Plate archive of Nikolaev Astronomical Observatory: digitization, databases, image processing and results of current research

Yuri Protsyuk, Alexander Mazhaev, Olga Kovylianska Nikolaev Astronomical Observatory

Multi Channel Telescope (MCT) former Zonal Astrograph





Zonal Astrograph (D=160 mm, Iris = 120 mm, F=2040 mm, FOV= 5° x 5°) operated from 1929 to 1999 Preview image of photoplate from database of observation. Plate made in NAO in 1976 $(\delta = -24^\circ, t = 20 \text{min}).$

0

Digitization of plates with 1200 DPI resolution after clearing of all marks on plates has been carried out since 2009 for astrometric image reduction.

200 1808, -24 18 09 5 - 24°00' N =>Kch. 20, 1 304042 - 14013 1976

Digitization of plates at first with 600DPI and then with 1200DPI resolution has been carried out since 2007 to obtain preview images with all marks made on plates.

Scanners

EPSON PERFECTION V200 Photo (2008) 3.2D max A4, 4800DPI optical Transparency 9"-2", 3.2D

EPSON PERFECTION V750 Pro (2011) 4.0D max A4, 4800x9600DPI optical Transparency 10"-8", 4.0D





Database management system of photographic observations

THIORAGE	int Niko	olaev a	rchive	Bulgaria	n archive	Help	Exit	A	ll text da
Search by pl	ate number				8			h	ooks wa
Search by ob	ject			——Pleas	e select f	the object			
View of the			-2	Venus				m	anagen
Calculation			-4	Mars					
View of the Update of the	o hour and	ilo a	-5 -6	Jupit Satur				E	oxPro.
Search by ob:			-6 1 -7	Uranu					
		progre	- 8	Neptu				a	าd 8271
			-9 SJ	Pluto					
			SJ	Io,Eu	ropa, Ganyı	nede,Calli	sto		BMS al
			SS E1		s,Dione,Rh	nea,Titan,'	Yapetus		
			1	Moon Ceres				h	andling
				Palla	S				
			2 3	Juno	13			m	enu op
				Vesta					
			4 5 6	Astre	a			_fi\	/e parts
			6	Hebe					
			.7	Iris				te	xt data
			11 15	Eunom	enope				
				nter - C		Esc - Ex	i t	Ca	alculato
				anda ang ang ang ang ang ang ang ang ang an		LOC LA	L . 		
					And the second	and the second se		_	
N plate A	lpha De	u elta	latabase (Date		NAO "Venu Clocking	s" angle 1	ехр. 2 ехр	. Nu	
N plate A		elta	Date	\mathbf{V}	Clocking	s" angle 1	ехр. 2 ехр	. Nu	Назван
603	7 22.4	elta 19 3	Date 19640827	V 012557	Clocking -321.9	angle 1		. Nu	
603 604	7 22.4	elta 19 3 19 3	Date 19640827 19640827	012557 014354	Clocking -321.9 -306.0	angle 1		. Nu	
603 604 616	7 22.4 7 22.5 7 51.4	elta 19 3 19 3 18 32	Date 19640827 19640827 19640903	012557 014354 013320	Clocking -321.9 -306.0 -314.4	angle 1		. Nu	програ КОМЕТЫ
603 604 616 619	7 22.4 7 22.5 7 51.4 7 55.6	elta 19 3 19 3 18 32 18 26	Date 19640827 19640827 19640903 19640904	012557 014354 013320 013723	Clocking -321.9 -306.0 -314.4 -310.6	angle 1		. Nu	програ КОМЕТЫ
603 604 616 619 631	7 22.4 7 22.5 7 51.4 7 55.6 8 38.7	elta 19 3 19 3 18 32 18 26 16 58	Date 19640827 19640827 19640903 19640904 19640914	012557 014354 013320 013723 011102	Clocking -321.9 -306.0 -314.4 -310.6 -340.7	angle 1		. Nu	програ КОМЕТЫ ЭКВАТОРИАЛЬ ЮПИТЕР МАРС
603 604 616 619 631 643	7 22.4 7 22.5 7 51.4 7 55.6 8 38.7 9 40.9	elta 19 3 19 3 18 32 18 26 16 58 13 34	Date 19640827 19640827 19640903 19640904 19640914 <u>19640928</u>	012557 014354 013320 013723 011102 022338	Clocking -321.9 -306.0 -314.4 -310.6 -340.7 -277.9	angle 1		. Nu	програ Кометы Эква ториаль Ком тер Марс Список михи Малые плані
603 604 616 619 631 643 650 ■ 1	7 22.4 7 22.5 7 51.4 7 55.6 8 38.7 9 40.9 0 3.1	elta 19 3 19 3 18 32 18 26 16 58 13 34 12 0	Date 19640827 19640827 19640903 19640904 19640914 19640928 19641003	012557 014354 013320 013723 011102 022338 000318	Clocking -321.9 -306.0 -314.4 -310.6 -340.7 -277.9 -421.1	angle 1		. Nu	програ КОМЕТЫ ЭКВА ТОРИАЛЬ КПИ ТЕР МАРС СПИСОК МИХА МАЛЫЕ ПЛАНІ НЕПТУН
603 604 616 619 631 643 -650 ■ 1 651 1	7 22.4 7 22.5 7 51.4 7 55.6 8 38.7 9 40.9 0 3.1 0 3.2	elta 19 3 19 3 18 32 18 26 16 58 13 34 12 0 12 0	Date 19640827 19640827 19640903 19640904 19640914 19640928 19641003 19641003	012557 014354 013320 013723 011102 022338 000318 002115	Clocking -321.9 -306.0 -314.4 -310.6 -340.7 -277.9 -421.1 -403.7	angle 1		. Nu	програ ЭКВА ТОРИАЛЬ ЭКВА ТОРИАЛЬ ИПИТЕР МАРС СПИСОК МИХ МАЛЫЕ ПЛАНІ НЕПТУН ПОЛЯРНАЯ ЗО
603 604 616 619 631 643 −650 1 655 1 1332	7 22.4 7 22.5 7 51.4 7 55.6 8 38.7 9 40.9 0 3.1 0 3.2 0 16.6	elta 19 3 18 32 18 26 16 58 13 34 12 0 12 0 12 0 10 59	Date 19640827 19640827 19640903 19640904 19640914 19640928 19641003	012557 014354 013320 013723 011102 022338 000318	Clocking -321.9 -306.0 -314.4 -310.6 -340.7 -277.9 -421.1	angle 1		. Nu	програ жометы экваториаль или тер марс список миха малые плані нептун полярная за полярная за
603 604 616 619 631 643 ■ 6 43 ■ 6 43 ■ 1 655 1 1 332 1333	7 22.4 7 22.5 7 51.4 7 55.6 8 38.7 9 40.9 0 3.1 0 3.2 0 16.6 4 28.5 4 28.5	elta 19 3 19 3 18 32 18 26 16 58 13 34 12 0 12 0 10 59 23 26 23 26	Date 19640827 19640827 19640903 19640904 19640928 19640928 19641003 19641003 19641006 19670421	012557 014354 013320 013723 011102 022338 000318 002115 024402	Clocking -321.9 -306.0 -314.4 -310.6 -340.7 -277.9 -421.1 -403.7 -261.8	angle 1		. Nu	програ ЭКВА ТОРИАЛЬ ЭКВА ТОРИАЛЬ ИПИ ТЕР МАРС СПИСОК МИХ МАЛЫЕ ПЛАНІ НЕПТУН ПОЛЯРНАЯ ЗС РАДИОИСТОЧЬ САТУРН
603 604 616 619 631 643 643 651 1 655 1 1332 1333 1334	7 22.4 7 22.5 7 51.4 7 55.6 8 38.7 9 40.9 0 3.1 0 3.2 0 16.6 4 28.5 4 28.6	elta 19 3 19 3 18 32 18 26 16 58 13 34 12 0 12 0 10 59 23 26 23 26 23 26	Date 19640827 19640827 19640903 19640904 19640928 196400928 19641003 19641003 19641006 19670421 19670421	012557 014354 013320 013723 011102 022338 000318 002115 024402 175346 181043 183439	Clocking -321.9 -306.0 -314.4 -310.6 -340.7 -277.9 -403.7 -261.8 +333.0 +354.9 +371.2	angle 1		. Nu	програ жометы экваториаль или тер марс список миха малые плані нептун полярная за полярная за радиоисточі сатурн спутники са
603 604 616 619 631 643 ■ 650 ■ 1 655 1 1332 1333 1334 1336	7 22.4 7 22.5 7 51.4 7 55.6 8 38.7 9 40.9 0 3.1 0 3.2 0 16.6 4 28.5 4 28.6 4 28.6 4 28.6 4 48.8	elta 19 3 19 3 18 32 18 26 16 58 13 34 12 0 10 59 23 26 23 26 23 26 23 26 23 26 24 16	Date 19640827 19640827 19640903 19640904 19640914 19640928 19641003 19641003 19641006 19670421 19670421 19670425	012557 014354 013320 013723 011102 022338 002115 024402 175346 181043 183439 183521	Clocking -321.9 -306.0 -314.4 -310.6 -340.7 -277.9 -403.7 -261.8 +333.0 +354.9 +371.2 +377.7	angle 1		. Nu	програ Кометы Эква ториаль ипитер марс Список миха малые планы нептун полярная за радиоисточн сатурн Спутники са
603 604 616 619 631 643 -650 ■ 1 655 1 1332 1333 1334 1336 1345	7 22.4 7 22.5 7 51.4 7 55.6 8 38.7 9 40.9 0 3.1 0 3.2 0 16.6 4 28.5 4 28.6 4 28.6 4 28.6 4 28.6 5 29.2	elta 19 3 19 3 18 32 18 26 16 58 13 34 12 0 10 59 23 26 23 26 23 26 24 16 25 23	Date 19640827 19640827 19640903 19640904 19640928 196400928 19641003 19641003 19641006 19670421 19670421 19670422 19670425 19670503	012557 014354 013320 013723 011102 022338 000318 002115 024402 175346 181043 183439 183521 180725	Clocking -321.9 -306.0 -314.4 -310.6 -340.7 -277.9 -403.7 -261.8 +333.0 +354.9 +354.9 +371.2 +377.7 +333.3	angle 1		. Nu	програ жометы экваториаль ипитер марс список миха малые плані нептун полярная за полярная за полярная за полярная за полярная с спутники са спутники са уран венера зодиакальны
603 604 616 619 631 643 -650 ■ 1 655 1 1332 1333 1334 1336 1345 1349	7 22.4 7 22.5 7 51.4 7 55.6 8 38.7 9 40.9 0 3.1 0 3.2 0 16.6 4 28.5 4 28.6 4 28.6 4 28.6 4 28.6 5 29.2 5 34.4	elta 19 3 19 3 18 32 18 26 16 58 13 34 12 0 10 59 23 26 23 26 23 26 23 26 23 26 24 16 25 23 25 29	Date 19640827 19640827 19640903 19640904 19640914 19640928 19641003 19641003 19641003 19641006 19670421 19670421 19670425 19670503 19670504	012557 014354 013320 013723 011102 022338 000318 002115 024402 175346 181043 183439 183521 180725 183440	Clocking -321.9 -306.0 -314.4 -310.6 -340.7 -277.9 -421.1 -403.7 -261.8 +333.0 +354.9 +354.9 +371.2 +377.7 +333.3 +327.1	angle 1		. Nu	програ жометы экваториаль ипитер марс список миха малые плані нептун полярная за полярная за полярная за полярная за полярная с спутники са спутники са уран венера зодиакальны
603 604 616 619 631 643 -650 ■ 1 655 1 1332 1333 1334 1336 1345 1345 1349 1350	7 22.4 7 22.5 7 51.4 7 55.6 8 38.7 9 40.9 0 3.1 0 3.2 0 16.6 4 28.5 4 28.6 4 28.6 4 28.6 4 28.6 4 28.6 4 28.6 5 29.2 5 34.4 6 4.6	elta 19 3 19 3 18 32 18 26 16 58 13 34 12 0 10 59 23 26 23 26 24 16 25 23 26 24 16 25 23 25 29 25 47	Date 19640827 19640827 19640903 19640904 19640914 19640928 19641003 19641003 19641003 19641006 19670421 19670421 19670425 19670503 19670504 19670510	012557 014354 013320 013723 011102 022338 000318 002115 024402 175346 181043 183439 183521 180725 183440 182333	Clocking -321.9 -306.0 -314.4 -310.6 -340.7 -277.9 -421.1 -403.7 -261.8 +333.0 +354.9 +371.2 +377.7 +333.3 +327.1 +341.8	angle 1		. Nu	програ жометы экваториаль ипитер марс список миха малые плані нептун полярная за полярная за полярная за полярная за полярная за полярная за полярная за полярная за спутники ка уран венера зодиакальны плутон луна
603 604 616 619 631 643 -650 ■ 1 655 1 1332 1333 1334 1336 1345 1345 1349 1350 1351	7 22.4 7 22.5 7 51.4 7 55.6 8 38.7 9 40.9 0 3.1 0 3.2 0 16.6 4 28.5 4 28.6 4 28.6 4 28.6 4 28.6 4 28.6 4 28.6 5 29.2 5 34.4 6 5.2	elta 19 3 19 3 18 32 18 26 16 58 13 34 12 0 10 59 23 26 23 26 23 26 23 26 23 26 24 16 25 23 25 29 25 47 25 47	Date 19640827 19640827 19640903 19640904 19640914 19640928 19641003 19641003 19641006 19670421 19670421 19670421 19670425 19670503 19670504 19670510	012557 014354 013320 013723 011102 022338 000318 002115 024402 175346 181043 183439 183521 180725 183440	Clocking -321.9 -306.0 -314.4 -310.6 -340.7 -277.9 -421.1 -403.7 -261.8 +333.0 +354.9 +354.9 +371.2 +377.7 +333.3 +327.1	s" angle 1 2 2 2 2 2 2 2 2 2 2 2 2 2 2 2 2 2 2 2		. Nu	ЭКВАТОРИАЛ МПИТЕР МАРС СПИСОК МИХ МАЛЫЕ ПЛАНІ НЕПТУН ПОЛЯРНАЯ ЗС ПОЛЯРНАЯ ЗС ПОЛЯРНАЯ ЗС РАДИОИСТОЧ САТУРН СПУТНИКИ С СПУТНИКИ С УРАН ВЕНЕРА ЗОДИАКАЛЬНЫ ЗОДИАКАЛЬНЫ

ata from the observational log as transferred into the database ment system (DBMS) written in Total number of plates is 8325, of them were already scanned. lows us to carry out data and processing by using various tions. The main menu consists of The first part contains various viewers and hour angle

N plate	Alpha		Database (Date		Clocking	exp.	2 exp.	Nu		M HA :	13.08.2				
		10 0	10/10007	V ALOFET		0			Название			сканировано		N	Имя
603 604	7 22.4		19640827 19640827			2	0.02		программы	пласт.	Всего	BMP	FIT	файла	файла
616	7 51.4	18 32	19640903	013320	-314.4	2	0.02		КОМЕТЫ	218	208	0	208	1	com_2000
619	7 55.6		19640904			2	0.02		ЭКВАТОРИАЛЬНЫЙ КАТАЛОГ ЮПИТЕР	489 458	471 457	0	471 457	23	ekzod_ jup_2000
631 643	8 38.7 9 40.9		19640914 19640928			2	0.02		MAPC	426	426	19	407	4	mars_bas
_650	10 3.1		19641003			2	0.02		СПИСОК МИХАЙЛОВА Малые планеты	106 2492	106 2484	0 573	106 1911	6	mihail mp_s
651	10 3.2	12 0	19641003	002115	-403.7	2	0.02	_	НЕПТУН Полярная зона 1-я эпоха	225 196	224	0	224	28	nep_basa polarz1
655	10 16.6		19641006			2	0.02		ПОЛЯРНАЯ ЗОНА 2-Я ЭПОХА РАДИОИСТОЧНИКИ	276 211	275 209	0	275 209	9 10	polarz2 roas
1332 1333	4 28.5 4 28.6		19670421 19670421			3	0.17 1.00		CATUPH	496	495	23	422	11	sat_2000
1334	4 20.0		19670421			3	0.17		СПУТНИКИ САТУРНА СПУТНИКИ ЮПИТЕРА	213 360	213 359 230	59 92	154 267	12 13	sp_sat spj_2000
1336		24 16	19670425	183521	+377.7	3	0.50		9PAH BEHEPA	230 360	230 360	0 285	230 75	14 15	uran_bas
1345	5 29.2		19670503			3	0.50		ЗОДИАКАЛЬНЫЙ КАТАЛОГ — А ЗОДИАКАЛЬНЫЙ КАТАЛОГ — Б	600 527	599 525	0	599 525	16 17	zod_a zod_b
1349 1350			19670504 19670510			3	0.60 0.50		ПЛУТОН	10	10	Ö	10	20	pluton
1351	6 5.2		19670510			3	1.00		ЛУНА Звездные поля	269 151	267 145	0	267	21 22	moon stars
1355	6 9.7	25 48	19670511	181333	+341.8	3	1.00		ПОЛЮС	93	93	0	93	23	test
1356	6 9.7	25 48	19670511	184546	+311.2	3	0.50		ВСЕГО	8406	8351	1101	7250		

Database management system of photographic observations

Infobase **Print** Nikolaev archive Bulgarian archive Help Exit

List of plates with modified FITS header Plates with unmodified FITS header Plate sizes and observational programs Information about the emulsion quality History of updated programs and databases Reports about scanning List of the plates with exposition more than 10 minutes

> Task "Observatory" Task "Formation heading" Primary Database - file VSE Nikolaev Archives Bulgarian Archives Directories Addition for database

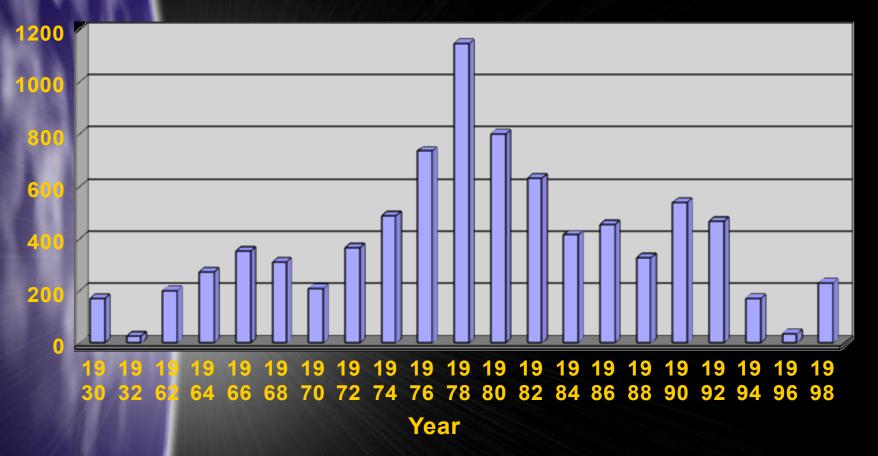
The second menu allows us to view and print various text data, such as list of plates with (un)modified FITS header, plate sizes vs observational programs, quality of emulsion, history of database update, statistical reports about scanned plates, list of plates with long exposures. The third menu allows us to compile output text files for all observational programs in the format of Nikolaev archive.

Infobase 🖗 Print	Nikolaev archive Bulgarian ar	ch					Sumple is a	Mars	However, the			name we		ana ing i	
	Comets	N	obj	N pl	Alpha	Delta	Date	Exp.1	Exp.2	N. of	ехр	Clock.	angle	Emul	0
	Equatorial catalog Yupiter Mars Mikhailov's list Minor planets Neptune Polar zone 1-st epoch Polar zone 2-nd epoch Radio sources Saturn Satellites of Saturn		obj	N pl 17 18 23 24 257 260 265 268 272 282 283	Alpha 7 20.3 7 20.4 7 30.2 7 30.3 7 58.4 8 0.7 8 3.1 8 5.3 8 27.5 8 41.9 8 42.0	24 24 24 24 23 59 23 59 21 37 21 32 21 27 21 21 20 24 19 42	19610410 19610410 19610415 19610415 19621006	5 5 5 5 5 5 5 5 4 4 4 3 4 2	5.00 5.00 5.00 0.08 0.02 4.00 3.00 0.02 2.00	N. of	ຕ ສາສາສາສາສາສາສາສາສາສາສາ ສາສາສາສາສາສາສາສ	Clock. +161.1 +189.0 +145.1 +169.0 -140.7 -150.4 -141.8 -144.5 -108.5 - 96.4 - 76.8		Emul A A A A A A A K K K K K K K K K K	
	Satellites of Jupiter Uranus Venus Zodiacal catalog - "A" Zodiacal catalog - "B" Pluto Moon (N plate + 9200) Star fields Nikolaev Joint Archive			283 284 285 290 291 293 294 302 303	8 42.0 8 45.9 9 1.0 9 1.0 9 2.8 9 2.8 9 41.7 9 41.7	19 30 19 30 18 42 18 42 18 36 18 36 16 29	19621028 19621028	2 2 1 1 2 2 1	2.00 2.00 1.00 1.00 2.00 2.00 1.00 1.00		9449944 49944	- 76.8 - 92.1 - 79.3 - 75.1 - 64.2 - 61.4 - 42.9 + 20.3 + 36.0		*****	ļ

Database management system of photographic observations

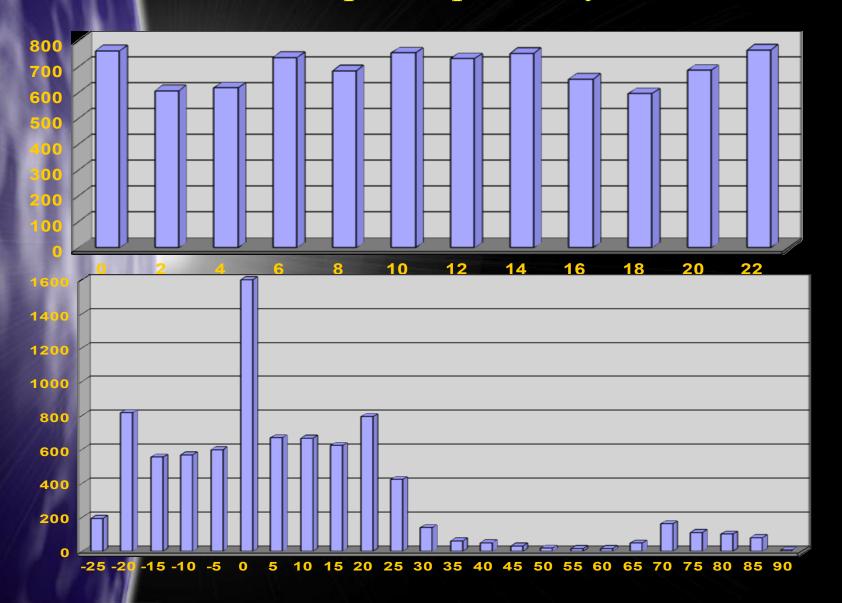
Joint Base of two	bservatory servatory (N plate+9000) observatories the Bulgarian archive file ile Pulkovo ? Ava	fourth menu allows us to view edit all text files in accordance the format created by the itute of Astronomy (Sofia, garia). fifth menu allows us to view reference information about tographic plates, such as ory of observations, programs objects, observers, iography, quality of emulsion, books of observations etc.
MYK012 000001 094130+143900 196 23205845 Uranus MYK012 000002A +900000 196 323 Stars MYK012 000002B +900000 19610323 Stars MYK012 000006 094042+144200 19610330 Uranus MYK012 000008 122854+040800 19610406133712 Uranus MYK012 000010 094006+144500 19610406133712 Uranus MYK012 000011 105248+211800 19610406133712 Uranus MYK012 000011 105248+211800 19610406205756 Par then MYK012 000012 122712+042000 19610406230820 Nep tune MYK012 000013 143706-132600 19610406230820 Nep tune MYK012 000016 143654-132500 19610410183003 Mars MYK012 000017 072018+242400 19610410185758 Mars MYK012 000021 12348+044200 19610410212135 Par then MYK012	Infobase Print Nikolaev archiv Directory of guality emulsic Type Name of the program scanne 1 Good 2 Average 3 White spots/scratches 4 Object signed on the emul. 5 Badly scratched emulsion 6 Area of detaching emulsion 7 Golden spots 8 Out of focus 9 Bad tracking 10 Broken and patched 11 Missing piece	Photographic observations of NAO Observational programs Observational programs and objects Observers Bibliography Program setting Scanners Emulsion type

Databases of photographic observations. Distribution of photo plates by year of observation.



Now databases contain information about CCD observations obtained in 1996-2013 and photographic observations obtained in 1929-1931 and 1961-1999. The glass archive of NAO contains 8325 of photographic plates.

Databases of photographic observations. Distribution of photo plates by RA & DEC.



Data volume of photo plate images obtained at NAO and stored in data bank

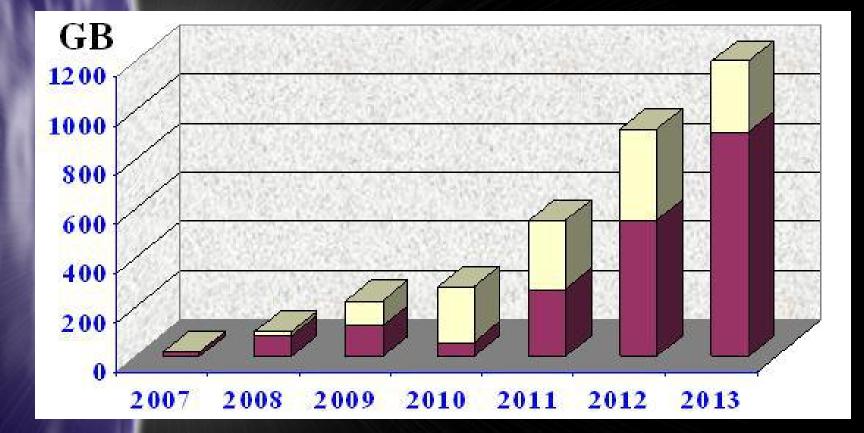
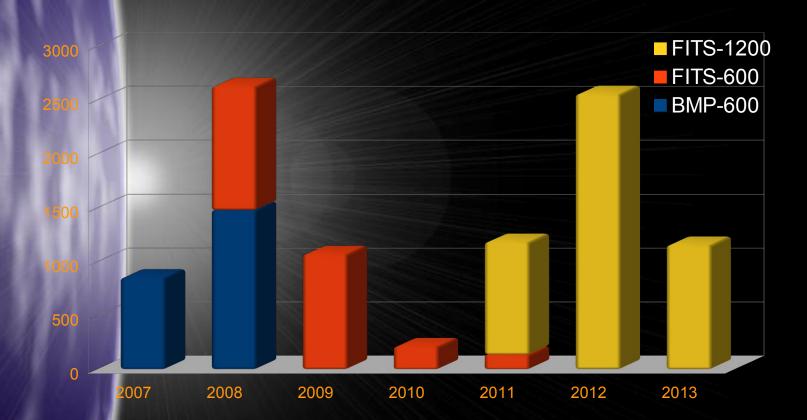


Plate archive of the Nikolaev observatory



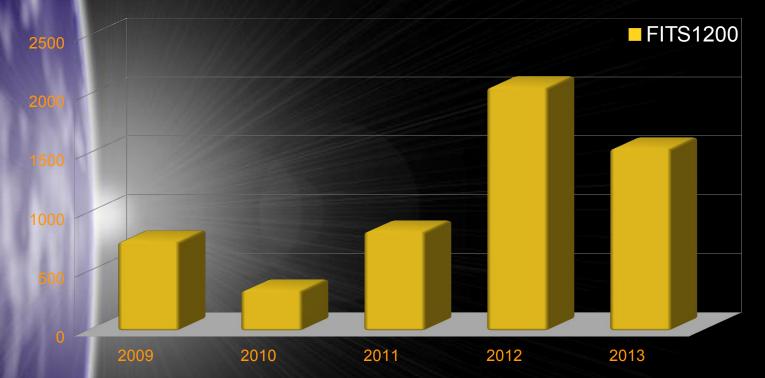


Number of preview images obtained in NAO



February 2014: Preview images - 99% of plate archive, 93% in FITS format. 99% of images are available in UkrVO.

Number of plate images obtained in NAO for astrometric reduction

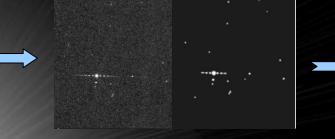


First astrometric results of data processing were obtained in 2009. Images of 50 plates containing about 17000 stars were processed. The obtained accuracy was about 0."07 for both coordinates and resolution of 1200 DPI.

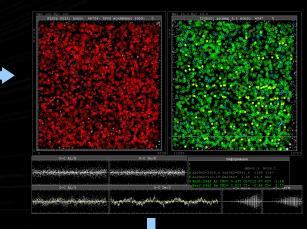
Catalogues of stars in fields near Galactic plane were obtained with **common reduction of CCD observation and plate archive images**



Use scanner Epson V750 Pro for receiving of 2100 images of photo plate in 210 fields



Reduction of 2100 images. Obtained coordinates of about **20,000,000** objects.





Use telescope Mobitel KT-50 for receiving 6500 CCD frames in 172 fields



Reduction of 6500 CCD images, Obtained coordinates of about **9,000,000** objects.

Obtained 3 catalogues in 2013:

Photographic catalogue for epoch 1981.6: **903000 stars (8-16)**^m, accuracy : **0."02 - 0."07** CCD catalogue for epoch 2012.2: **760000 stars (9-17)**^m, accuracy : **0."02 - 0."04** Catalogue of coordinates and proper motions: **700000 stars (8-16)**^m, accuracy:**0."02-0."04 , 0.005"/year**

In 2013, using 2100 images of 210 plates distributed close to the Galactic plane and 6500 CCD images we obtained a catalogue of coordinates and proper motions for about 700000 stars. The catalogue accuracy is about 0."04, proper motion - 0."005/year. Also we obtained a catalogue of coordinates for more than 900000 stars from plates with accuracy about 0."06.

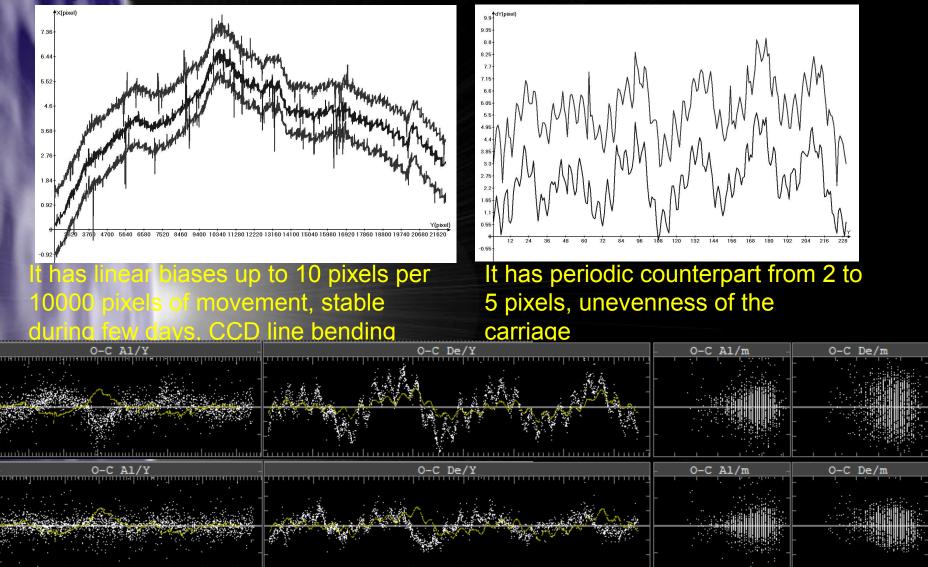
MIDAS data reduction for photo plate images

Data reduction process: filtering, bright stars image restore, find stars and save X,Y coordinate and brightness. 20-30 minutes per image on Core2Duo 2.5Ghz



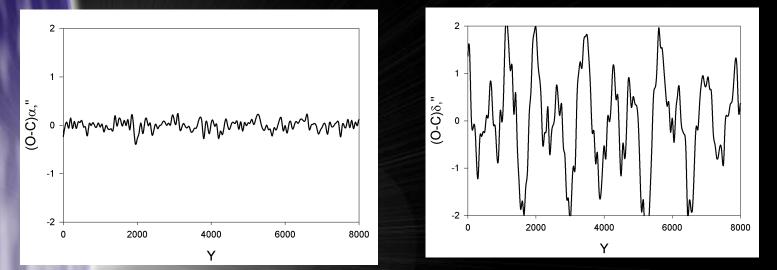
Part of image before (left) and after (right) filtering. Processing was carried out in a batch mode of 30-50

Using high precise ruler to check V750 scanner in 2400 DPI

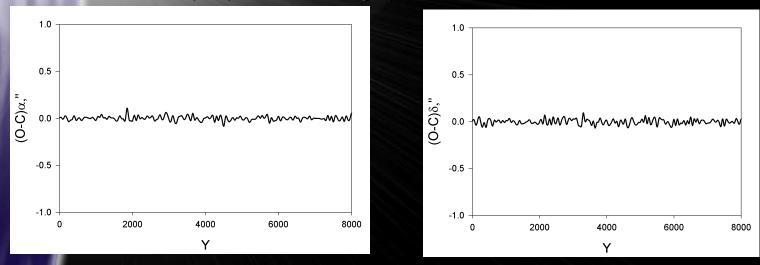


The results are used as amendments in calculating the coordinates of the objects on images. Consideration of amendments improves the result by RA of about 25-30% and by DEC of about 40-60%.

Improvement of results by statistical methods using reference stars

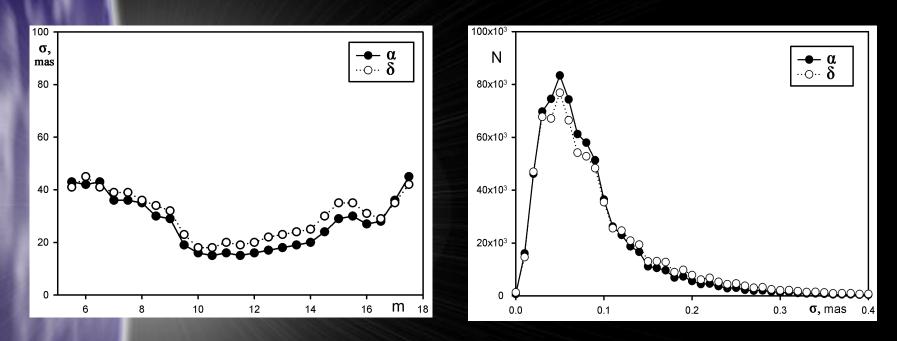


RA (left) and DEC (right) after first iteration



RA (left) and DEC (right) after third iteration

Catalogue accuracy



Distribution of catalogue accuracy in mas by magnitude (RA – black, DEC – white) Distribution of number of stars in catalogue by accuracy (RA – black, DEC – white)

Development of the digital database

Development of astronomical databases with web interface has been started since 2004, connect databases to Aladin program has been started since 2005.

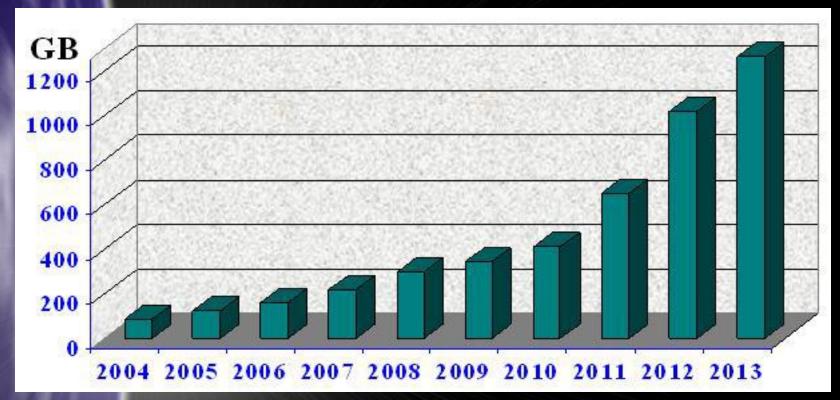
The daily average volume of the new astronomical information obtained from the CCD instruments makes from 1 GB up to 12GB, depending on the purposes and conditions of observations. For compare: size of all observation from 1996 till 1998 was near 5GB.

The total data volume of obtained plate and CCD images was about 3 TB at the middle of 2013.

Ukrainian Virtual Observatory (UkrVO) is a member of IVOA since 2011

At the end of 2013 the contribution of the NAO to the UkrVO are: 8066 • metadata of photo plate 20% • photo plate images (blue). 35% • metadata of CCD observations: 100% • CCD images: 100% 80%

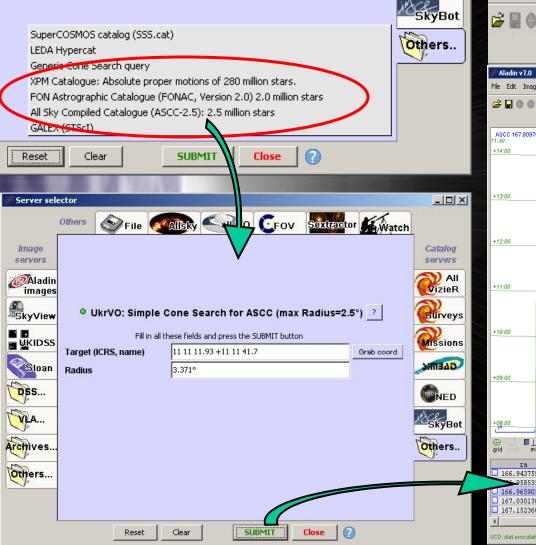
Volume of the CCD raw data obtained in NAO and stored in the data bank

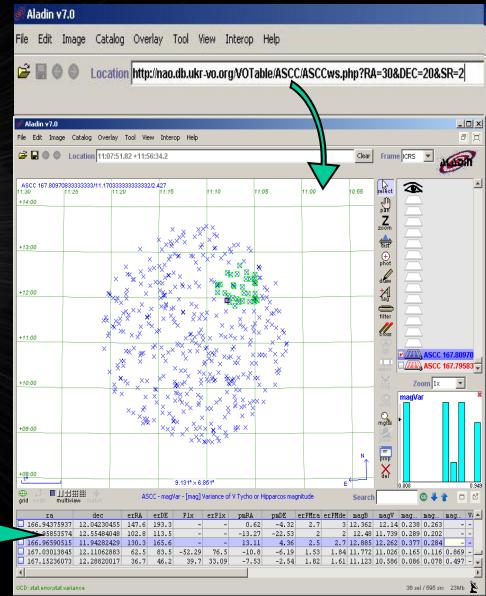


All receiving data are stored on servers in two copies, namely, working and backup. Also we made copies of observational data as archives on DVD. All obtained observations have been stored in FITS format since 1998 and for plate images since 2008.

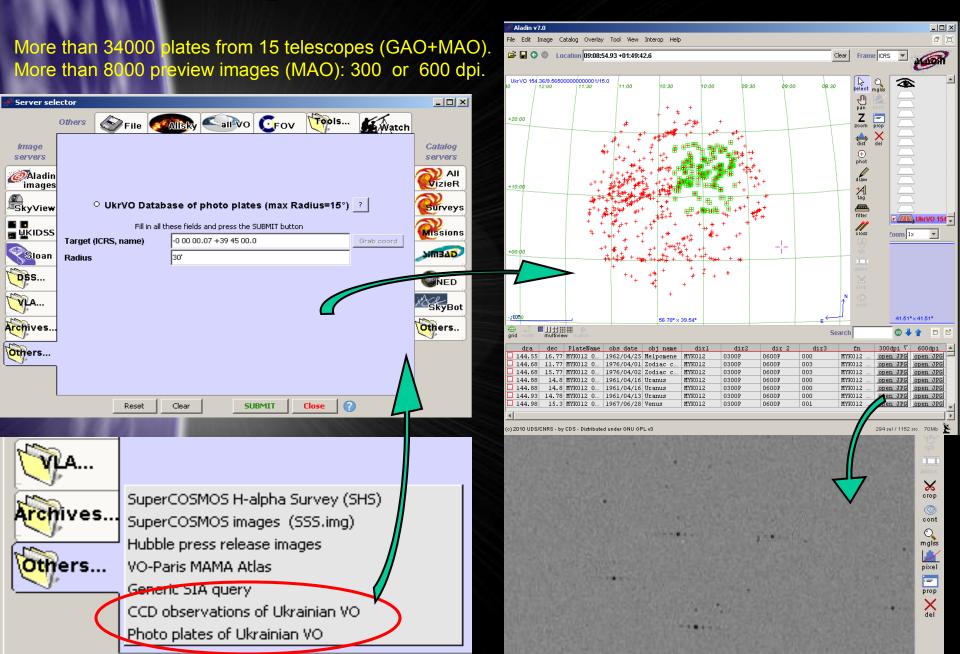
Web services via Aladin graphical interface

ASCC, FONAC, XPM



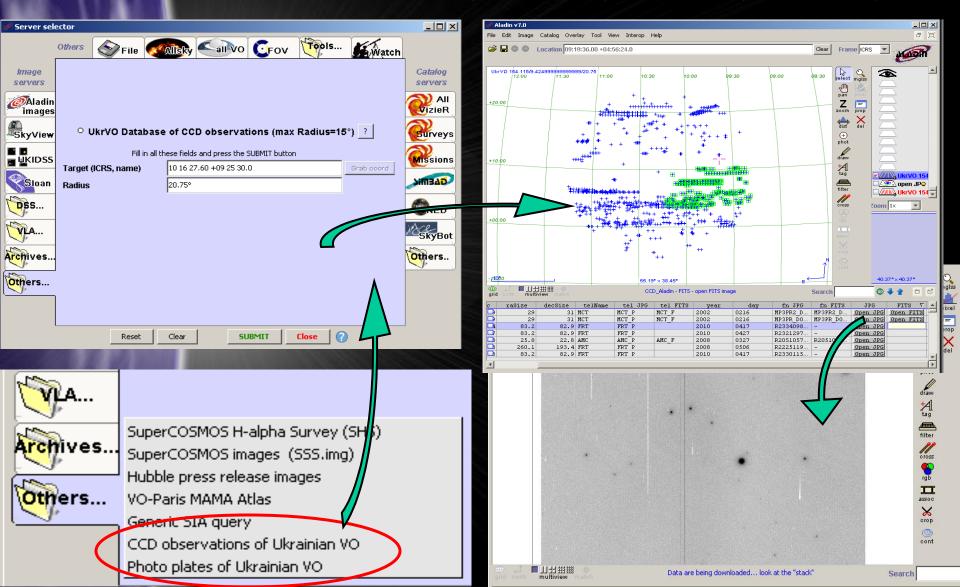


Database of photographic observations via Aladin



Database of CCD observations via Aladin

More than 70000 CCD frames from 3 telescopes (MAO) up to 2012. Preview images for all frames. FITS for AMC (2002-2005) and MCT (2001-2005).



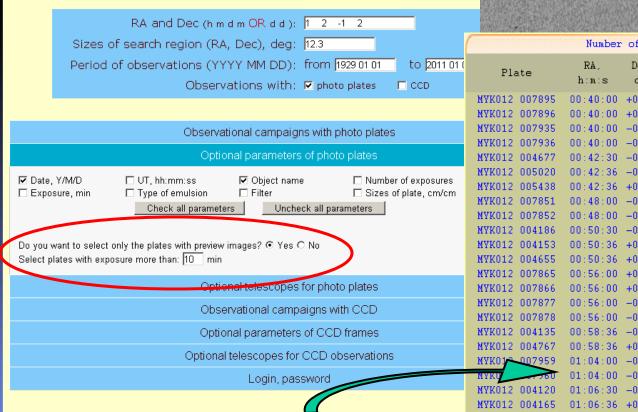
Database of photographic and CCD observations via browser

More than 34000 plates from 15 telescopes (GAO+MAO) More than 8000 preview images (MAO): 300 or 600 dpi. More than 70000 CCD frames from 3 telescopes (MAO). Preview images for all frames.

FITS for AMC (2002-2005) and MCT (2001-2005).



Ukrainian Virtual Observ



Search

		Number	of pla	tes in the o	database: 34198			
Pla	ate	RA, h:m:s	Dec, d:m	Y∕M∕D	Object	300 pi	600dpi	
012	007895	00:40:00	+02:00	1990/08/29	Equatorial catalog	preview	preview	
012	007896	00:40:00	+02:00	1990/08/29	Equatorial catalog	preview	preview	
012	007935	00:40:00	-02:00	1990/09/24	Equatorial catalog	DIEVIEW	DIEWIEW	
012	007936	00:40:00	-02:00	1990/09/24	Equatorial catalog	preview	preview	
012	004677	00:42:30	-05:44	1978/10/22	Zodiac catalog - B	preview	preview	
012	005020	00:42:36	-01:44	1979/08/25	Zodiac catalog - B	preview	preview	
012	005438	00:42:36	+02:16	1980/08/17	Zodiac catalog - B	preview	preview	
012	007851	00:48:00	-00:00	1990/08/25	Equatorial catalog	preview	preview	
012	007852	00:48:00	-00:00	1990/08/25	Equatorial catalog	preview	preview	
012	004186	00:50:30	-03:44	1977/10/12	Zodiac catalog - A	preview	preview	
012	004153	00:50:36	+00:16	1977/10/06	Zodiac catalog - A	preview	preview	
012	004655	00:50:36	+04:16	1978/10/07	Zodiac catalog - A	preview	preview	
012	007865	00:56:00	+02:00	1990/08/26	Equatorial catalog	preview	preview	
012	007866	00:56:00	+02:00	1990/08/26	Equatorial catalog	preview	preview	
012	007877	00:56:00	-02:00	1990/08/27	Equatorial catalog	preview	preview	
012	007878	00:56:00	-02:00	1990/08/27	Equatorial catalog	preview	preview	
012	004135	00:58:36	-01:44	1977/09/16	Zodiac catalog - B	preview	preview	
012	004767	00:58:36	+02:16	1978/12/19	Zodiac catalog - B	preview	preview	
01	007959	01:04:00	-00:00	1990/10/14	Equatorial catalog	preview	preview	
	007.75	01:04:00	-00:00	1990/10/14	Equatorial catalog	preview	preview	
012	004120	01:06:30	-03:44	1977/09/14	Zodiac catalog - A	preview	preview	
012	004165	01:06:36	+00:16	1977/10/10	Zodiac catalog - A	preview	preview	▼

Number of found plates in the table: 34

Conclusions

We obtained preview images of all plate archive of NAO. The database is available in the UkrVO web site

Photographic and CCD databases are populated with new data and work via graphical interfaces of browser as well as Aladin.

We obtained new catalogues using new CCD and old photographic observations.

Thank you for attention!