The ALE Project

2021 March 7

This manual describes the data-entry and submission requirements for the Astrometric Literature Extraction (ALE) project.

DISTRIBUTION: Public
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Contents

Notes on the Astrometric Literature Extraction Project

These notes are intended to help you do the raw data entry on the as-yet-uncollected pre-1939 astrometry of minor planets and comets that was published in the literature and that is not yet available in machine-readable form. This is the aim of the Astrometric Literature Extraction (ALE) project.

The 1939 date results from the decision of Paul Herget, the first director of the Minor Planet Center, to only include observations made after that date in the Center's archive. The reason given was that earlier observations could easily be extracted from the literature using the comprehensive journal indexes that were standard at the time. The completeness date for comets is as recent as 1964.

1: The Rereduction Procedure

The rereduction of literature astrometry requires several steps.

- Computer entry of the raw observational data.
- Submission of file(s) containing raw observational data for conversion.
- Conversion of raw observational files into J2000.0 observations, rereducing (where possible) the observations using modern comparison-star coordinates.
- Checking of the J2000.0 observations with amendment of erroneous observations (if possible).
- Insertion of J2000.0 observations into the MPC archive.

The data files will be archived so that further rereductions will be possible in the future.

2: COMPSTAR

COMPSTAR is the name of the procedure that is used to convert raw observational data into J2000.0 observations. When sufficient information is supplied in the input files, COMPSTAR will attempt to rereduce the observation using modern comparison-star coordinates. If there is insufficient information to allow a rereduction, the given minor-body position is simply converted to J2000.0 using the IAU-approved procedure.

3: Journal Processing Order

The first journals to be processed, those with the bulk of the missing astrometry, are as follows:

- *Astronomische Nachrichten*
- *Journal des Observateurs*
- *Bulletin Astronomiques*
- *Astronomical Journal*

Once these are completed, the project will move onto smaller journals and observatory publications. Many of the observations in observatory publications also appeared in one of the four listed publications, and it is preferable if the observations are entered from the listed publications.

4: Updated Versions of this Document

Updated versions of this document may be obtained from the ALE website, which is currently (as of 2021 Mar,) under active development. The website is at: `https://www.ale-astrometry.org`.

Changes from the previous version of this document are as follows:

- Added section on resubmitting batches already sent (see Resubmitting Batches).

5: Format of the Input Files

You will be preparing the input files needed by COMPSTAR to convert the published observations into J2000.0 observations. Since the required input files may be up to almost 160 columns wide, you will need to use a text editor that can cope with lines of this length.

6: Format of Rereduction Records

The layout of each rereduction record is similar to the B1950.0 format for observations of minor bodies. This is a consequence of the evolution of the COMPSTAR program.

7: Micrometer Observations

Micrometer measures are the most common type of observation prior to 1900. Observations were obtained by measuring the difference in either R.A. and Decl. from a comparison star (with assumed known coordinates) multiple times over the space of a number of minutes. Generally, the observer would combine these multiple R.A. and Decl. offsets into a single R.A. and Decl. offset (and hence a single derived position for the minor body) at a time near the middle of the span of observations. In effect, the published observation is a “normal place”. Occasionally, the observer will report R.A. measures for one time and Decl. measures for a slightly different time.

8: Locating the Items to be Entered

When starting a new batch, it is advisable to locate the various bits of data that you will need to create the input file. Each journal tended to have its own standard format (which in some cases varies over time), so once you become familiar with it, you should have no problem. The various data that you will need to enter is described in the next chapter.

9: Entering the Data

There is a lot of data to be entered. It is important that the data is entered correctly. Data should be entered as published, except as noted in the next chapter. COMPSTAR can perform checking on the positional data that is entered if the object coordinates, comparison-star coordinates, offsets and reduction-to-day values are given.

But there is no automatic check possible if all these values are not supplied. Neither is any check possible on the object designation, reference, observatory code or date/ time of observation. So when proof-reading your entered data prior to submission, pay particular attention to those sections that cannot be checked automatically.

10: Saving Time...

Much of the data for each observation in a given batch will be the same. The reference, the observatory code and (generally) the year of observation will be the same for the entire batch. There may be multiple observations of the same object so the designation will be the same in many cases. To have to retype this repeated data every time is clearly a waste of time and a strain on the fingers.

To alleviate this time-wasting element, input files need only contain the data that changes from observation from observation. It is necessary to type out the first observation in full, but subsequent observations generally do not. Columns on subsequent observation records after the first record inherit the contents of the previous record (the columns containing magnitude estimates do not have this inheritance property). As an example, the start of the first four lines in the test data that you will be asked to submit (as a check that these instructions are understandable and that you understand them) may be entered as (noting that the two initial lines are simply there as a guide to the column numbers):

```
        1         2         3         4         5         6         7         8
2 4 6 8 0 2 4 6 8 0 2 4 6 8 0 2 4 6 8 0 2 4 6 8 0 2 4 6 8 0 2 4 6 8 0 2 4 6 8 0 2 4
  7         L 1899 07 27 231313 01 03 58.97 +14 50 07.4  APP.      7.8VAN152030 -01
                                     58.67        12.8
                    08 04 243506    12 32.03 +16 08 31.0           8.0V
                       14 245120    21 22.92 +17 34 59.8                        +00
```

It can be seen that the amount of typing necessary is much reduced.

If you need to disable the column inheritance feature (possibly because the observer used an uncatalogued comparison star) put an at-sign (“@”) in the columns which are not to be copied. The example below assumes the third observation shown above does not have a published object coordinate. Note that the fourth observation has to have the position entered in full, as there is nothing in the corresponding columns of the third observation for it to inherit!

```
        1         2         3         4         5         6         7         8
2 4 6 8 0 2 4 6 8 0 2 4 6 8 0 2 4 6 8 0 2 4 6 8 0 2 4 6 8 0 2 4 6 8 0 2 4 6 8 0 2 4
  7         L 1899 07 27 231313 01 03 58.97 +14 50 07.4  APP.      7.8VAN152030 -01
                                     58.67        12.8
                    08 04 243506 @@ @@ @@@@@ @@@ @@ @@@@          8.0V
                       14 245120 01 21 22.92 +17 34 59.8                        +00
```

Note that TABs must not be included in the input files!

Note also that metadata lines (those beginning with #) do not affect the inheritance of previous lines. So the example above would still be valid if the following metadata line:

```
#PAGE 183
```

was inserted between the first and second observations.

11: The Test Data

The test data consists of a number of observations of (7) Iris made at Arcetri Observatory (code 030) stretching over some five months in the second half of 1899, as well as some observations of (4) Vesta made at the same site. The observations were published in *AN* **152**, 83. See Entering Real Data for information on how to access this article.

Please enter this data according to the instructions given in this booklet. When you have completed entering the data, e-mail the completed input file, according to the notes in the sub-section Submitting Batches, to `ale.astrometry@gmail.com` for checking. Please indicate that it is the test batch in the subject line.

You will receive two e-mails after you submit each batch. The first will inform you about forrmatting issues in the submitted batch. If there are serious problems, you will be asked to fix the problems and resubmit. The second e-mail will detail any discrepancies between what you submitted and what was published.

12: Entering Real Data

When the test batch has been received and verified you can start to enter real data. You will be assigned a journal and volume to work on. It is very important that you pick up all the observations in a single volume.

You will access the publications via the Astrophysical Data System (ADS). It is up to you whether you work from the on-screen PDFs or work from printouts.

You will scan through all the pages in your assigned volume via the ADS article service:

http://articles.adsabs.harvard.edu/article_service.html

You will find the *AJ*, *AN* and *JO* on the Scanned Journals Service (SJS) link:

http://adsabs.harvard.edu/journals_service.html

The *BA* is found on the Scanned Bulletins and Observatory Publications Service (SBOPS) link:

http://adsabs.harvard.edu/bulletins_service.html

The SJS and SBOPS both work in the same fashion: select the desired journal from the list, enter the volume number and enter 1 for the page number. Then click Send Request. The requested page is displayed, embedded in a page displaying a lot of information about the ADS entry and links to surrounding pages. It is easier (for me, at least) to click on the displayed page, which takes you to a much simpler version of the page. Navigation is much easier and at the bottom of the page are

links to the other pages that are part of the article. When you come across a non-observation article, say a 30-page theory of the motion of the Moon, you can quickly skip to the last page of that article by clicking on the last page link, rather than having to click Next Page multiple times.

13: Submitting Batches

A batch consists of all observations in a single article. Each batch/article should be in a separate file.

It is up to you how frequently you wish to send batches of completed data for processing. You can send each batch as it is completed. Or you can send all completed batches once a day/week/month/whenever.

Your files should be .txt files with leafnames that indicate your surname, the journal name, the volume number and the starting page number, with each bit separated by underscores. For example, `Smith_AN_176_234.txt`. If there are multiple articles on the same page, you can distinguish between files by appending a dash and a number or letter before the file type: e.g., `Smith_AN_176_234-A.txt` or `Smith_AN_176_234-2.txt`.

1: Submitting Via File Upload

File uploading of completed ALE observation batches is the preferred method of submission.

The file upload form is on the ALE website at `http:ale-astrometry.org/file_upload.html`. This allows you to transfer one or more ALE files directly from your desktop to the ALE server.

After you submit each batch, you will receive an e-mail detailing any formatting issues with the submission. If there are serious formatting issues, you will be asked to fix the problems and resubmit.

2: Submitting By E-Mail

You should use e-mail submission only if you cannot do file upload. You must submit completed batches to `ale.astrometry@gmail.com`. Please ensure that the subject line clearly indicates that this is an ALE submission.

Since e-mail will corrupt the very long lines, you must zip or gzip your batches, even if submitting only one batch. The compressed zip/gzip file should be attached to your mail.

After you submit each batch, you will receive an e-mail detailing any formatting issues with the submission. If there are serious formatting issues, you will be asked to fix the problems and resubmit.

14: Resubmitting Batches

Please do not resubmit batches without first sending an e-mail to `help@ale-astrometry.org`, stating what was wrong with your original

submission. Await a response. If the problem does not warrant resubmission, you will be so informed. If it does, we will first remove the original submission, then tell you that you can resubmit.

15: Processing Order

Submitted batches are processed in size order, from largest to smallest.

Processed batches are transmitted to the Minor Planet Center several times per month. Transmitted batches are subject to additional checks before being added immediately to the database, as well as to flat files that will be incorporated into the master flat files of observations when the next batch of *Minor Planet Circulars* is prepared.

16: Need Help?

If you find yourself in need of help while entering data (e.g., you can't work out the observation site or which object is being observed) simply send an e-mail to `help@ale-astrometry.org`. Please be sure to identify the journal name, the volume and page number to which your enquiry refers.

Note that there is no need to include a PDF of the article in your e-mail.

The Required Input Data

The required input data varies slightly depending on whether or not there is sufficient published information to allow rereduction of the observation. For transit-circle and photographic observations, no rereduction is possible, so for these types of observation only the data in sections 1 through 8 below need to be entered. For micrometric observations where the comparison star is identified by position or the offsets from a comparison star is given, you will need to enter the data in sections 9 through 12 (and possibly through 14) as well.

1: Designations

Designations of minor planets are entered in columns 1–4 if the object is a numbered minor planet or columns 5–10 if unnumbered. Unnumbered designations are entered in unpacked form, with any spaces removed. Numbered designations do not have leading zeroes if less than (1000).

Occasionally, there will be no designation present in the article. In such cases, use 'X' as the designation.

The entry of the designation is complicated by a number of factors: the use of old-style provisional designations for pre-1925 objects; and errors or changes in the assignment of designations (this is particularly troublesome for comets).

In the earlier iteration of this project, a photocopy of Strobel's *Identifizierungsnachweis der Kleinen Planeten* was supplied and it was the volunteer's responsibility to figure out the mapping between old-style and new-style designations for minor planets. This is no longer necessary. Simply enter provisional designations, as published, starting in column 5. Any spaces in the designation should be removed.

1: Comet Designations

Similarly, comet designations should be entered as published, starting in column 1. Remove any spaces. Truncate if longer than ten characters. Do not include the word 'Comet' (or variations thereof).

For newly-discovered comets, where no designation is shown in many cases (particularly in the 19th Century), enter the name, truncating if longer than ten characters. If no comet name is present, enter 'Comet'.

It was common in the 19th Century for comet Roman numeral designations to be given in reverse order from modern usage: e.g., 'III 1883' instead of the modern form '1883 III'; enter as 'III1883'.

2: Time Systems

Prior to 1925, the astronomical day started at noon.

The time system flag is encoded in column 14 and has the following possible values:

- ' ' (ASCII space), UT(C)
- 'L', local mean time

- ‘S’, local sidereal time
- ‘G’, local mean time, geocentric position
- ‘g’, UT, geocentric position

Occasionally, the time of observation will be given as a local timezone time (e.g., MST) rather than as a local mean time. In such cases the time system flag should be left blank and the published time of observation should have the timezone correction applied before being entered into the datafile. Don’t worry if the number of hours is greater than 24.

Pay particular attention to cases (by using the appropriate time-zone flag) where the observer has made allowances for parallax. While modern observers should never correct their observations for parallax, it was a rather common practice in the past (particularly by transit-circle observers). And very occasionally, some observations in a single article would be corrected for parallax and others would not!

The time system is generally indicated in the header attached to the observations. Local mean time is indicated in German as, for example, “M. Z. Münc”, meaning “Munich mean time”, or in English as “Cape M. T.”, meaning “Cape of Good Hope mean time”. The place name is usually abbreviated but the full place name can usually be found in the article, typically in the author line at the end.

Prior to 1925 it was usual for local mean time to be used for timing observations. After 1925, Universal Time quickly became standard. To complicate matters, some observers used UT prior to 1925: such cases will be marked “Weltzeit” (and these will generally need the 0.5 day or 12 hour correction to be applied). Be aware of the non-standard use of Universal Time prior to 1925 and local mean time after 1924!

Some observations are reported without stated times of observation. These tend to be observations made by meridian circles, transit instruments or mural quadrants. The published R.A. is to be used as the sidereal time of observation, noting that a 0.5-day correction is not applied in such cases.

3: Date of Observation

The date of observation is entered in columns 16–31 in the standard “YYYY MM DD.ddddd” format or in columns 16–32 in the “YYYY MM DD hhmmss” format. The year of observation is generally not given with every observation but is typically indicated in the header of the observations.

For dates prior to 1925, 12 hours (or 0.5 day) should be added to the published time before being entered into the datafile, unless the observation time is a sidereal time. Don’t worry if the number of hours is greater than 24.

If the date of observation is given as a decimal day, up to 5 decimal places may be given (with the decimal point being in column 26).

If the date of observation is given as time, enter it in the form ‘hhmmss’, beginning in column 27 (and a space in column 26). Near the end of the year, the date may be given as, for example, Dec. 32. Enter the date as published since COMPSTAR will output a standard equivalent. Some times may be given to reduced precision, such as 10h30m or 14h23.7m. Such times should be entered in the form ‘hhmm’ or ‘hhmm.d' (i.e., as published).

If the times of the start and end of the observation are given (rather than the usual mid-point), determine the mid-point of the start and end times and use that as the time of observation..

The month name may be given in either English, French, German, Italian or Spanish. For convenience, the names of the months in each of these languages are collected in the table below:

English	French	German	Italian	Spanish
January	janvier	Januar	gennaio	enero
February	fevrier	Februar	febbraio	febrero
March	mars	März	marzo	marzo
April	avril	April	aprile	abril
May	mai	Mai	maggio	mayo
June	juin	Juni	giugno	junio
July	juillet	Juli	luglio	julio
August	aôut	August	agosto	agosto
September	septembre	September	settembre	septiembre
October	octobre	Oktober	ottobre	octubre
November	novembre	November	novembre	noviembre
December	decembre	Dezember	dicembre	diciembre

Month names in various European languages

4: Position of Minor Body

The position of the minor body is given as published. The right ascension (if given in the standard "hh mm ss.dd" form) is entered in columns 34–44. The declination (if given in the standard "±dd mm ss.d" form) is entered in columns 46–56, with the sign in column 46.

If a position is published with lower precision, enter the positions exactly as published. For example, if the RA is given as "10 13.33", enter "10 13.33" in columns 34–41.

There is no justification for higher-precision positions. Simply round higher-precision positions to the normal precision. E.g., a Declination published as "+10 13 24.46" should be entered as "+10 13 24.5". Use "round to even" as the rounding method.

Some observers reported North Polar Distance (NPD) instead of declination. If this is the case, the number of degrees of NPD are given left-zero-filled in columns 46–48 without sign (as NPDs are always positive) and column 57 contains 'P'. Observers who report NPDs are typically French.

Very rarely, you may see South Polar Distance (SPD), where measurement starts at the south celestial pole and increases northwards. Enter such positions as if they were NPDs, but put 'S' in column 57.

Occasionally, the RA is given in degrees rather than hours. This generally occurs only in the older pre-1880 literature. In such cases, enter the left-zero-filled degrees in columns 33–35 and enter the minutes and seconds of arc as normal.

5: Equinox of Minor Body Position

The equinox of the minor-body position is given in columns 59–62. The equinox is marked in the observation header.

Visual micrometer or transit observations are generally apparent positions, this is entered as 'APP.'

Photographic observations are generally for a standard equinox (e.g., '1925' or '1950') or for the mean equinox of the start of the year of observation. If the equinox is not stated, assume mean equinox of the start of the year of observation.

Watch out for cases where the equinox changes in the middle of a batch of observations and for cases where the observations span New Year and the equinox doesn't change. Such cases will hopefully be encountered very infrequently. Computational convenience meant that a single batch from a single observer was typically given for the same equinox.

6: Magnitude

The magnitude, if any, will usually be given in a column marked 'Gr.' (from the French *grandeur*).

Visual observations (i.e., micrometer or transit observations) should be marked as being *V* magnitudes. Magnitude estimates from photographic observations should not be so marked.

If a magnitude is only listed in the header for a specific object, rather than on an observation line, enter the magnitude only for the first observation. Unless the magnitude is indicated as being for a specific data, in which case enter it for the observation made on that day. Do not apply a header magnitude to all the observations of the object.

Ensure that you do not accidentally enter the magnitude of the comparison star!

If magnitudes are given as fractions, round ¼ to 0.2 and ¾ to 0.8. If the observer has given the magnitude to high precision (such precision is meaningless), round to the nearest 0.1 mag.

The magnitude is given in columns 68–71, with the decimal point in 70, and the band is in column 72.

If the object is brighter than 10.0, do not include a leading zero.

Because of the confusing nature of cometary magnitudes ("what does the quoted magnitude estimate refer to?"), do not bother recording magnitudes for comet observations.

7: Reference

The reference is given in columns 73–77. It consists of a one-, two- or three-character publication identifier, followed by a left-zero-filled volume number.

Common abbreviations are listed in the table below:

AJ	*Astronomical Journal*
AN	*Astronomische Nachrichten*
BA	*Bulletin Astronomique*
JO	*Journal des Observateurs*

If you are entering observations from volume 77 of the *Astronomische Nachrichten*, you would enter "AN077" as the reference.

8: Observatory Code

Columns 78–80 contain the standard three-character observatory code of the observing site. If a site does not have an observatory code, enter XXX as the code and make mention of this fact in the e-mail you send when you submit the observations. The determination of whether a new (historical) observatory code needs to be assigned will be made in consultation with the MPC.

9: Offset from Comparison Star

The R.A. and Decl. offsets from the comparison star to the object are given in columns headed $\Delta\alpha$ and $\Delta\delta$.

The right-ascension offset is given in minutes and seconds of time (to 0.01 seconds of time). This value should be entered in columns 82–90, with the sign in column 82 and the decimal point (of the seconds) in column 88. Quantities are zero-left-filled. Round the offset if given to a precision better than 0.01 seconds of time.

The declination offset is given in minutes and seconds of arc (to 0.1 seconds of arc). This value should be entered in columns 92–99, with the sign in column 92 and the decimal point (of the seconds) in column 98. Quantities are zero-left-filled. Round the offset if given to a precision better than 0.1 seconds of arc.

If the NPD offset is given instead of the declination offset, column 100 contains "P".

Sometimes an explicit offset is not given. However, the observation may still be rereduceable if the position for the comparison star is given as the offset can be derived by subtracting the comparison star coordinates (amended with the reduction-to-day values, if needed) from minor-body coordinates. You will need to pay particular attention when checking such observations prior to submission, as the lack of a published offset means the automated checks mentioned earlier are not possible. Do not be tempted to determine the offset yourself!

10: Reduction-to-Day Values

The reduction-to-day values are the offsets that are applied to the mean position for start of year of a comparison star in order to convert it into an apparent place at the time of observation. These values are typically given in columns headed “Red. ad l. app.”.

The right ascension value (in seconds of time, to 0.01 s) is given in columns 103–106 (decimal point in 104) with the sign in column 102. Round the value if given to higher precision.

The declination value (in seconds of arc, to 0.1") is given in columns 109–112 (with leading zeroes and the decimal point in column 111) with the sign in column 108. Round the value if given to higher precision.

If the declination value is in fact a NPD or SPD value, enter ‘P’ or ‘S’, as appropriate, in column 113.

11: Comparison Star Coordinates

The comparison star coordinates are generally collected in a table at the end of the observations. The comparison star that is used for a particular observation will be indicated in a column labelled “*” or “Comp.”: the number (or, occasionally, letter) given there needs to be found in the comparison star table. The table may be headed as “Angenommenemittlere Oerter der Vergleichsterne” (German), “Positions moyennes des Étoiles de Comparaison” (French), “Stelle di confronto” (Italian), “Stelle di comparazione” (Italian), or variants thereof.

The comparison star R.A. is entered in ‘hh mm ss.dd’ form in columns 115–125.

The comparison star Decl. is entered in ‘±dd mm ss.d’ form in columns 127–137.

If the NPD (or SPD) of the comparison star is given instead of the Decl., columns 127–129 contain the left-zero-filled degrees of NPD (or SPD). Column 138 should then contain ‘P’ (or ‘S’).

Occasionally, a lower-precision comparison-star position may be given. E.g., hh mm.d, ±dd mm form. In such cases, enter the comparison-star position as given.

12: Equinox of Comparison Star Coordinates

The equinox of the comparison star coordinates is given in columns 140–143.

The comparison star coordinates are generally given for the start of the year of observation: e.g., for observations made in 1899, the comparison-star coordinates are generally mean positions for 1899.0 and “1899” is what is entered.

Occasionally, apparent coordinates are given for the comparison stars. Columns 140–143 should then contain 'APP.'.

13: Secondary Observatory Code

A secondary observatory code is placed in columns 144–146. These columns will be entered only if the observation time is a local time referrred to some site other than the observation site.

14: Secondary Comparison Star Offsets

Occasionally, an observer made use of a faint comparison star which was not in any catalogue available to him. Sometimes they would tie the position of this primary comparison star to a secondary comparison star of known position. And there are even cases where a tertiary comparison was used! In the earlier incarnation of this project it was necessary to enter the data on secondary comparison star. This is no longer necessary as the star catalogues now used are deep and dense enough to include all stars likely to have been used as comparisons.

15: Metadata

Various items of metadata associated with each batch should be entered. Metadata is entered on lines beginning with #. A metadata tag name is followed by a space, then by the metadata for that tag.

There are two types of metadata: required and optional. The tags are described below, separated by type, in the order that they should given.

1: Required Metadata

This is data that is required.

Metadata tag	Purpose	Format	Example(s)
#ID	Your name	String	
#EMAIL	Your e-mail address	String	
#JOURNAL	Journal name and volume number	String	AN 178
#ARTICLE	Indicates a new article	String	
#PAGE	Page number on which observations reside	Generally an integer, sometimes a string	134 A76

The #PAGE tag must be given whenever the page number changes. A #PAGE tag must be given immediately after an #ARTICLE tag.

The #ARTICLE tag must be given whenever observations from a new article are entered. The value given for the #ARTICLE tag should be enough of the title of the article to uniquely identify it on that page. There is no need to enter the accented characters, just enter the unaccented character. E.g., if the title contains “á” or “ü” you would simply enter “a” or “u”.

There must only be one #ID, one #EMAIL and one #JOURNAL tag in each batch.

Since Submitting Batches states that each submitted batch should contain observations from one article, there should only be one #ARTICLE in each batch.

2: Optional Metadata

This is data that it would be nice to have entered, but it is up to you whether or not you include it.

Metadata tag	Purpose	Format	Example(s)
#COD	Observatory code	String	522
#OBS	List of observers	Comma-separated list of names	F. X. Bloggs H. van Gent
#MEA	List of measurers	Comma-separated list of names	F. Sy, S. Arend
#TEL	Details of telescope		0.12-m refractor

The format of the #OBS, #MEA and #TEL lines should be the same as that used on new submission of current observations. These formats are documented on the MPC website. These tags should be given once for each batch of observations.

16: Example Metadata

Below is a (ficticious) sample of a two-page batch showing the required metadata.

```
#ID Homer J. Simpson
#EMAIL hjsimpson@springefield.net
#JOURNAL BA 13
#ARTICLE Observations des cometes
#PAGE 134
... observations on p. 134 ...
#PAGE 135
... observations on p. 135 ...
```

Here is another (again ficticious) sample of a one-page batch showing optional metadata.

```
#ID Theophilous P. Wildebeest
#EMAIL t.p.wildebeest@sirlenny.org
#JOURNAL AN 134
#ARTICLE Beobachtungen der Kleine Planeten
#PAGE 308
#COD 045
#OBS J. Palisa
#TEL 0.63-m refractor
... observations on p. 308 ...
```

Tricks, a.k.a. Tricky Cases

This section mentions some of tricky cases that you may run across during your data entry.

1: "Buried" Observations

Not all observations are nicely laid out in table form. When a new comet or minor planet is announced it is more usual for the observation(s) to be buried in a block of text. Such items have titles similar to, for example, "Entdeckung eines neuen Cometen von Finlay" ("Discovery of a new comet by Finlay") or "Entdeckung eines neuen Planeten (260) auf der Sternwarte in Wien" ("Discovery of a new minor planet, (260), at the Vienna Observatory"). A similar form of publication is often used if an observer made only a single observation. These will have titles such as, for example, "Beobachtung des Winnecke'schen Cometen" ("Observations of Winnecke's comet"). A particular thing to watch out for is where the comparison-star table ends halfway down a page and there is a buried observation or two further down.

2: Page Numbers in the Astronomische Nachrichten

The *Astronomische Nachrichten* used different page numbers for the left and right side of each page. This seems to be a consequence of the two-column formatting of most pages.

When an observation occupies the whole page width, use the left-hand page number (which will be odd). When an observation occupies only the right-hand column, use the right-hand page number (which will be even).

3: Astronomische Nachrichten Beilage

The *Beilage* (*Supplement*) of the *Astronomische Nachrichten* were a series of rapid-announcement circulars that carried news that was urgent. Observations that appeared on the *Beilage* would usually later appear in the regular *AN*, sometimes in an updated form.

When you run across a *Beilage*, leave it until you've completed the rest of the volume. Then check to see whether the *Beilage* observations appeared in later *AN*. If they did not, and the observations are not approximate observations of comets, then they need to be entered.

Some *Beilage* have page numbers in the regular *AN* sequence. The normal form of the `#REF` metatag should be used in such cases.

For those *Beilage* that are not part of the regular *AN* sequence, the `#REF` metatag should be `#REF AN Beilage <issue number>, <page no>`. A single-page example can be found between *AN* 199, 288 and *AN* 199, 289, with the title Beilage zu Nr. 4769 der Astronomischen Nachrichten. In this case, you would enter `#REF AN Beilage 4769, 1`.

4: Erroneous Designations

In the days of visual minor planet discovery, names and (starting in the 1850s) numbers were assigned to new discoveries immediately upon discovery. There are many cases in the old literature where a new number was assigned to a object that had been discovered previously but had been lost (the new number would then be reassigned to a later discovery), or where an object's number was changed after initial announcement due to the late report of an earlier discovery. You do not need to worry about these historical anomalies, simply use the published designation.

5: Multiple Observations for the Same Time

If there are two or more observations of the same object for the same time, do not ignore the second and subsequent observations or try to average them. Simply enter them as published. For micrometric observations it is usually a sign that two or more comparison stars have been used and the multiple observations are independent measures. During the subsequent processing of the raw input files the positions will be averaged.

6: Weird Magnitudes

You will sometimes see weird magnitudes, such as 9.10. This is not a magnitude quoted to 0.01 mag, rather it means mag. 9 to 10. In such cases, enter the mid-point. In the given example, this would be 9.5.

There is a problem: a real estimate of $V = 8.9$ is not distinguishable from a range 8.9. Determining what 8.9 refers to depends on context. As an example, if most magnitudes in the article are given to integer values, and there is one 8.9, then you can safely assume that this refers to the range 8 to 9, so that you would enter 8.5. If in doubt, contect ALE help for advice.

7: Incomplete Observations

Incomplete observations are those observations where only the R.A. or the Declination (but not both) of the object is derived for a given instant.

Two situations are possible. The first is the easier to deal with. Here we have two observations close together in time (they must be on the same night). The missing data (derived coordinate of minor body and coordinate offset) are copied from the nearby observation, but the precision of the data is reduced. The second situation is where there is no nearby observation from which to take the missing values. In this case, blank out the missing columns. They will have to be filled in during the processing of the batch.

An example of incomplete observations is attached (it is taken from *AN* 128). The first four observations would be entered as follows (noting that the reduction-to-day values and comparison star coordinates are entered in full on the first line):

```
...181919 05 37.6     -41 53 33.3...-02.7     -03 04.1  -1.57 +01.3  05 40 16.20...
...182446      @34.28        @@@@...   @40.35     @@@@
...182527 06 28.5     -45 20 16.8...-01.6     -02 34.3  -1.67 -00.9  06 30 04.37...
...183130      @28.74        @@@@...   @33.95     @@@@
```

See how missing R.A.s are given in HH MM.d form, missing Decls in ±DD MM form, missing R.A offsets in ±MM.d form and missing Decl. offsets in ±MM form.

Be sure to disable the inheritance feature for the decimal-point column in low-precision values on following lines, as shown in the example above.

8: Definitive Orbits

Often, when definitive orbits (often those computed with consideration of planetary perturbations) were published, orbit computers would publish lists of the observations they used in their computation. Orbit computers would often rereduce the observations, using more recent star positions than were available to the observers. This is essentially what the ALE Project is doing. In most cases, these observations had already been published, so they do not need to be entered when you encounter a definitive-orbit paper.