

WFPDB New Development and Analysis

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Abstract. The data in the latest on-line version of the Wide-Field Plate Database (WFPDB) have been analyzed. The total number of observations in WFPDB from the archives of more than 100 professional instruments that operated in the period 1885–1999 has reached nearly half a million. The characteristics of the two main parts of the database – the Catalogue of Wide-Field Plate Archives (CWFP) and the Catalogue of Wide-Field Plates (CWFP) – are described. The inclusion recently in WFPDB of digitized images of the plates, as well as some new possibilities for data search are discussed.

1 Introduction

The Wide-Field Plate Database (WFPDB; for the establishment and development of the database see [1]) is a long-term project aimed at making an inventory of all wide-field ($\gtrsim 1^\circ$) photographic observations archived in astronomical institutions all over the world, and facilitating and stimulating in this way their use and preservation as a valuable source of information for investigations in astronomy. WFPDB can be useful especially in studies of objects with variable position on the sky or with variable brightness. At present WFPDB exists in two forms as two on-line versions, the first one installed at the Strasbourg Data Centre (CDS) in 1997 and accessed there through the Vizier system at address <http://vizier.u-strasbg.fr/viz-bin/VizieR?-source=VI/90>, and the second one installed in Sofia Sky Archive Data Centre since 2001, accessed at <http://www.skyarchive.org>. The first and older version is a static one, while the second version is regularly updated, and not only enlarged with new data but also provided with new possibilities for data search. Here we present the new development of this second version of WFPDB.

2 General Structure of WFPDB

The scheme in Figure 1 shows the general structure of the WFPDB. It has two main parts: (1) a Catalogue of Wide-Field Plate Archives (CWFP) containing

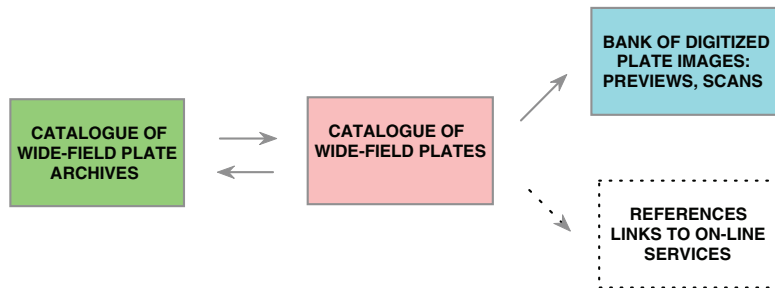


Figure 1. General structure of the WFPDB.

the information for all known plate archives and the observational instruments that have produced them, and (2) a Catalogue of Wide-Field Plates (CWFP) containing the parameters of the individual observations. An additional part of the database is the bank of digitized plate images. These can be either plate previews or plate scans. A fourth part of the database is in preparation, now only being in the initial stage [2]. It will contain references to publications concerning the observations in WFPDB and links to on-line services offering the publications in electronic form. Thus the user of the database can get important information for the observation of interest to him.

Combining the information from all parts of WFPDB one can obtain the complete available data for any observation in the database.

3 Analysis of the Catalogue of Wide-Field Plate Archives

We have analyzed separately the two main parts of WFPDB – CWFPA (see [3] for more details for its last version 5.0) and CWFP – in order to derive the general characteristics of the database. The results from the analysis of CWFPA are summarized in Table 1 and presented graphically in Figures 2–7. At present the total number of known to us plate archives has reached 414. Let us note that by “archive” we understand as a rule the collection of plates produced with a definite observational instrument at a definite observational site and stored at a

Table 1. Content of WFPDB.

| | Archives | Instruments | Observatories | Countries | Plates |
|----------------|----------|-------------|---------------|-----------|----------|
| CWFPA | 414 | 324 | 119 | 40 | ~2200000 |
| CWFP | 106 | 105 | 24 | 19 | 476374 |
| In preparation | 44 | 40 | 22 | 18 | 187168 |

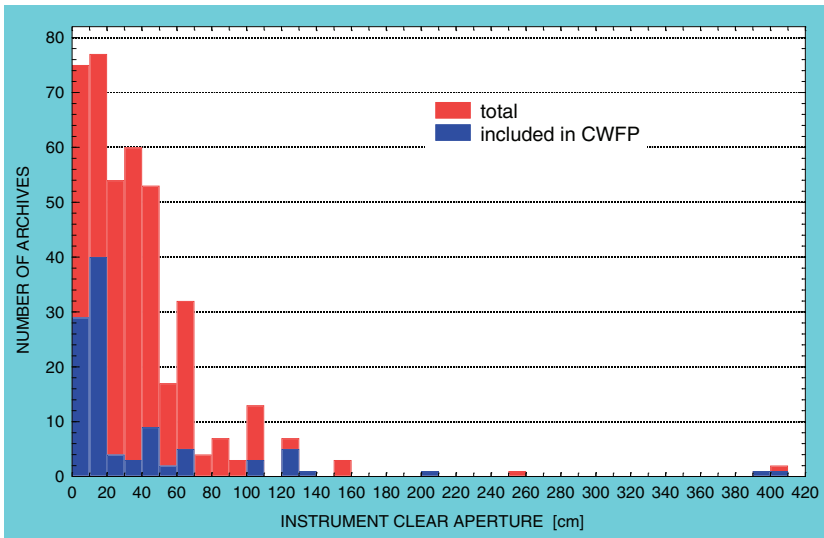


Figure 2. Number of archives versus instrument clear aperture.

definite place. This means that one telescope may have more than one archive and even one instrument may have more than one archive. The existing 414 archives have been produced with 324 instruments in 119 observatories in 40 countries. The estimated total number of plates in these 414 archives is about 2 200 000. About 65 000 of them are spectral observations.

Figure 2 shows the frequency distribution of the archives according to instrument clear aperture. It is seen that most of the wide-field plate archives are produced with instruments with small apertures up to 50–60 cm. The field size of the instruments is predominantly between 1° and 20° (Figure 3). As it is seen in Figure 4 most of them are refractors, astrographs and cameras.

The number of plates in the individual archives ranges between several dozens to more than 100 000 (Figure 5). Only a small number of archives have more than 10 000 plates. 35 of the archives contain a total of 64 095 spectral plates.

According to the initial year of operation of the instruments in CWFP the oldest plate archive was started in 1879 in Potsdam. The boom in the appearance of new archives was between 1955 and 1965 when the first observations of more than 100 archives started.

The geographical distribution of the wide-field instruments that have produced the plate archives is shown in Figure 6. It is very uneven, with strong maximum in Europe and several local maxima more in North and South America and in South Africa.

To the beginning of 2006 106 plate archives are included in CWFP. They are

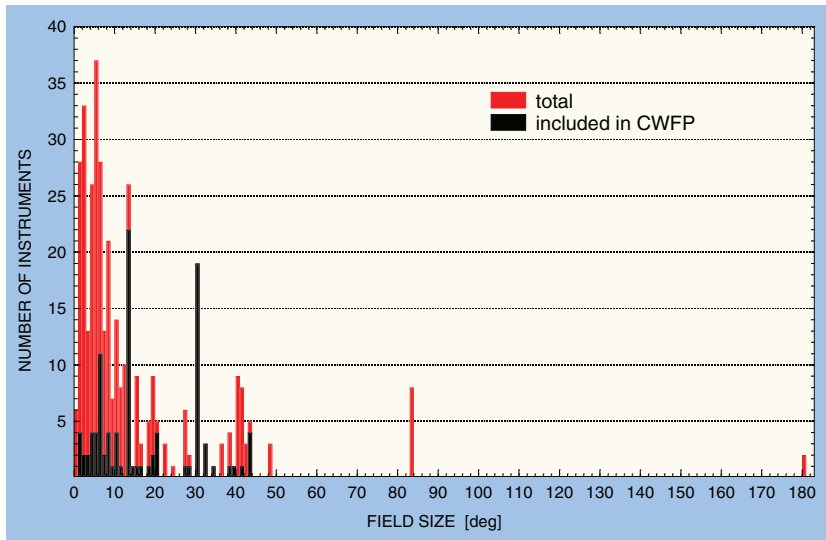


Figure 3. Number of instruments according to field size.

from 105 instruments in 24 observatories in 19 countries (see Table 1). The total number of plates in these archives is 476 374 (16 797 of them are spectral observations).

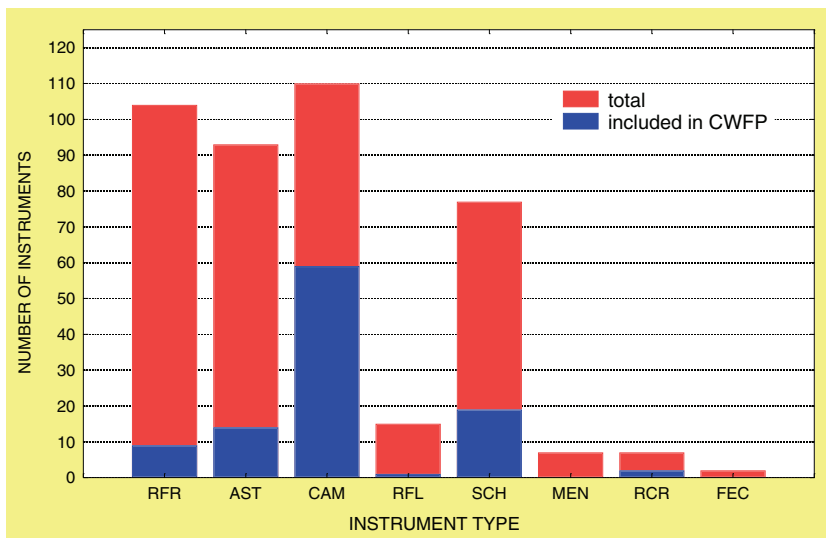


Figure 4. Number of instruments according to instrument type.

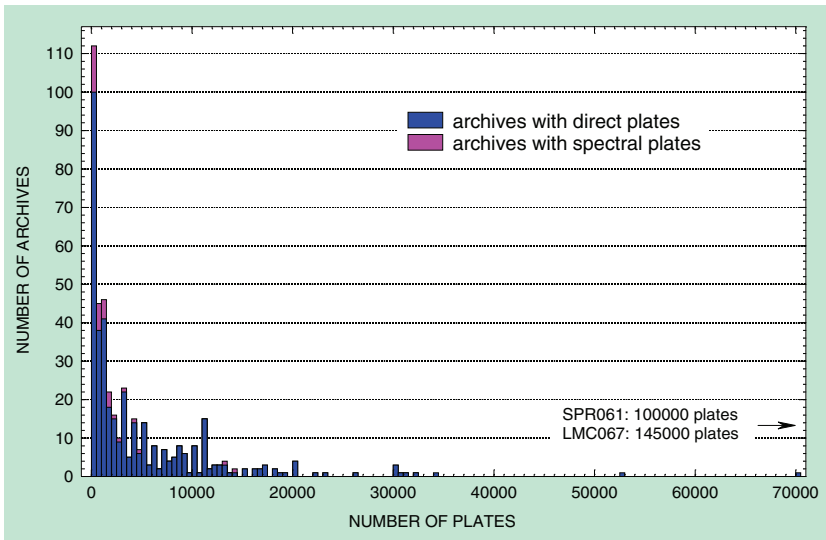


Figure 5. Number of archives versus number of plates.

The distribution of the archives included in CWFDP by instrument clear aperture, field size and type are shown in Figures 2–4, respectively. The geographical distribution of the archives included in CWFDP is shown in Figure 7. It resembles

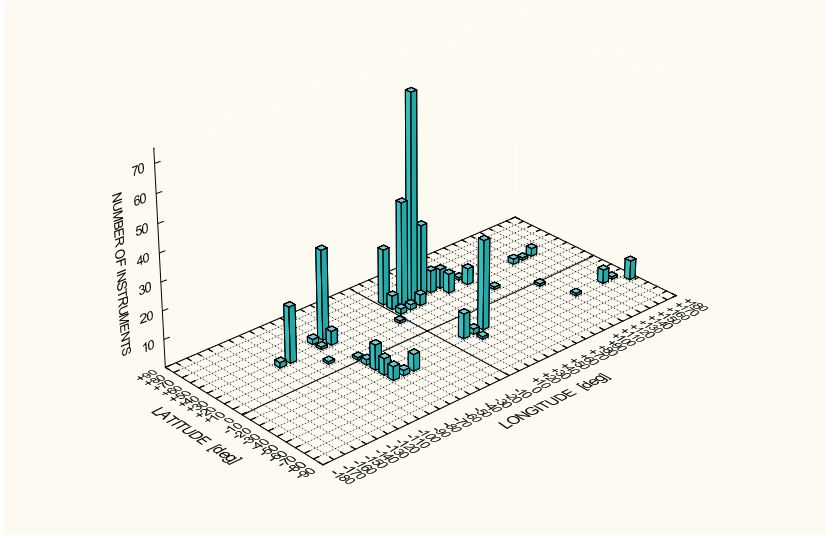


Figure 6. Geographical distribution of the wide-field instruments.

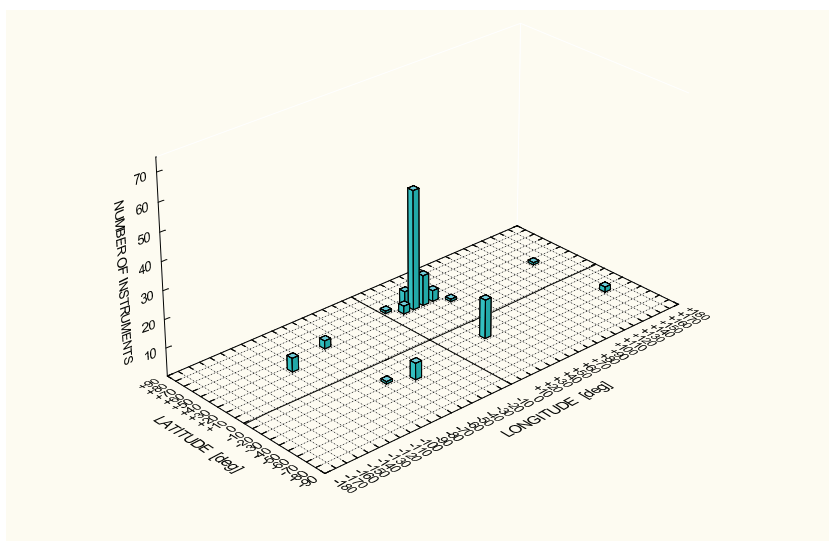


Figure 7. Geographical distribution of the instruments with archives included in CWF.

the distribution in Figure 6 but only for 25% of all plate archives and reflects the still low completeness of CWF.

The last row in Table 1 gives information for the plate archives which are in preparation for inclusion in CWF: 44 archives for 40 instruments in 22 observatories in 18 countries, with a total of 187 168 plates (1393 of them being spectral plates).

4 Analysis of the Catalogue of Wide-Field Plates

As it was pointed out CWF contains at the beginning of 2006 476 374 plates from 106 archives/instruments. Figure 8 shows the contribution of each of the 24 observatories possessing these instruments to the total number of plates in CWF. Most of the plates in CWF (62.5%) are from Sonneberg Observatory (217 340 plates) and from Harvard (76 679 plates). The distribution of the plates by the instrument clear aperture is shown in Figure 9. Most plates are obtained with telescopes with aperture not larger than about 60 cm.

The distribution of the plate centres on the sky is shown in Figure 10 in equatorial coordinates. The density of observations is much larger in the regions near the ecliptic and the galactic equator due to the large number of observations of solar system bodies and of objects in the Galaxy. One can see in Figure 10 also smaller regions of high concentration of observations like the regions of M 31, the Pleiades, the Magellanic Clouds, etc., which have been of greater interest to the observers.

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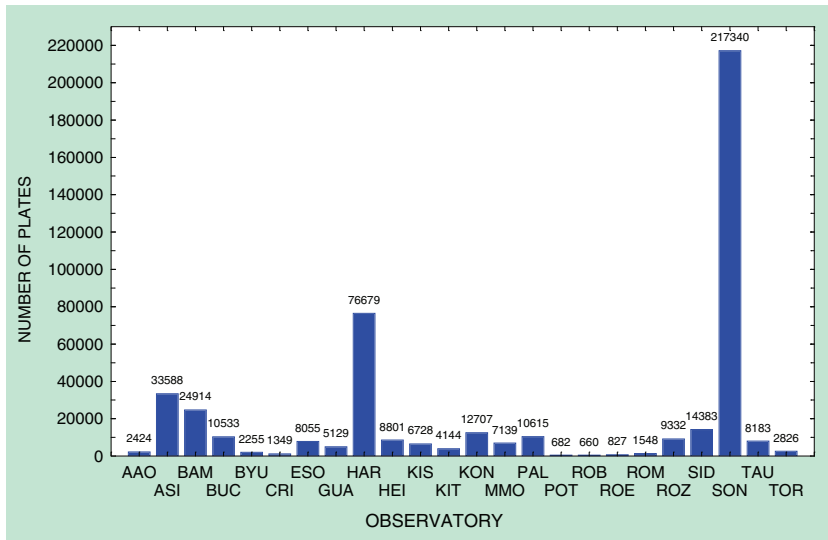


Figure 8. Number of plates from 24 observatories included in CWF.

Up to now we have determined the type of the observed object for about 73 000 observations included in CWF (about 51 000 of which have been classified simply as stellar fields) using the object name and coordinates, if given in the orig-

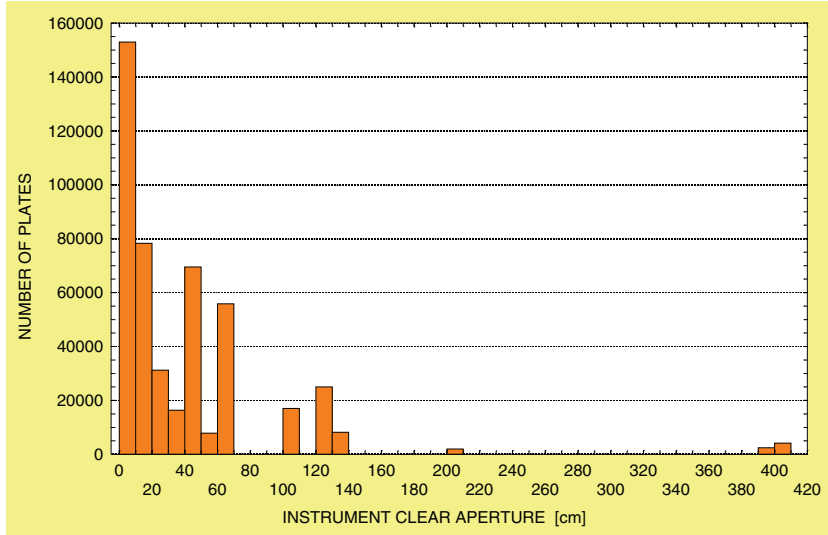


Figure 9. Distribution of the number of plates in CWF by instrument clear aperture.

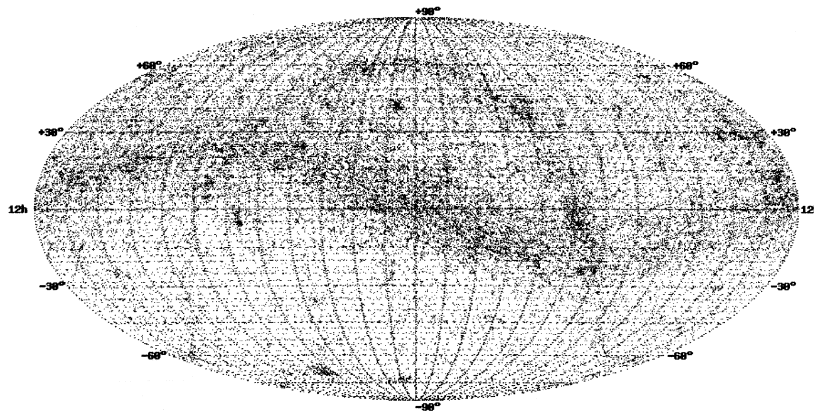


Figure 10. All-sky distribution in equatorial coordinates of the centres of plates included in CWF.

inal plate catalogues. Figure 11 shows how these observations are distributed according to the object type. If we exclude the stellar fields, most of the observed objects are solar system bodies, stars and stellar systems.

It is interesting to see how the observations in CWF are distributed according to the time of observation. This is shown in Figure 12. The observations in CWF cover the period 1885–1999, i.e. the time baseline of CWF is 114 years. One

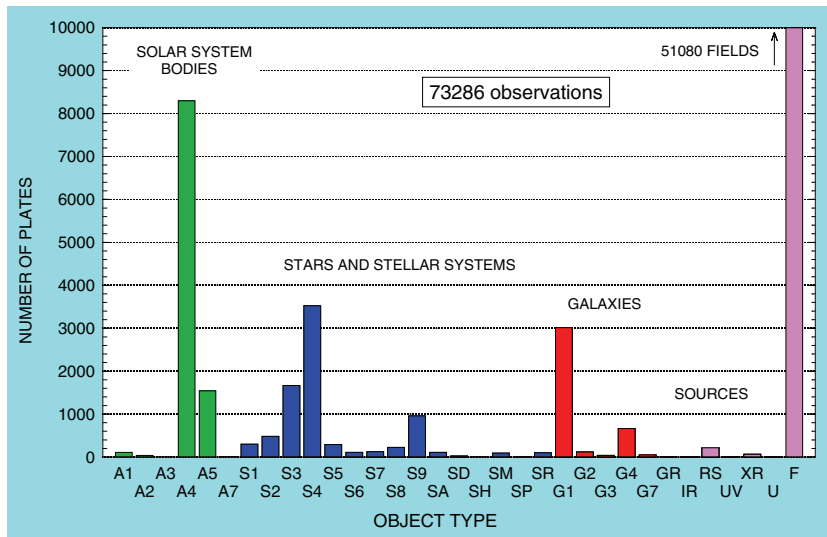


Figure 11. Number of observations in CWF versus object type.

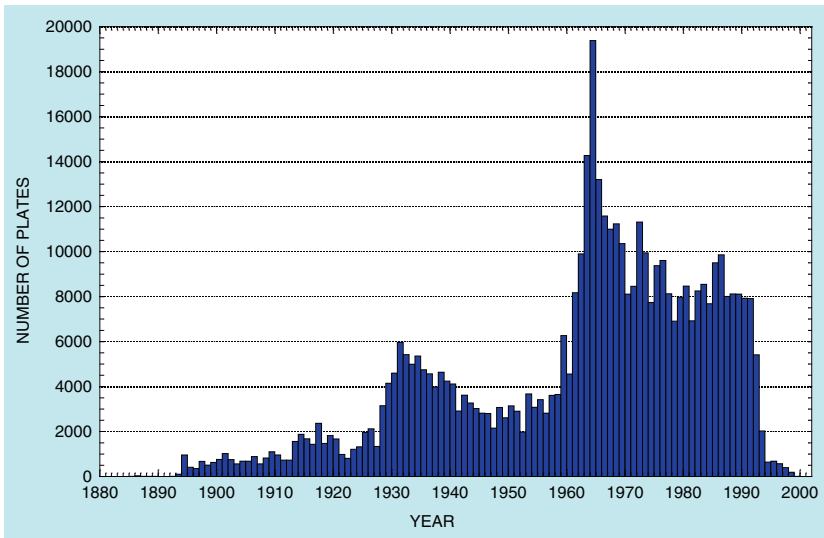


Figure 12. Number of observations in CWF versus time of observation.

can clearly see in the distribution by time the two dips due to the two world wars, a sharp maximum in the middle of the 60-es due to a great extent to the activities of Sonneberg Observatory (we can say that the 60-es were the “golden” period of wide-field photography), and the inevitable decline in the 90-es due to the overwhelming upsurge of the CCD detectors of light.

5 Plate Digitization

The creation of a bank of digitized plate images as a part of WFPDB is one of the new developments of the database. The plate images can be either previews – scans with low resolution (usually $\lesssim 600$ dpi) and snapshots of the plates made with digital cameras – or scans with higher resolution (usually $\gtrsim 1200$ dpi). The previews offer to the WFPDB user the possibility to examine visually the plate appearance and to make a preliminary judgment for the usefulness of a certain archived observation for his purposes. The plate scans with higher resolution are intended for photometric processing. However, they are not yet accessible on-line. At present the number of plates with previews in WFPDB is comparatively small – less than about 1400, and the number of plates scanned with higher resolution is about 1000. However, this new feature of the database will be intensively developed in the future.

6 Search in WFPDB

Recently the WFPDB-Sofia search page has been improved and provided with new possibilities for data search. The search can be done either by object or field coordinates or by constraints on the observation parameters. From the result page the user can display an additional page with details for the archive to which a selected observation belongs with a map of the all-sky distribution of the observations from this archive, as well as an additional page with details for the selected observation, including, if available, notes, observer name, and information for the plate availability and plate digitization. This page may contain also the plate preview, if available. The plate image can be examined in detail by zooming the preview.

References

- [1] M. Tsvetkov (2006) in *Virtual Observatory: Plate Content Digitization, Archive Mining & Image Sequence Processing*, eds. M. Tsvetkov, V. Golev, F. Murtagh, and R. Molina, Heron Press, Sofia, p. 10.
- [2] A. Holl, D. Kalaglarsky, M. Tsvetkov, K. Tsvetkova, K. Y. Stavrev (2006) *Ibid*, p. 374.
- [3] K. Tsvetkova, M. Tsvetkov (2006) *Ibid*, p. 45.