# Ariel Catalogue of X-Ray Sources

## (Warwick et al.; McHardy et al. 1981)

Documentation for the Computer-Readable Version

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September 1991

Doc. No. NSSDC/WDC-A-R&S 91-22
Contract NAS 5-28752

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**Abstract**

This document describes the overall file structure and individual data fields of the computer-readable version of *Ariel Catalogue of X-Ray Sources* distributed by the Astronomical Data Center, NASA Goddard Space Flight Center. It is a compilation of data describing 251 X-ray sources divided into three files which consist of a low latitude sources file, a high latitude sources file, and a reference file. Position of the source and the corners of an error box enclosing it are listed in celestial coordinates. Maximum, minimum, and average flux vlaues are given as are suggested identifications and references for each source.

# 1 Introduction

**A copy of this document should be distributed with every copy of the computer-readable catalogue.**

## 1.1 Description

The *Ariel Catalogue of X-Ray Sources* (3A; Warwick et al.; McHardy et al. 1981) is in three files which contain data identical to the tables published in the original reference, as follows: low latitude sources, high latitude sources, and references. The data in these files are in exactly the same format. The present document describes the overall file structure and the individual data fields. For references to authors mentioned in this document, see the source references.

## 1.2 Source References

Warwick, R.S., *et al.* 1981, MNRAS, 197, 865
McHardy, I.M., *et al.* 1981, MNRAS, 197, 893

# 2 Structure

## 2.1 Each File as a Whole

The 3A consists of 3 files. Table 1 gives the tape-file attributes that are the same no matter what computer the catalogue is copied for. All records are of fixed length. Detailed descriptions of the data files are given in the following sections.

There are also attributes that will change from computer to computer if the catalogue has been distributed on tape. These attributes include block size, blocking factor, total number of blocks, density, number of tracks, and character coding (ASCII, EBCDIC). This information has not been

| Ariel Catalogue of X-Ray Sources (Warwick et al.; McHardy et al. 1981) | | | | |
|---|---|---|---|---|
| File | Contents | Record Format | Record Length | Number of Records |
| 1 | Low Latitude Sources | Fixed | 254 | 109 |
| 2 | High Latitude Sources | Fixed | 254 | 142 |
| 3 | Reference File | Fixed | 80 | 195 |

Table 1: Summary Description of Catalogue Files

included for tapes, but should always accompany secondary copies if any are supplied to other users or installations.

**Quotations in any of the following descriptions come from Warwick et al.; McHardy et al. (1981) unless otherwise noted**.

## 2.2 Data (Files 1 and 2 of 3)

The two data files, low latitude and high latitude sources, contain data in exactly the same format. Table 2 describes the data format of these files in detail. Detailed descriptions of certain fields in Table 2 are listed below.

**Ariel Name** This designation consists of a "3A" followed by the celestial coordinates of the source position.

**Alternative Names** Up to three other names are given for the X-ray source. These designations are generally derived from observations by the following satellites:

**A** *Ariel V*; both earlier SSI and rotation collimator observations.

**2A** *Ariel V*; see Cooke et al. (1978a).

**H** *HEAO-1*; A2 and A3 experiments.

**1E** *Einstein* observatory

**MX** *OSO-7* or *SAS-3*; see Markert et al. 1976.

**4U** *Uhuru*; see Forman et al. 1978.

In addition, common names (e.g. SCO X-1, Cen X-3) and "source names obtained from earlier, mainly rocket, observations derived from the galactic coordinates of the source (e.g. GX 301-2)" are listed in this field. References to these names may be found in Forman et al. (1978) or Bradt, Doxsey, & Jernigan (1979) respectively. Otherwise, a reference identification enclosed in brackets may be listed here or the **other information** field; these refer to references located in file 3 (see section 2.3).

| Bytes | Units | Suggested Format | Default Value | Data |
|---|---|---|---|---|
| 1-10 | — | A10 | — | Ariel Name |
| 11-40 | — | A30 | — | Alternative Names |
| 41-46 | deg | F6.2 | — | R.A. (1950) |
| 47-52 | deg | F6.2 | — | Dec. (1950) |
| 53-58 | deg | F6.2 | blank | Error Box Corner: R.A. |
| 59-64 | deg | F6.2 | blank | Error Box Corner: Dec. |
| 65-70 | deg | F6.2 | blank | Error Box Corner: R.A. |
| 71-76 | deg | F6.2 | blank | Error Box Corner: Dec. |
| 77-82 | deg | F6.2 | blank | Error Box Corner: R.A. |
| 83-88 | deg | F6.2 | blank | Error Box Corner: Dec. |
| 89-94 | deg | F6.2 | blank | Error Box Corner: R.A. |
| 95-100 | deg | F6.2 | blank | Error Box Corner: Dec. |
| 101-105 | $deg^2$ | F5.3 | blank | Area: Error Box |
| 106-110 | — | A5 | — | Position Code |
| 111-118 | count/s | F8.2 | blank | Average Flux |
| 119-126 | count/s | F8.2 | blank | Error: Average Flux |
| 127-134 | count/s | F8.2 | blank | Minimum Flux |
| 135-142 | count/s | F8.2 | blank | Error: Minimum Flux |
| 143-150 | count/s | F8.2 | blank | Maximum Flux |
| 151-158 | count/s | F8.2 | blank | Error: Maximum Flux |
| 159 | — | A1 | blank | Variability Code |
| 160-179 | — | A20 | — | Identification |
| 180-254 | — | A75 | — | Other Information |

Table 2: Data Files Record Format

**Position** The "position of maximum probability density for the X-ray source location" given in degrees of right ascension and declination (1950.0).

**Error Box** Right ascension and declination (1950.0) of the four corners of "a rectangle enclosing an elliptical approximation to a 90 per cent confidence contour for the source location." These are listed only for sources "for which the SSI observations provide information of a precision which is comparable to, or better than, previously reported X-ray measurements (above 2 keV)." These are sources with a **position code** of '3A'.

**Area** The area within the 90 per cent confidence contour.

**Position Code** The **position code** indicates in what manner the position of the X-ray source was obtained. Thus, the source positions are not limited to those derived from SSI observations. "Accurate X-ray positions (notably from *SAS-3* and *HEAO-1* satellite observations) as well as optical and radio positions are available for many of the bright, low latitude X-ray sources." The position codes are as follows:

**3A** Position based on SSI observations

**X-RAY** Position obtained from other published X-ray observations

**OPT** Position obtained from published observations of the optical counterpart of the X-ray source.

**RAD** Position obtained from published observations of the radio counterpart of the X-ray source.

References to these published source positions may be found in Bradt et al. (1979) unless a reference identification enclosed in brackets follows a "POS" flag in the **other information** field; these references may be found in the reference file.

**Source Flux** **Average**, **minimum**, and **maximum flux** values for X-ray sources in SSI count $s^{-1}$. Error values ($\pm 1\sigma$) follow each flux value. "All flux determinations and **variability code** assignments were made from summed-orbit records."

**Variability Code** Flux variability codes are assigned as follows:

**S** Steady: The **average flux** is the weighted mean flux from *all* observations. The **minimum** and **maximum flux** fields contain no data.

**I** Irregular: The **average**, **minimum**, and **maximum flux** values are lisited. These are sources which the SSI determined to be periodic (e.g. HER X-1) This class also includes those sources "seen to exhibit flaring where emission was also observed by the SSI outside of the flares (e.g. 3A 1102+385 = MKN 421)" and "those with a formal

probability < 1 per cent that the X-ray light curve could result from steady X-ray emission."

**T** Transient: Only the **maximum flux** is listed. This class includes sources that would generally not be detected by SSI observations because of their short duration ($\leq$ 50 days). Such outbursts often exhibit dramatic flux increases (see Kaluzienski 1977; Cominsky et al. 1978), some of which are recurrent (e.g. A 0535+26). For a transient source, the SSI did not detect any X-ray emission except for that which was a result of the outburst.

**Identification**

The suggested identification of the X-ray source. The method by which these were obtained in the high latitude survey is described in section five of McHardy et al. (1981). Otherwise, references to identifications taken from previously published results are located in file 3, referenced in brackets in the **other information** field.

The high latitude survey file contains an identification code (bytes 170-179, A20 FORTRAN format) within this field which expresses confidence in the **identification** as follows:

******** Almost certain: There are three categories of evidence which support the **identification**. They are as follows: "(a) correlated X-ray/optical or X-ray/radio variability; (b) the X-ray emission has been spatially resolved e.g. sources proposed as clusters of galaxies; (c) the object is inside a very precise (dimension $\sim$ few arc seconds) X-ray error box." More than one category of evidence may support any given identification.

******* Very likely: the source is contained within a "very small (dimensions $\leq$ 1 arcmin) error box."

****** Probable: the source is contained within or very close to a "small ($\leq 0.1\mathrm{deg}^2$) 3A error box or inside a larger 3A error box and has supporting evidence."

***** Possible: the source identification is a result of positional coincidence only.

The supporting evidence may be referenced in **other information** field.

**Other Information**

This field mainly contains additional information which is often followed by a reference identification in brackets. References for the **identification** and **position code** fields are listed in a similar fashion. The latter is always indicated by a "POS" flag. The low latitude survey (file 1) contains references to earlier papers based on SSI observations of sources in the catalogue; these are indicted by a "SSI" flag followed by the reference identification in brackets.

Also listed is any periodic behavior in the X-ray emission from the source. Note that " 'Seyfert' indicates a 'Seyfert type I' galaxy, and 'Hexelg' refers

to any other type of high extinction emission line galaxy. It is probable that almost all of the latter are, in fact, 'Seyfert type II' galaxies." See Warwick et al.; McHardy et al. (1981) for additional information concerning this field.

### 2.3 Reference file (file 3 of 3)

The reference file contains all references found in the **alternative names** and **other information** fields which are indicated by a reference identification, a letter and number combination, in brackets. The full references are listed alphabetically in the file by the reference identification. Table 3 describes the data format of this file.

| Bytes | Suggested Format | Data |
|---|---|---|
| 1-3 | A3 | Reference ID |
| 4-10 | 7X | Blank |
| 11-80 | A70 | Full Reference |

Table 3: Reference File Format

## 3 Remarks and Modifications

The *Ariel Catalogue of X-Ray Sources* was received on magnetic tape by the Astronomical Data Center (ADC), NASA Goddard Space Flight Center, from the Centre de Données de Stellaires (CDS), Strasbourg in March 1989. The original tape consisted of five files in the same format as the published catalogue. In addition to the four data files, a description file was also included; this has been incorporated into this document.

A FORTRAN program was run to check the validity of each field according to its data type and value.