

Wide-Field Plate Database: Latest Results

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Abstract. We present the Wide-Field Plate Database, a basic source of data and meta-data for astronomy's more than 2.4 million wide-field photographic images obtained with professional telescopes worldwide. The technology developed in Sofia for plate digitization with commercial high-quality flatbed scanners yields low-resolution digital images for quick visualization and easy online access, and optimal high-resolution ones for photometric and astrometric investigations.

1. Introduction

The Wide-Field Plate Database (WFPDB, <http://www.skyarchive.org>; Tsvetkov 1992) was started at the Institute of Astronomy of the Bulgarian Academy of Sciences in 1991. It collects data from, and meta-data for, astronomy's wide-field plates that are stored worldwide, and includes not only index catalogues extracted from logbooks but also digitized logbooks, digitized plate images and relevant research papers. Along with each catalogue, under the appropriate WFPDB identifier, can be found specific details about the location of the archive, the observatory, telescope parameters and period of operation, and essential meta-data for each observation such as the coordinates of the plate centre in epoch 2000.0, the date and beginning of the observation in UT, object name and type, method of observation, the exposure duration and number (if multiple), the type of emulsion, the filter and spectral band, the size of the plate and its quality, plus the identity of the observer, the location of the plate, and the status of plate digitization and the name of astronomer in charge of the archive.

The WFPDB offers the option to select plates from the various plate catalogues. The search can be done either by object or field co-ordinates, or by constraints on observational parameters. From the results page the user can display an additional page showing details about the archive to which a selected plate belongs, with a map of the all-sky distribution of the observations from that archive and an additional page with details about the selected observation including (if available) any notes, the name of the observer, and information about the plate's availability and its digitization. The same page may also link to the plate preview ("thumbnail"), if available. The image can then be examined in some detail by zooming in on the preview.

In 1997 a static version of the WFPDB, giving details of about 323,000 plates, was copied to Strasbourg (<http://vizier.u-strasbg.fr/cats/VI.htx>), where an online search is provided via Vizier (see Search in the WFPDB Catalogue number VI/90). In parallel, an enlarged and daily-updated version has been running in Sofia since 2001 (<http://www.skyarchive.org>); that Catalogue was later mirrored at Potsdam in 2007 (<http://vodata.aip.de/WFPDBsearch>) and at the Institute of Mathematics and Informatics of the Bulgarian Academy of Sciences (<http://www.wfpdb.org>) in 2010, both also offering options for data searches.

2. Catalogue of Wide-Field Plate Archives

The most recent version of the Catalogue of Wide-Field Plate Archives (CWFPA, January 2011) gives, in table form, descriptive information for each plate archive that is listed. It uses an archive identifier, which is composed of the name of the observatory, the respective instrument aperture (and an instrument aperture suffix in the case of instruments with the same aperture). One can also find details about the observatories where the plates were exposed, the parameters of the telescopes used and their period of operation, as well as the present location of the archive and the name of astronomer in charge to contact. The number of the known archives rose from 68 in 1989 (as in the first lists prepared by B. Hauck and C. Jaschek) to 476 at the present day, the numbers of direct and objective prism plates listed correspondingly rising from 1,500,000 to 2,475,636.

3. Catalogue of Wide-Field Plate Indexes

The current (2011 September) version of the Catalogue of Wide-Field Plate Indexes (CWFPI) contains the parameters of 563,600 plates from 133 archives, with online access and data search possibilities, together with quick previews (low-resolution JPEG files) of some of the plates and an option for complete images at high resolution (FITS files) upon request. The all-sky distribution of the centres of the plates in the CWFPI in equatorial co-ordinates is shown in Fig. 1.

4. Plate Digitization

The aims of the preview scans at low resolution (600 or 1200 dpi) in JPEG format are to provide quick visualization and examination of the images, with easier Web accessibility, and to store any marks which the observer may have made on the plate. The high-resolution images are carried out at optimal resolution (1600 or 2400 dpi, in FITS file format). The latter scans are only made accessible upon request. Systematic digitization of plates takes considerable funds and yields a huge volume of data which then has to be stored. One solution to that problem is to make digital archives of selected plates only from a given observing programme (Tsvetkova & Tsvetkov 2009)—observations

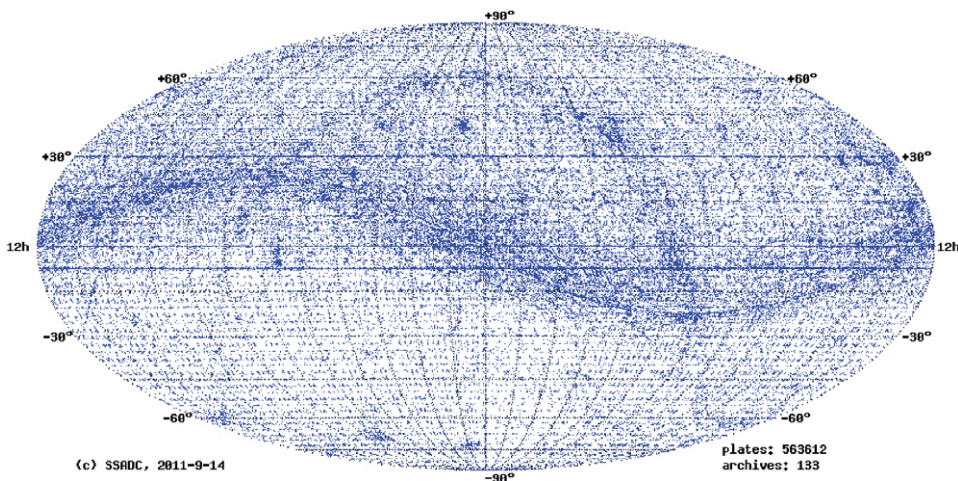


Figure 1. All-sky distribution of the plate centres, in equatorial co-ordinates (J2000).

of the Pleiades, supernova search (Tsvetkova *et al.* 2008), flare stars, Potsdam Carte du Ciel plates (Tsvetkova *et al.* 2009), installed on the German Astrophysical Virtual Observatory Potsdam server (<http://vo.aip.de/plates>).

Plate digitization includes an estimate of the quality of the digitized data, a link to the WFPDB for online access, the implementation of Wavelet transformation methods for compression, and a digitization of the relevant logbooks and notes to link the plate to its description in the appropriate logbook.

At present about 250,000 plates currently stored in European observatories (Sonneberg, Tautenburg, Potsdam, Bamberg, Heidelberg, Hamburg, Byurakan, Brussels, Rozhen, Bucharest, Cluj, Belgrade, Konkoly, Pulkovo, Moscow, Kiev, Asiago and Vatican) have been digitized, mainly with professional flatbed scanners, and are awaiting the implementation of online access. A future goal of the WFPDB is to accomplishing the high-resolution digitization (in standardized FITS file format) together with and digitization of the catalogues, logbooks, and any observers' notes that have come to light.

5. References and Online Services

The project also registers links between specific archived plates and any papers based on them. In the case of flare stars, for instance, publications in the electronic Information Bulletin on Variable Stars are linked to the scanned plates containing the relevant images (e.g. Holl *et al.* 2006), and efficient representation of image scans at different resolutions.

A basic scheme for further development is to establish Photographic Multimedia Plate Libraries at astronomical observatories. Such libraries, which are based on the latest computer-science methods, unify the efforts of astronomers, librarians, and networking and information technology specialists and give good storage, access, effective search possibilities and data optimization, digital curation and similar services.

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