

Catalogue-atlas of photographic observations along the path of the comet Liller's

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We present the on-line version of the catalogue-atlas of photographic observations along the path of comet Liller (1988a). The comet was observed in the N. D. Kalinenkov Astronomical Observatory (AOK) of the Nikolaev National University from April to June 1988. Digitizing of negatives with flat bed scanner and astrometric calibration of digitized images resulted in creation a VOTable version of the catalogue available through the interface of the interactive sky atlas ALADIN.

Key words: astronomical databases: catalogues, techniques: image processing

INTRODUCTION

Observational archive of AOK [2] stores about 1000 photographic plates obtained as direct images of selected sky areas. These observational data can become one of the sources for compilation of a shared database of AOK as a part of the global database with access via the virtual observatory tools. In this consideration we started the project of photographic archive digitizing.

The object of our interest is comet Liller. The comet was discovered on January 11, 1988 by W. Liller¹ at the Vina de Mar observatory (Chile). Later that year, on April 19, K. I. Churyumov and his group of students observed the comet in Cassiopeia. Photographic observations of the comet in AOK started on April 30, 1988.

Photographic plates NP-27 or ZU-21 were exposed on Uran-16 camera ($D = 210\text{mm}$, $F = 741\text{mm}$ and field $13^\circ \times 18^\circ$). Plate linear dimensions are $18\text{cm} \times 24\text{cm}$. Total number of plates along the comet path is 13. Their data are shown in Table 1. Here, start and end moments of exposition are given in local time scale (difference with UT is -3 hours). The plate number in AOK is given in the first column.

DIGITIZING AND CALIBRATION

Each of photographic plates is processed in the following stages:

1. Plates were scanned on EPSON Expression 10000XL flatbed scanner. Output files saved in FITS (preview images) have the dynamic range of 16 bit of grey scale, the resolution of 1200 dpi and are suitable for further processing by means of the interactive service, sky atlas ALADIN [1] (Fig. 1). The aim of creating these images, first of all, is an estimation

of quality of negatives and primary analysis of the registered areas.

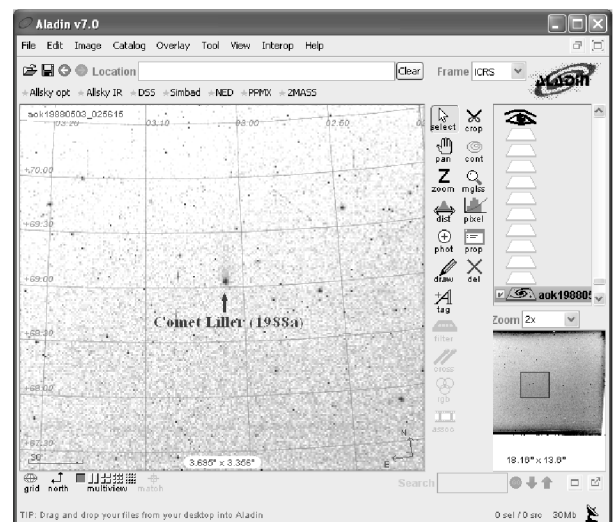


Fig. 1: A part of preview image uploaded into ALADIN window.

2. Astrometric calibration of digitized images was carried out in ALADIN environment with Hipparcos [4] as a reference, which was loaded into the service from VizieR database of astronomical catalogues [3].

3. The results of the calibration allowed to build the scheme of plate superimposition in order to define their location on the celestial sphere and to build them into the sky atlas by creation of hyperlinks to every image (Fig. 2).

4. As the mean value of registered objects down to 12^m per plate is about 6000 it was interesting to look for peculiar objects among them. We found near 500 stars from the catalogue of variable stars (VSX)

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¹www.cbat.eps.harvard.edu/iauc/04500/04528.html

Table 1: Journal of observations of the comet Liller (1988a)

N	Date	Start time	End time	Exposure	Emulsion	R.A. (2000.0)	Decl. (2000.0)
537	30.04.1988	23 02 40.5	23 23 12.5	20 ^m 32 ^s	NP-27	02 ^h 44 ^m	+67°55′
538	01.05.1988	22 41 22.0	22 51 22.0	10 00	NP-27	02 28	+67 25
539	01.05.1988	22 58 40.0	23 08 40.0	10 00	NP-27	02 28	+67 25
540	02.05.1988	23 17 00.0	23 27 00.0	10 00	NP-27	03 03	+69 00
541	02.05.1988	23 34 21.0	23 44 21.0	10 00	NP-27	03 02	+69 00
542	02.05.1988	23 51 15.5	00 01 15.5	10 00	NP-27	03 23	+69 00
543	03.05.1988	22 52 06.5	22 57 06.5	05 00	NP-27	03 15	+70 00
544	03.05.1988	23 03 12.0	23 23 12.0	20 00	ZU-21	03 15	+70 00
545	03.05.1988	23 30 48.0	23 40 48.0	10 00	NP-27	03 15	+70 00
546	03.05.1988	23 43 14.0	23 53 14.0	10 00	NP-27	03 15	+70 00
547	03.05.1988	23 56 57.0	00 06 57.0	10 00	NP-27	03 15	+70 00
550	09.06.1988	00 02 05.5	00 13 59.5	11 54	NP-27	11 00	+50 39

[5] (black circles in Fig. 3), among them more than 200 have a magnitude less than 12^m at the maximum of brightness. Table 2 is a fragment of the list of variable stars which was registered on photographic plates. Some of these stars have unknown or poorly defined parameters of variability (amplitude, type of variability etc.). For some stars brightness values obtained from the processing of photoplates differ significantly from those in VSX catalogue (see, e. g., RXJ0153.3+7446). Therefore, such stars require more detailed study. Table 2 contains the following data: right ascension and declination of the object (epoch 2000.0), an identifier of a star in VSX catalogue, minimum and maximum brightness of the star in the V band (V_max and V_min) in VSX catalogue, apparent magnitude (V) from the Hipparcos/Tycho catalogue (band V), and our photographic estimation of the apparent magnitude (V_obs).

RESULTS AND CONCLUSIONS

The result of this work is catalogue-atlas of photographic observations along comet Liller’s path carried out at AOK. The data obtained will be used in further studies of variable stars in this region of the sky.

The observational data are available at the CrAO web-page². To view the distribution of areas and scanned images in ALADIN interface, click “AOK DB C1988A”.

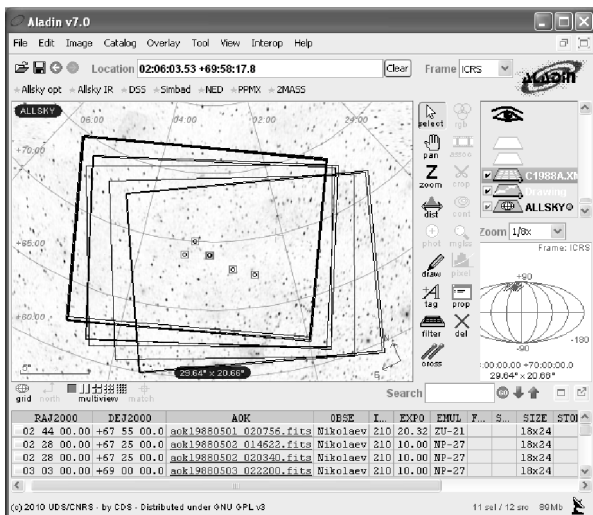


Fig. 2: ALADIN window with hyperlinks to images (bottom table of the window).

²<http://crao.crimea.ua/~aas/PROJECTs/PROJECTs.html>

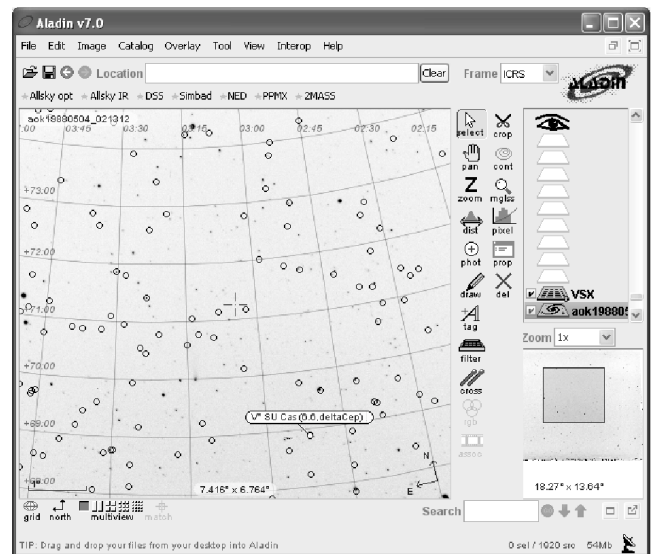


Fig. 3: The part of the scanned area, loaded into ALADIN for further processing.

We intend to continue the digitizing of the archive in order to create the catalogue of objects, visible on photographic plates, as well as the detail study of objects with brightnesses different from those in the catalogue of variable stars and objects with unknown parameters of variability.

Table 2: List of variable stars

R.A. (2000.0)	Decl. (2000.0)	Name of star	V_max	V_min	V	V_obs
032.62150	+63.29753	V0395 Cas	10.39	10.95	10.692	10.74
041.96892	+64.75472	NSV 916	10.54	10.64	10.973	10.66
041.47842	+65.72639	TW Cas	8.32	8.98	8.394	8.06
046.94062	+67.57739	RX Cas	8.64	9.49	9.130	8.45
033.92729	+67.67228	V0989 Cas	7.13	7.16	7.303	7.23
046.73917	+67.73694	NSV 15633	9.74	9.79	9.765	9.28
042.99479	+68.88850	SU Cas	5.70	6.18	6.037	6.54
030.66512	+71.29789	V0393 Cas	7.20	7.90	7.643	7.80
039.38129	+71.30453	AB Cas	10.10	11.85	10.321	11.71
028.33746	+74.77286	RX J0153.3+7446	15.85	17.100	11.591	12.56
065.30246	+75.18864	BG Cam	11.38	11.81	12.064	11.61

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REFERENCES

[1] Bonnarel F., Fernique P., Bienaymé O. et al. 2000, A&AS, 143, 33

[2] Kalinenkov N. D. Zemlya i Vselennaya, 1987, 2, 53

[3] Ochsenein F., Bauer P. & Marcout J. 2000, A&AS, 143, 23

[4] Perryman M. A. C., Lindegren L., Kovalevsky J. et al. 1997, A&A, 323, L49

[5] Watson C. L. 2006, Society for Astronomical Sciences Annual Symposium, 25, 47