THE NATIONAL SPACE SCIENCE DATA CENTER (NSSDC) AND THE WORLD DATA CENTER A FOR ROCKETS AND SATELLITES (WDC-A-R&S): THEIR ROLE IN X-RAY ASTRONOMY DATA

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ABSTRACT

The combined role of NSSDC and WDC-A-R&S in collecting, preserving and disseminating data from 10 years of X-ray observations is presented along with a brief history of the organizations.

NSSDC AND WDC-A-R&S

The National Space Science Data Center was officially established in November 1965, as part of Goddard Space Flight Center, Greenbelt, Maryland, USA, to provide the means for further analysis and dissemination of space science data beyond that provided by the analyses, presentations and publications of the principal investigators and their co-workers. Data deposited in NSSDC are made available to scientists outside the USA through the co-located World Data Center A for Rockets and Satellites.

In order to fulfill its mission, the NSSDC acts as a central repository for the data from space science flight experiments in at least two general forms. Reduced data records, which are usually prepared by a compaction, editing, and merging operation performed by the principal investigator, form the primary data base for the NSSDC. Data in this form contain all of the the basic usable information obtained from the experiment and include the instrument responses measured as functions of time along with the appropriate ephemeris and spacecraft information necessary to analyze the data in an independent fashion. Hopefully, in this way there will be a minimum of information removed from the data by analysis techniques which the principal investigator favors for his own interpretation of the results. A second form of the data which must be collected is the final analyzed data which the principal investigator designates as the best to display the scientific results of the experiment. This form may include charts, graphs, and photographs, and tables which are the

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results of data processing techniques employed by the principal investigator but are too numerous to be contained in the published works in their entirety.

Primarily the NSSDC has used manual or semi-automated techniques for storing, retrieving, and reproducing the data. These techniques include microfilming or microfiching data to reduce storage space, using microform and photographic copy devices, and regenerating magnetic tape through standard computer copying routines. In addition an attempt is made to assure later investigators independent use of the data by providing additional information and services such as descriptions of the instrument, calibration history, references to published scientific results and all other pertinent bibliographic materials.

However, the various measurements of space astronomy parameters are made in numerous ways and can cover widely different energy-time regions, often making it difficult for an individual investigator to utilize the data from different experiments. Yet in order to fully characterize the nature of a particular astronomical phenomena it may be necessary to compare the results from many satellites. This procedure can involve a tremendous amount of data, the processing of which may not be feasible for individuals or groups. Data compilations are one solution and are consistent with the purposes of further use and dissemination of space science data. Toward this goal, NSSDC is currently involved in the acquisition of data from past X-ray astronomy satellite experiments.

X-RAY ASTRONOMY DATA

Although extrasolar X-ray sources were first discovered in 1962, the full scope of X-ray astronomy began with extended observations by the satellite Uhuru (SAS-A) which was launched in December 1970. During the past decade since Uhuru's launch more than 11 major satellite missions have been flown with instruments dedicated in whole or in part to exploring the X-ray sky. The discoveries made by these missions have clearly established that X-ray observations are an essential tool in the study of the dynamics and evolution of many cosmological objects. New missions and advances in technology will not make these data obsolete but to the contrary, expanding knowledge gives new insight and often new meaning to early observational phenomena. Not every mission could cover all energy ranges nor take all the different types of measurements; however, the combined data available from these early experiments spans not only a full decade in time (1970-1980) but over five decades of the electromagnetic spectrum (10^2-10^7eV). The overlap of these missions in both time and energy presents an impressive possibility of compiling timelines that for many sources would reflect 10 years of activity in several energy ranges (Table 1 indicates missions from which data are

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currently becoming available). There are many unanswered questions in astronomy that require no new technology or sophisticated instruments, but are best answered by having observations with continuity over long time spans.

Data compilations are precisely the type of intermediary function that can be performed by a central data repository such as NSSDC. The reduced data records from many experiments can be sorted and compiled by parameters such as position, time, energy or any other area of interest and then made available with appropriate documentation to requesters for further analysis. This eliminates the need to copy, ship, and process large volumes of tapes or microform in order to sort out specific information. It is also a way to provide non-X-ray astronomers with the available data in the form most complementary to their own measurements.

Services can also be rendered for the previously analyzed data that would further its use. For example, the many published source catalogs and positions can be compiled and made available in machine readable form; bibliographies of published results can be assembled; and cross references can be generated for data available in assorted forms such as plots, charts, tables, or images.

By using the facilities of NSSDC and WDC-A-R&S in this manner, the full potential of the information gathered from these and other space science investigations can be realized and made available to not just a select few, but to the entire world scientific community.

TABLE 1. X-RAY ASTRONOMY MISSIONS 1970-1980

SPACECRAFT	LIFETIME	ENERGY RANGE
UHURU	DEC. 1970 - JAN 1975	$1x10^3$ - $2x10^4$ EV
OSO 7	SEPT. 1971 - JULY 1974	$1x10^3$ - $6x10^5$ EV
OAO 3	AUG. 1972 - DEC. 1980	$1x10^2$ - $8x10^3$ EV
ANS	AUG. 1974 - JULY 1976	$2x10^2$ - $4x10^4$ EV
UK 5	OCT. 1974 - MAR. 1980	$3x10^2$ - $3x10^4$ EV
SAS-C	MAY 1975 - APR. 1979	$2x10^2$ - $6x10^4$ EV
OSO 8	JUNE 1975 - OCT. 1978	$2x10^3$ - $1x10^6$ EV
HEAO 1	AUG. 1977 - JAN. 1979	$1x10^2$ - $1x10^7$ EV
HEAO 2	NOV. 1978 - APR. 1981	$1x10^2$ - $2x10^4$ EV
UK 6	JUNE 1979 - PRESENT	$1x10^2$ - $3x10^4$ EV
HEAO 3	SEPT. 1979 - MAY 1981	$6x10^4$ - $1x10^7$ EV

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