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ASTROMETRIC CATALOG DISTRIBUTION AT THE U.S. NAVAL OBSERVATORY

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Abstract. Modern requirements have changed the method of distribution of astrometric data from predominantly on paper at long intervals to CD-ROM, WWW and interactive dialog with the users.

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1. INTRODUCTION

Traditionally, star catalogs have been made available in the form of books distributed free to the astronomical community as a continuing series of publications representing the research work of the institution. Unlike much of astrophysics, the creation of an observed or measured star catalog (such as the Washington W_{50} series) involves lengthy analysis of huge data sets, which often can only be properly treated as a unit once the observing has been completed. Compiled catalogs (such as the FK5) require no new observations, but the intensive analysis that must be done also results in the catalog being made available long after the last observations were taken. Thus, star positions tend to be made available as large lists at irregular, but relatively lengthy, intervals; the data are seldom published as they are gathered.

The USNO is frequently called upon to produce short lists of star positions for a given epoch, to verify positions of individual stars and to provide tables or algorithms for predicting the positions of stars that may not have well determined histories. Because those making the requests may not be astronomers and may be severely limited

in their computing resources, a considerable amount of interaction is also required.

2. PAPER OR PLASTIC?

The series of catalogs known as the W_{50} series began with $W1_{50}$, and the $W6_{50}$ ($W1J_{00}$) is now complete and about to be published. The $W2J_{00}$ will be produced from the results of the transit circle program that has just been concluded and involved the observation of the IRS from both Washington and Black Birch, New Zealand. Since all of the previous catalogs were printed on paper and published as part of the *Publications of the USNO*, it is expected that the latest catalogs will be published in the same way. This will ensure that there will be a book on the library shelf in the place where the researcher expects it, that institutions with less modern facilities will still be able to handle the material and that there will be a complete series of observations in the same format. It should also be noted that the introductions to these catalogs serve as the written, historical record of the program and the instrument, as well as containing a thorough description of the method of data analysis employed. We have not decided whether to print the data or just to include a CD-ROM with the catalog.

3. THE ASTROGRAPHIC CATALOG

The Astrographic Catalogue (AC) was an international effort designed to photograph and measure the positions of all stars brighter than magnitude 11.0. In total, some 5 million stars were observed, many as faint as 13th magnitude. This project was started over 100 years ago, and the positions that can be derived from the AC data can be used, in combination with modern epoch positions, to determine accurate proper motions.

The USNO has completed data entry of the printed volumes of the AC and is reducing the data zone by zone. For many uses the individual zones provide useful data, so, as the analysis of each zone is completed, it is made available on the World Wide Web. However, when using this method of distribution, one must be aware that there are still many people who do not have access to the WWW and/or do not have high speed Internet connections. Although transfer of the data at low speeds is possible, it is often difficult to complete a transfer of many megabytes without something interrupting the

transmission. Therefore, we have also made this data available on a CD-ROM. In addition to the more obvious advantages (easy to use, convenient to mail, becoming less expensive all the time), it is also significant that once a CD-ROM is created it cannot be changed. This can be extremely important when dealing with interim data sets and also when dealing with data that may have been re-analyzed by people other than the originator of the data.

4. TWIN-ASTROGRAPH CATALOG (TAC)

Photographic plates taken with the 20 cm Twin Astrograph (in blue and yellow) during the period 1977–1986 have been measured. Approximately 700 000 stars in the range $-18° \leq \delta \leq 90°$ and as faint as $B = 11.5$ mag have been reduced using the IRS, with the expectation of a re-reduction when the Hipparcos positions become available. It is expected that the use of Hipparcos positions will give final accuracies of around 60 mas, but the preliminary version that is available now is still considerably better than any existing catalog. Combining this data with the data of the AC will produce proper motions with a mean error of approximately 3.5 mas/year.

5. CONSIDERATIONS

While electronic distribution of data is convenient, fast and cheap, there are some potential difficulties to be considered. Many institutions, particularly those who must justify their funding, must maintain their ownership of their data. Distribution from a data center can mean the loss of the identification of the institution with the data. In addition it is often difficult to track the "customers" for the data. Electronic publishing will encourage the electronic distribution of manuscripts outside the review process. However, it also allows the electronic document to be associated with the data, so that the relevant explanatory material is always available.

6. SUMMARY

Many of the customers of the USNO require the data in non-traditional forms. The data are being made available by WWW at `www.usno.navy.mil` and CD-ROM. Interactive forms are being developed to allow closer cooperation between the customer and the catalog developer via the WWW.