The New Milky Way

a wide-field survey for optical transients near the Galactic plane

Kirill Sokolovsky
ASC Lebedev/SAI MSU

Stanislav Korotkiy
Ka-Dar observatory,

Moscow, Russia

Project aim

Rapid detection of bright (V<13.5) optical transients, including Novae, to enable quick multiwavelength follow-up.

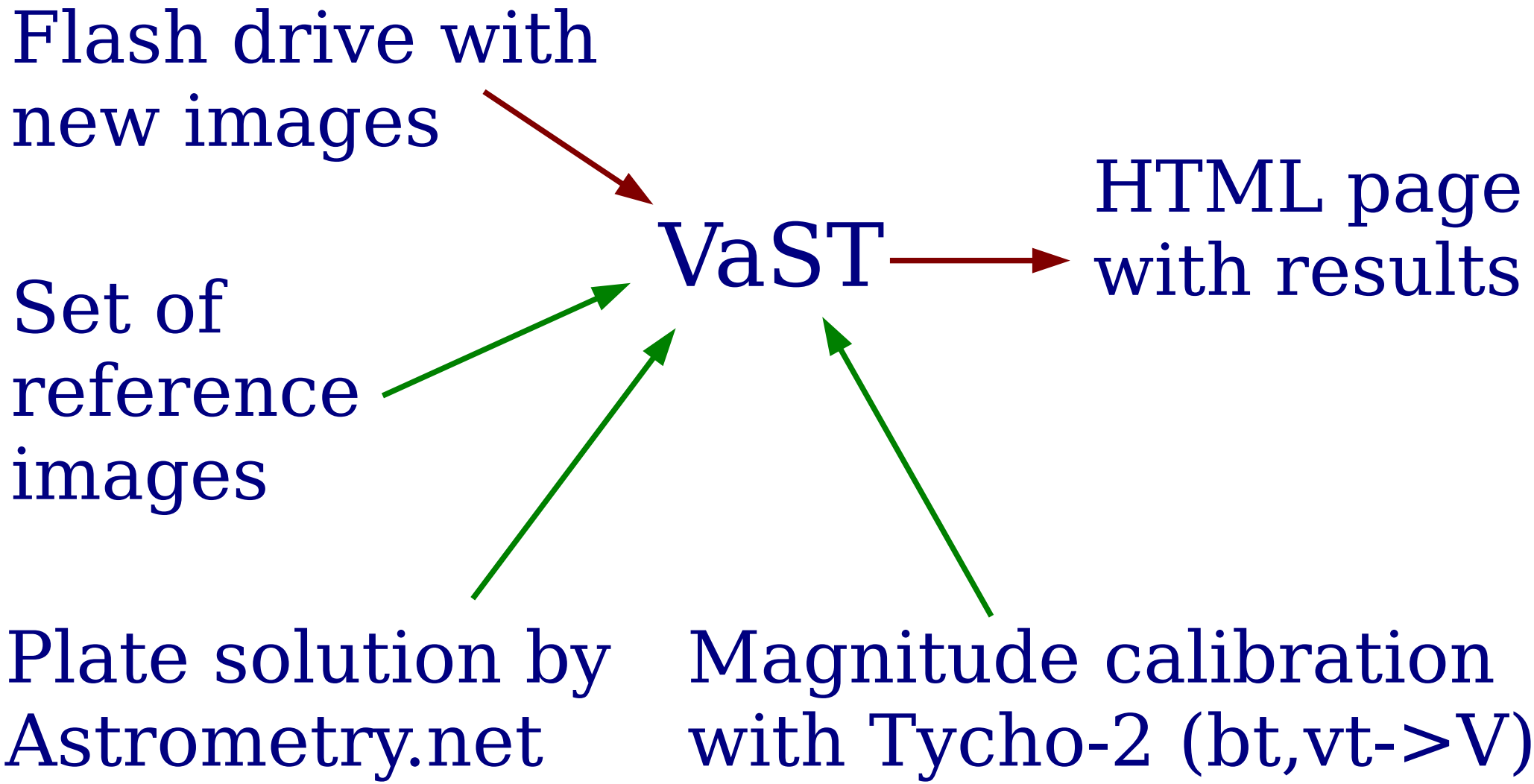
It may take **days** for a bright nova to be discovered and reported. Why we want bring this time down to **hours**?

- Aid in interpretation of unusual novae (like V407 Cyg) by better constraining the explosion time.
- Study rise time distribution.
- Search for new interesting phenomena like ultra-fast novae (t_2 < 1d).

Hardware

- 135 mm f/2.0 lens
- SBIG ST-8300M CCD camera (unfiltered)
- HEQ-5Pro mount
- Netbook + custom-made software controlling mount and camera
- Dedicated data-processing server
- Satellite internet

Software

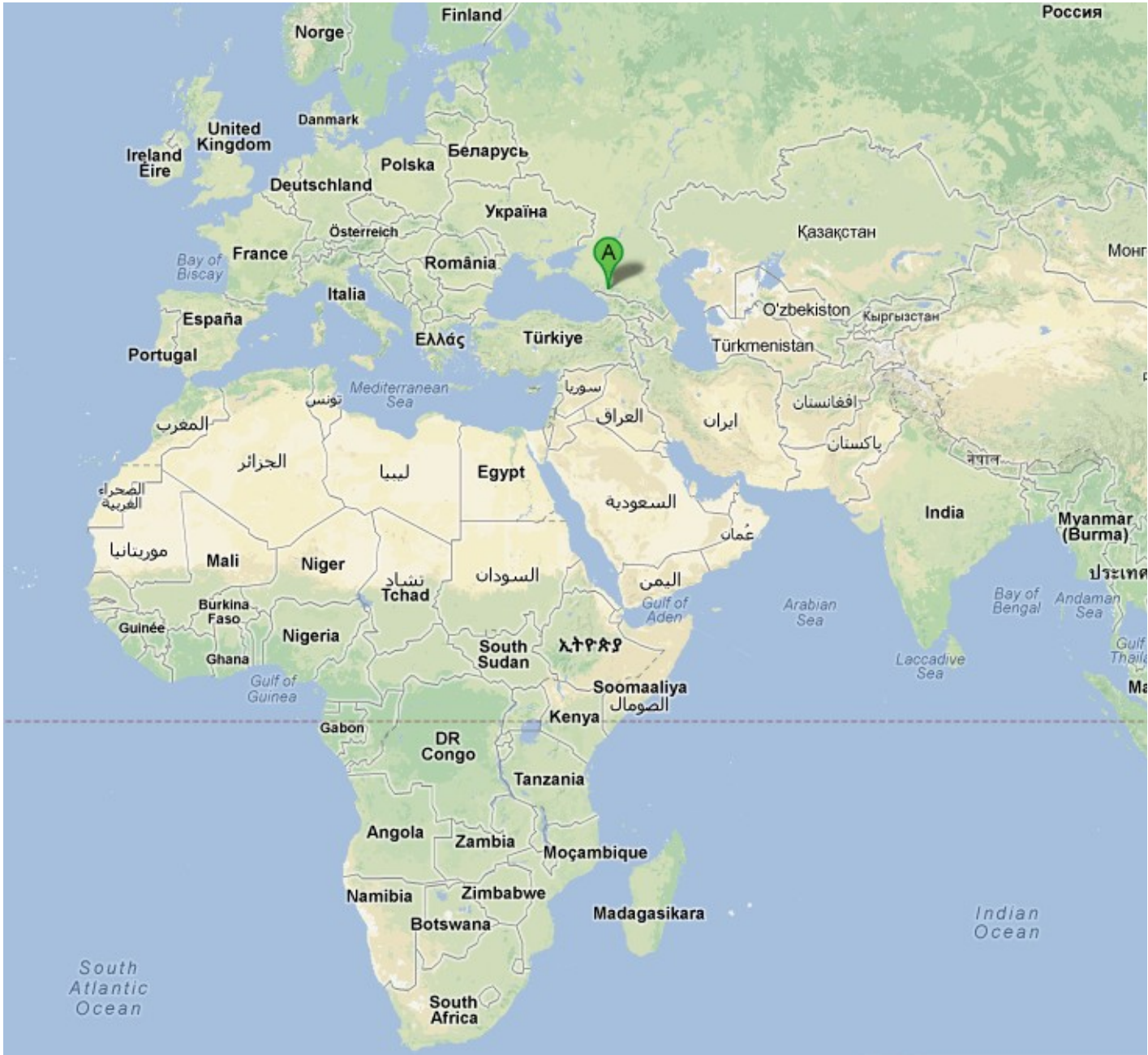

Flash drive with new images
Set of reference images
Plate solution by Astrometry.net
VaST
HTML page with results
Magnitude calibration with Tycho-2 (bt,vt->V)

Observatory Site

North Caucasus, Russia

Altitude 2000 m

Near the 6-m telescope site



Observatory Site

Observing strategy

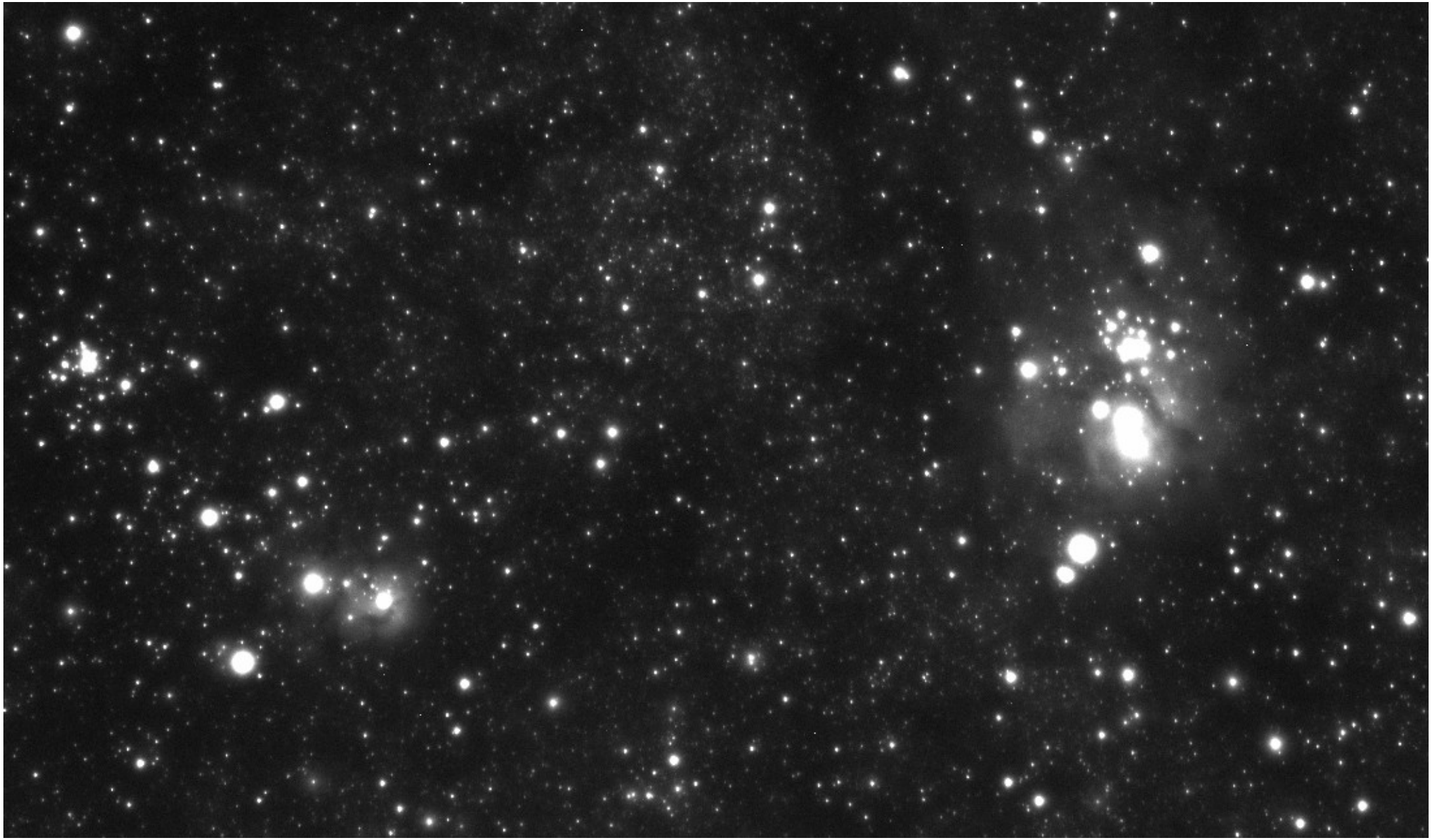
- Exposures 2x40 sec. with shift (confusion limited at longer exp.).
- It takes 5 (January) to 10 (April) hours to image all visible MW.
- Main limitation: observer has to be present on site.
- First observing run January-April 2012.
- Next run planned for March-June 2013.

System performance

- FOV 7.8x5.9 deg., scale 8.4”/pix
- Limit V~14.5, transient detection at V<13.5.
- Photometric accuracy at V~12 is ~0.1m (abs), <<0.1m (internal).
- Image processing time up to 7hr.
- Up to 4hr to inspect results.

Example image: full frame

Example image: zoom-in



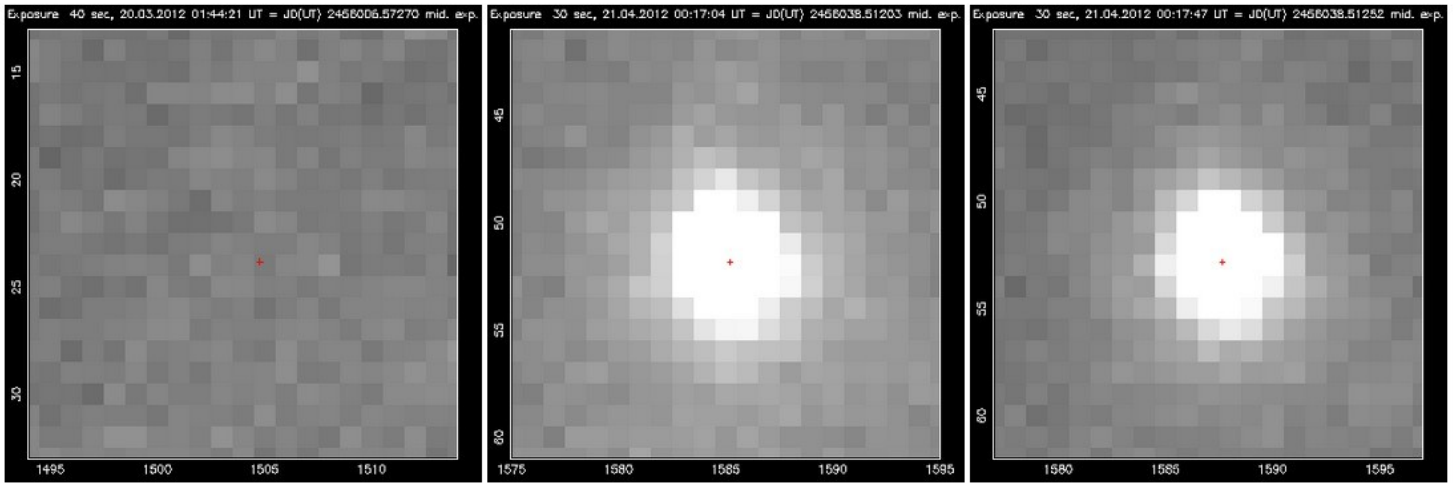
What we see

- Known variable stars (GCVS, VSX).
- New variable stars (2MASS & WISE colors + NSVS & ASAS lightcurves allow us to distinguish «red variables»)

  + 2 CVs discovered.
- Asteroids (offline astcheck), Comets (online MPChecker).
- Various image artifacts.

Nova Sgr 2012 #1: Discovery

42459_Sgr1_201_rename_001.fts



	Date (UTC)	JD(UTC)	mag.	R.A. & Dec.(J2000)	Image
Discovery image 1	2012 04 21.0120	2456038.5120	9.63	17:45:27.91 -23:05:21.3	/mnt/usb2/Sgr1_2012-4-21_0-17-45_002.fts
Discovery image 2	2012 04 21.0125	2456038.5125	9.63	17:45:27.91 -23:05:21.4	/mnt/usb2/Sgr1_201_rename_001.fts

Mean magnitude and position on the discovery images:
2012 04 21.0123 2456038.5123 9.63 17:45:27.91 -23:05:21.3
Maximum position difference between discovery images is 0.000028 degrees (.100800 arcsec).
The object was found in VSX
53″ OGLE-BLG-RRLYR-02100
Type: RRAB

#	Max.	Min./Amp.	JD0	Period
	18.596 Ic	(0.446 Ic	2455000.0557	0.55566926

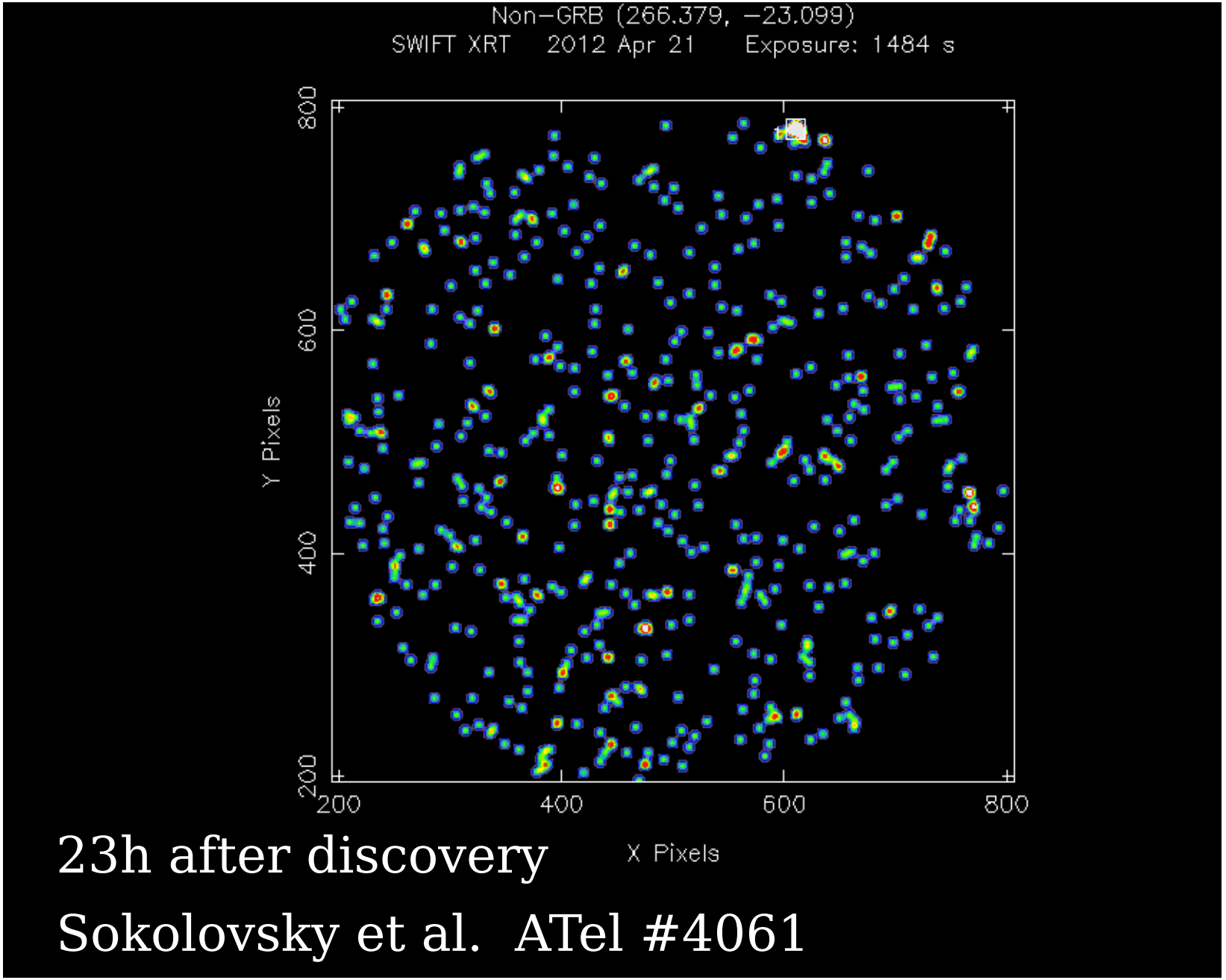
117″ OGLE-BLG-RRLYR-02109
Type: RRAB

#	Max.	Min./Amp.	JD0	Period
	16.408 Ic	(0.606 Ic	2455000.0543	0.55487898

The object was not found in astcheck.
Search this object in SIMBAD.
Search for previous observations of this object in the NSVS database.

Preview of the reference image(s) and two 2nd epoch images:

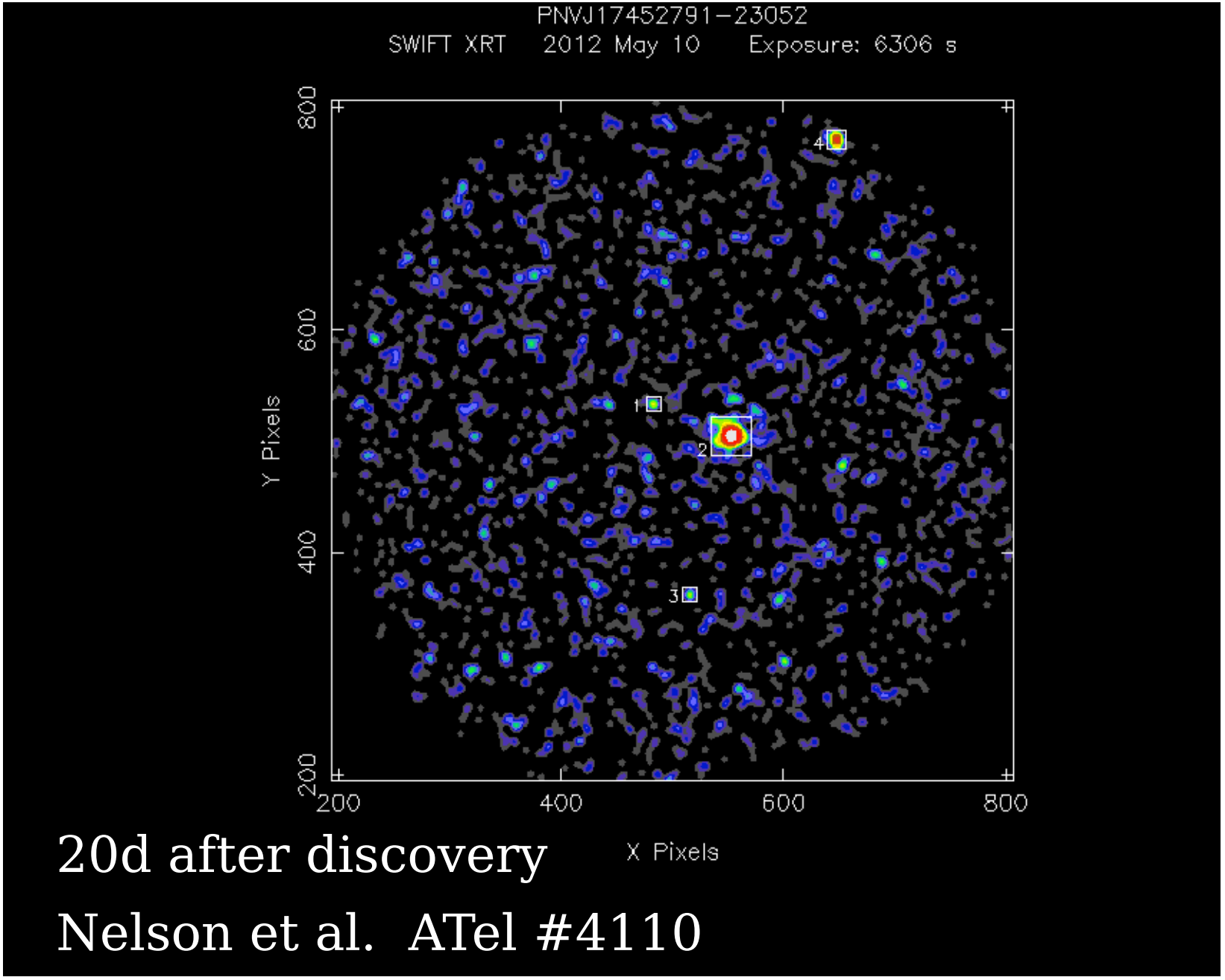
Nova Sgr 2012 #1: Swift follow-up



23h after discovery

Sokolovsky et al. ATel #4061

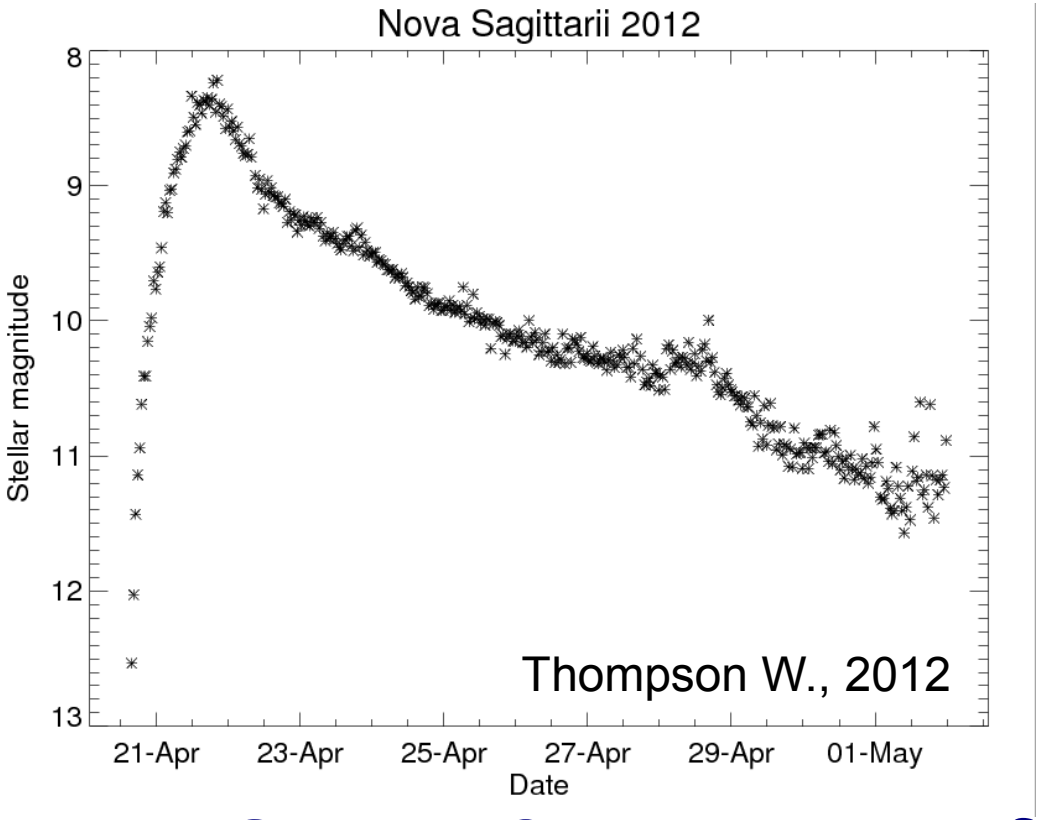
Nova Sgr 2012 #1: Swift follow-up



20d after discovery

Nelson et al. ATel #4110

Nova Sgr 2012: Pre-discovery



April ~20.6 UT — STEREO-B spacecraft

April 20.8043 UT — Xingming obs. (Urumqi, China)

April 21.0112 UT — NMW image

Rapid data processing is the challenge!

Future plans

- New “manual” observing run in March-June 2013.
- Build an enclosure that would enable fully-automatic observations.
- Develop a web-accessible image and lightcurve archive.

Summary

- An operational nova-search system is implemented using limited resources.
- We developed VaST, the open source transient- (and variability-)detection software available at *http://scan.sai.msu.ru/vast*
- Web-based image and photometry archive to be launched soon.
- We are happy to collaborate with you!