OBSERVING FACILITIES AT THE NATIONAL OBSERVATORY OF ATHENS

GAIA SCIENCE ALERTS WORKSHOP
NOVEMBER 11, 2015

ALCESTE BONANOS
NATIONAL OBSERVATORY OF ATHENS, GREECE
OBSERVATORIES OPERATED BY NOA

OBSERVATORIES OPERATED BY NOA

Distance from Helmos to Athens: 220 km
HELLOS OBSERVATORY

Mount Helmos, 2340 m elevation, 22°11’46” E, 37°59’04” N

©Theofanis Matsopoulos
Mount Helmos, 2340 m elevation, 22°11’46” E, 37°59’04” N
# Weather Statistics (2014)

<table>
<thead>
<tr>
<th>Months</th>
<th>Obs. time (hrs)</th>
<th>Total time (hrs)</th>
<th>Fraction (%)</th>
<th>Clear fraction (%)</th>
</tr>
</thead>
<tbody>
<tr>
<td>January</td>
<td>123.13</td>
<td>385.18</td>
<td>32.0</td>
<td>32.0</td>
</tr>
<tr>
<td>February</td>
<td>100.10</td>
<td>322.25</td>
<td>31.1</td>
<td>31.1</td>
</tr>
<tr>
<td>March</td>
<td>101.78</td>
<td>321.35</td>
<td>31.7</td>
<td>31.7</td>
</tr>
<tr>
<td>April</td>
<td>46.25</td>
<td>273.27</td>
<td>16.9</td>
<td>16.9</td>
</tr>
<tr>
<td>May</td>
<td>94.87</td>
<td>249.92</td>
<td>38.0</td>
<td>38.0</td>
</tr>
<tr>
<td>June</td>
<td>64.00</td>
<td>142.68</td>
<td>44.9</td>
<td>40.1</td>
</tr>
<tr>
<td>July</td>
<td>137.13</td>
<td>242.23</td>
<td>56.6</td>
<td>56.6</td>
</tr>
<tr>
<td>August</td>
<td>178.05</td>
<td>270.92</td>
<td>65.7</td>
<td>65.4</td>
</tr>
<tr>
<td>September</td>
<td>87.37</td>
<td>286.95</td>
<td>30.4</td>
<td>29.4</td>
</tr>
<tr>
<td>October</td>
<td>108.62</td>
<td>343.95</td>
<td>31.6</td>
<td>27.6</td>
</tr>
<tr>
<td>November</td>
<td>172.68</td>
<td>365.58</td>
<td>47.2</td>
<td>32.9</td>
</tr>
<tr>
<td>December</td>
<td>86.80</td>
<td>394.48</td>
<td>22.0</td>
<td>15.0</td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th></th>
<th></th>
<th></th>
<th>Summer</th>
<th>Winter</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>670.03</td>
<td>1536.65</td>
<td>43.6</td>
<td>42.0</td>
</tr>
<tr>
<td></td>
<td>630.75</td>
<td>2062.12</td>
<td>30.6</td>
<td>26.7</td>
</tr>
</tbody>
</table>
SEEING STATISTICS

Total Seeing Distribution 2013-2014

- Median 2013: 0.78
- STDEV 2013: 0.49

DIMM
- 19 nights

- Median 2014: 0.57
- STDEV 2014: 0.31

17 nights

- FWHM 2014
- FWHM 2013

Range of FWHM (Arcsec)
Aristarchos 2.3m Telescope

Primary Mirror Diameter: 2.3 m
Focal ratio: f/8
Type: Ritchey-Chretien
First light: 2007
FOV RC corrected: 1.04 deg
FOV uncorrected: 10.1’
Image quality on-axis: <0.35” (80% encircled energy)

Constructed by:

http://helmos.astro.noa.gr/
ARISTARCHOS 2.3M TELESCOPE
# Aristarchos 2.3m Telescope

## Acquisition and Guiding Unit (AGU)
- **Module 1:** 2 off-axis autoguiders
- **Module 2:** 4 side ports for instruments (uncorrected field)
- **Module 3:** 1 main port for science instruments (RC-corrected field)

## Control System
- **Manual Mode**
- **Automatic Mode:** Including advance activity scheduling
- **Remote control mode:** Including planetarium mode
- **Levels of safety:** 3 (software, signal, hardware limits)

## Parameter Table

<table>
<thead>
<tr>
<th>Parameter</th>
<th>Value</th>
<th>Parameter</th>
<th>Value</th>
</tr>
</thead>
<tbody>
<tr>
<td>Range of movement:</td>
<td>+/- 200 deg (in azimuth)</td>
<td>Resonant frequencies:</td>
<td>16 Hz (fork), 21 Hz (tube)</td>
</tr>
<tr>
<td>Range of movement:</td>
<td>+/- 90 deg (in altitude)</td>
<td>Total weight capacity:</td>
<td>up to 300 kg of instrumentation</td>
</tr>
<tr>
<td>Rate of movement:</td>
<td>max 2 deg per second (in azimuth)</td>
<td>Cassegrain weight capacity:</td>
<td>up to 300 kg of instrumentation</td>
</tr>
<tr>
<td>Rate of movement:</td>
<td>max 2 deg per second (in altitude)</td>
<td>Side port weight capacity:</td>
<td>up to 100 kg of instrumentation</td>
</tr>
<tr>
<td>Pointing accuracy:</td>
<td>&lt;4&quot; up to zenith distances of 70 deg</td>
<td>Operating temperature range:</td>
<td>-10 C to +35 C</td>
</tr>
<tr>
<td>Tracking accuracy:</td>
<td>&lt;0.5&quot; in 10 min, 2&quot; in 1 hr (open loop)</td>
<td>Operating humidity range:</td>
<td>up to 80% relative humidity</td>
</tr>
<tr>
<td>Tracking accuracy:</td>
<td>&lt;0.25&quot; in 10 min, 0.5&quot; in 1 hr (closed loop)</td>
<td>Wind tolerance:</td>
<td>up to 15 m/s (in operation)</td>
</tr>
<tr>
<td>Rotator tracking accuracy:</td>
<td>0.25&quot; in 10 min, 0.5&quot; in 1 hr</td>
<td>Earthquake resistance:</td>
<td>up to 2 m/sec² in any direction</td>
</tr>
<tr>
<td>Radius of zenith blind spot:</td>
<td>2 deg</td>
<td></td>
<td></td>
</tr>
</tbody>
</table>
## ARISTARCHOS IMAGERS

<table>
<thead>
<tr>
<th>Instrument</th>
<th>Detector</th>
<th>Filters</th>
<th>FOV</th>
<th>Scale (&quot;/pixel)</th>
</tr>
</thead>
<tbody>
<tr>
<td>LN CCD</td>
<td>e2V 1kx1k</td>
<td>table</td>
<td>4.8'x4.8'</td>
<td>0.28</td>
</tr>
<tr>
<td><strong>LN2 CCD</strong></td>
<td>e2V 2kx2k</td>
<td>table</td>
<td>5.5'x5.5'</td>
<td>0.16</td>
</tr>
<tr>
<td>MES-AT</td>
<td>e2V 2kx2k</td>
<td>table</td>
<td>4'.8x4'.8</td>
<td>0.27</td>
</tr>
<tr>
<td>VEC</td>
<td>4kx4k Fairchild</td>
<td>table</td>
<td>10'x10'</td>
<td>0.17</td>
</tr>
<tr>
<td>RISE2</td>
<td>Andor DW485 1kx1k</td>
<td>broad-VR</td>
<td>10'x10'</td>
<td>0.60</td>
</tr>
</tbody>
</table>

**LN2 CCD**

**VEC**

**RISE2**
## Aristarchos Spectrographs

<table>
<thead>
<tr>
<th>Instrument</th>
<th>Wavelength range (Å)</th>
<th>Dispersion</th>
<th>Slit Length</th>
<th>Detector</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>ATS</strong></td>
<td>4009-7257</td>
<td>-</td>
<td>Fiber: 10&quot; on sky</td>
<td>Alta U47 1kx1k</td>
</tr>
<tr>
<td><strong>MES-AT</strong></td>
<td>3900-7500</td>
<td>-</td>
<td>5.8'</td>
<td>2kx2k</td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th>gratings</th>
<th>option 1 (RED)</th>
<th>option 2 (BLUE)</th>
<th>option 3</th>
</tr>
</thead>
<tbody>
<tr>
<td>(grooves/mm)</td>
<td>1200</td>
<td>1200</td>
<td>600</td>
</tr>
<tr>
<td>(arcsec)</td>
<td>≅ 10</td>
<td>≅ 10</td>
<td>≅ 10</td>
</tr>
<tr>
<td>spectral range</td>
<td>5736.9-7071.8 Å</td>
<td>4309.8-5768.8 Å</td>
<td>4009.0-7257.0 Å</td>
</tr>
<tr>
<td>resolution</td>
<td>1.3 Å</td>
<td>1.4 Å</td>
<td>3.2 Å</td>
</tr>
<tr>
<td>dispersion</td>
<td>103 Å mm⁻¹</td>
<td>95 Å mm⁻¹</td>
<td>245 Å mm⁻¹</td>
</tr>
<tr>
<td>centered wavelength</td>
<td>6441.6 Å</td>
<td>5074.1 Å</td>
<td>5691.5 Å</td>
</tr>
</tbody>
</table>

[Image of ATS and MES-AT]
Mount Kyllini, 930 m elevation, 37°58′19″ N, 22°37′07″ E
KRYONERI 1.2m TELESCOPE

Primary Mirror Diameter: 1.2 m
Focal ratio: f/8
Type: Cassegrain
First light: 1975

Constructed by: Grubbs Parsons Co., Newcastle

http://kryoneri.astro.noa.gr/
NELIOTA: ESA’s New Lunar Impact Monitoring Project at NOA

Goal: Establish an operational system at the National Observatory of Athens to conduct a lunar impact monitoring campaign, which will help determine the distribution and frequency of small NEOs.

Technical Officer: Vicente Navarro (ESAC)
PI: AB (NOA)

http://neliota.astro.noa.gr/
**Kryoneri Prime Focus Instruments**

- f/2.8 optical corrector with a dichroic beam splitter
- Lunar imager with two fast-frame sCMOS cameras
  - Zyla sCMOS 5.5 cameras, FOV: 17’x14’, pixel size: 6.5μm (0.4”)
  - frame rate: up to 40 fps
  - R and I filters will be mounted in front of the cameras
- f/3.1 direct science focal plane
  - FOV: 1.4 degrees, large format camera and a filter slider are needed
Evidence for Rapid Variability in the Optical Light Curve of the Type Ia SN 2014J*

A. Z. Bonanos and P. Boumis

IAASARS, National Observatory of Athens, GR-15236 Penteli, Greece
e-mail: bonanos@astro.noa.gr

Received November 26, 2014; accepted October 25, 2015

ABSTRACT

We present results of high-cadence monitoring of the optical light curve of the nearby, Type Ia SN 2014J in M82 using the 2.3m Aristarchos telescope. $B$ and $V$–band photometry on days 15–18 after $t_{\text{mea}}(B)$, obtained with a cadence of 2 min per band, reveals evidence for rapid variability at the 0.02–0.05 mag level on timescales of 15–60 min on all four nights, taking the red noise estimation at face value. The decline slope was measured to be steeper in the $B$–band than in $V$–band, and to steadily decrease in both bands from 0.15 mag day$^{-1}$ (night 1) to 0.04 mag day$^{-1}$ (night 4) in $V$ and from 0.19 mag day$^{-1}$ (night 1) to 0.06 mag day$^{-1}$ (night 4) in $B$, corresponding to the onset of the secondary maximum. We propose that rapid variability could be due to one or a combination of the following scenarios: the clumpiness of the ejecta, their interaction with circumstellar material, the asymmetry of the explosion, or the mechanism causing the secondary maximum in the near-infrared light curve. We encourage the community to undertake high-cadence monitoring of future, nearby and bright supernovae to investigate the intraday behavior of their light curves.

Key words. supernovae: individual: SN 2014J – supernovae: general – Galaxies: individual: M82

PROOF OF CONCEPT – SN 2014J

- 5 sec (V) & 20 sec (B) sequences
- 3-6 mmag precision
- 0.02-0.05 mag variability

PROOF OF CONCEPT - ARISTARCHOS/LN CCD

ASASSN-15RB (TYPE UNKNOWN, 16.7 MAG ON OCT 12)

R-band, 300 s

ASASSN-15RW (TYPE IA, 15.5 MAG ON OCT 24)

V-band, 60 s

M. Kounriotis, Nov 5, 2015
PROOF OF CONCEPT-ARISTARCHOS/ATS

M. Kourriotis, Nov 5, 2015

ASASSN-15RB

Wavelength (Angstroms)

2 x 40 min

M. Kourniotis, Nov 5, 2015
**HUBBLE CATALOGUE OF VARIABLES (HCV)
ESA PROJECT AT NOA**

**Goal:** Define a system to extract and validate variable sources in the Hubble Source Catalog, & make them available to the community via a catalog (the HCV).

- 30 million sources in HSC (Whitmore et al. 2015)
- 112 instrument & filter combinations
- 25 yrs of imaging (WFPC2, ACS, WFC3)
- 1% of sky

**Technical Officer:** AntonellaNota (STScI)
**Project Scientist:** AB (NOA)
CONCLUSIONS

Both telescopes of the National Observatory of Athens could potentially participate in Gaia Science Alert follow-up observations starting in Summer 2016.

<table>
<thead>
<tr>
<th>Telescope</th>
<th>Instrument</th>
<th>FOV</th>
<th>Limiting Mag</th>
<th>Availability &amp; Comments</th>
</tr>
</thead>
<tbody>
<tr>
<td>Aristarchos 2.3m</td>
<td>LN2 CCD</td>
<td>5.5’x5.5’</td>
<td>~23</td>
<td>June-October, UBVRI filters</td>
</tr>
<tr>
<td>Aristarchos 2.3m</td>
<td>Aristarchos Transient Spectrometer (ATS)</td>
<td>10” fiber</td>
<td>~16</td>
<td>June-October, R~ 1500-5000</td>
</tr>
<tr>
<td>Aristarchos 2.3m</td>
<td>RISE2</td>
<td>10’x10’</td>
<td>~23</td>
<td>June-October, VR wide filter</td>
</tr>
<tr>
<td>Kryoneri 1.2m</td>
<td>Lunar Imager</td>
<td>17’x14’</td>
<td>~19 (30 sec)</td>
<td>Summer 2016 onward, RI filters</td>
</tr>
</tbody>
</table>

THANK YOU! QUESTIONS?
Welcome to EWASS 2016!

European Week of Astronomy and Space Science
4 – 8 July 2016

Eugenides Foundation, Athens, Greece

Organised by the European Astronomical Society

Follow us!

Important dates:
Call for Session Organisers: deadline: 11 September 2015 (past)

http://eas.unige.ch/EWASS2016/
SUPERNova REMNANTS
AN ODYSSEY IN SPACE AFTER STELLAR DEATH
6 - 11 JUNE 2016, CHANIA, CRETE, GREECE

Scientific Topics

- Radiation studies from gamma-rays to radio in SNRs
- Galactic and Extragalactic SNRs
- The search for the binary companions of SN progenitors in SNRs
- Pulsar winds nebulae (including Crab flares)
- Magnetic fields in SNRs and PWNe
- Collisionless shock waves in SNRs
- Jets and Asymmetries in SNe and their Remnants
- SNRs as probes and drivers of galaxy structure
- SNe and SNRs cosmic ray acceleration
- SN ejecta – abundances, clumpiness
- SNe and SNRs with circumstellar interactions

Invited Speakers

R. A. Chevalier (USA)
J. Vink (Netherlands)
E. Amato (Italy)
C. Badenes (USA)
G. Dübner (Argentina)
P. Ghavamian (USA)
W. Kerzendorf (Germany)
S. - H. Lee (Japan)
M. Lemoine-Goumard (France)
I. Leonidaki (Greece)
L. Lopez (USA)

R. McCray (USA)
D. Milisavljevic (USA)
D. Patnaude (USA)
W. Reich (Germany)
S. Reynolds (USA)
S. Safi-Harb (Canada)
N. Soker (Israel)
T. Temim (USA)
S. Van Dyk (USA)
B. Williams (USA)

Scientific Organizing Committee (SOC)

P. Boumis (co-chair), J. Raymond (co-chair), T. Bell, W. Blair, K. Borkowski, A. Decourchelle, R. Fesen, D. Green, R. Kothes, A. Rest, P. Slane

Local Organizing Committee (LOC)

P. Boumis (co-chair), A. Bonanos (co-chair), D. Abartzi, S. Akras, J. Alikakos, A. Chiotellis, M. Kopsachili, M. Kourniotis, I. Leonidaki, A. Liakos, M. Pilatsika, S. Williams

http://snr2016.astro.noa.gr