it was used, for publication of research, etc. No effort has been made to use standardized formats or to provide cross indexing or referencing. This means that requests for data are responded to by copying all the data of a file in the storage format for the period of time covered by the file, and, if it is coordinate data, in the coordinate system in which it was prepared. There is no preparation in a special format or extraction of specific data. For example, coordinates of the Sun are available in apparent right ascension and declination, or mean longitude and latitude, at daily interval, 1968-1980, or in geocentric spherical and rectangular coordinates referred to 1950.0 at 4-, 10-, and 20-day intervals, 1800-2000. The user would have to perform transformations to other coordinate systems, or extractions for shorter time intervals, or interpolations for other tabular intervals.

Almost all of the ephemerides and miscellaneous tables have been published in the various publications of the Naval Observatory including annual almanacs, Circulars of the USNO, or the Astronomical Papers of the American Ephemeris and Nautical Almanac. Observations of stars at the USNO have been published in Publications of the USNO, Second Series. Many of the star catalogues are standard references available from many sources; time data is circulated in Time Service Bulletins. Conversely, most numerical data published by the USNO is available in machine-readable form.

A list of data available, or in preparation, as of spring 1975 is published in USNO Circular No. 146, "Astronomical Data in Machine-Readable Form." Requests for this Circular, or inquiries about specific data not listed, may be directed to the Superintendent, Naval Observatory, Washington, D. C. 20390.

INFORMATION EXCHANGES

The USNO provides information upon request, the terms being a three-for-one exchange of cards or tapes.

Some installations in the U. S. have data of interest to other users, but do not wish to be distributors either for lack of personnel or lack of appropriate computer capabilities. Then it is desirable for some other center to accept responsibility for distribution, with the stipulation that the original institution supply corrections and revisions as necessary. The USNO has done this in several instances, and is willing to consider more if the amount of material and the projected demand for it is within the capabilities of staff and computer time. However, this service may at a future time be provided by another federal agency, if the efforts of a recently appointed interagency task force are successful.

The proliferation of data and observations, especially by non-optical methods and space missions, raised interest over a decade ago in coordination of formatting and exchanging data. Initially, existing specialized data centers were supplemented through informal working groups composed of representatives from institutions having similar projects. Then there were formal and informal working groups within and between international organizations; later, formal operations centers were established, such as the Stellar Data Center at Strasbourg and the International Bureau on Astronomical Ephemerides at the Bureau des Longitudes, Paris. The latter is a reference and information center, rather than a data center, and thus it helps a potential user of data to contact the appropriate source directly and quickly, but does not provide data itself. Now, the U. S. Government has established an Interagency Coordinating Committee on Astronomy which has appointed a Task Force on Data. Part of the assignment of this task force is the investigation of establishing either data centers or information centers for U. S. Government agencies and possibly for non-government participants as well.

SUMMARY

The Naval Observatory continues to operate as a data center for astronomical data within the general limitations of its fields of expertise and the limitations of personnel and computer capabilities. Recognizing the problems of acquiring, storing, correcting, extending, editing, and distributing extensive astronomical data files, the Naval Observatory seeks to cooperate with all efforts to make knowledge of the data and the data itself available to astronomers around the world. To this end, it has

participated in several of the cooperative endeavors mentioned previously. At the same time that the quantity of data available is growing, the observatory strives to improve the quality and usefulness of the data which it has.