The Anton Pannekoek Observatory in Amsterdam

An observatory for students

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Abstract

The Anton Pannekoek Observatory (APO) in Amsterdam, in operation since 2010, is with its 50 cm Ritchey-Chrétien telescope (in the higher dome) , imager and spectrographs the most advanced optical observatory in the Netherlands. The lower dome is for solar work.

In spite of the high sky-background, UBVRI photometry, deep-sky imaging and spectroscopy are well feasible. The seeing varies mostly around 2", but has been down to 1.2".

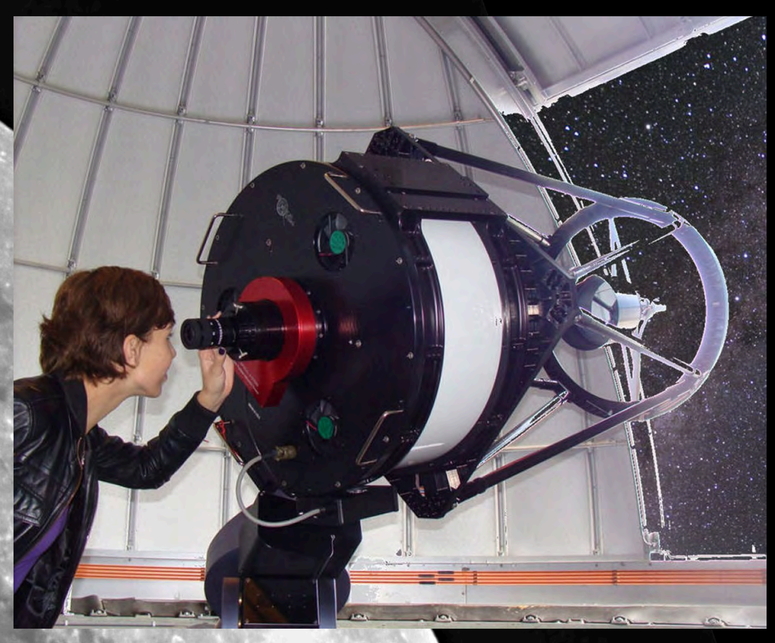
Photometry reaches V=17.5 in one minute exposure with astrometric accuracy of 0.2 arcsec.

Several spectrograph settings are available, including fiber-fed echelle with R = 10000 over the full wavelength range, and R = 17000 with limited coverage.

The observatory is primarily meant for students who can work under professional-like and convenient circumstances. It is designed to be operated remotely, and also robotically. The latter is still under construction.

First results from the observatory are illustrated with highlights from the commissioning phase and student projects, which include exo-planet transit observations, spectra of planets, stars, planetary nebulae and galaxies, and deepsky broad- and narrow-band filter images.

All images and spectra shown were obtained at this observatory.



Instrumentation

Telescope: Ritchey-Chrétien D = 50 cm, f = 417 cm, f/D = 8.2

Automated dome control by ACP, including weather monitoring, pointing, autoguiding, focusing, field identification, filter and rotation settings, planning

Imager: - FLI Proline 16803, 4048x4048 pixels 9μ square, 0.45'' per pixel
Filters: L, U, B, V, R, I, Hα, Hβ, OIII, SII

Spectrographs , all with autoguider
- **SBIG Self Guiding Spectrograph, R = 500-2000**
- **Shelyak eShel, R = 10000, 4450 – 6750 A**
  fiber-fed, with internal ThAr and Flat Field lamps
- **Shelyak LHIRES III, R = 17000, 85 A**

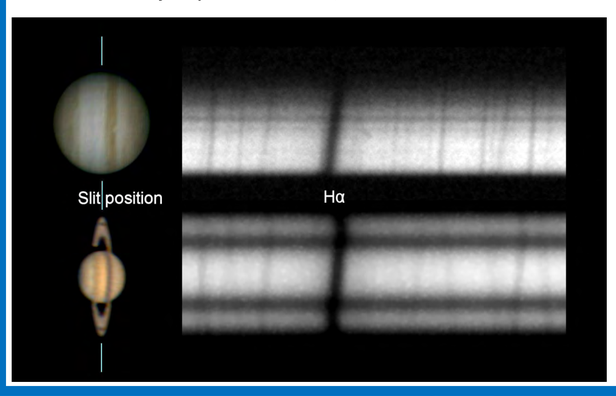
Rotation of Jupiter and Saturn from spectroscopy

Marieke van Doesburgh, Jonathan Nip, Laurien Schreuder, Erik de Bok

Images: 300 stacked frames

Spectra with LHIRES spectrograph, R = 17000

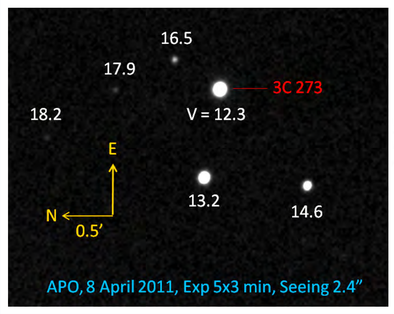
Rotation velocity Jupiter: 12 km/s, Saturn: 9 km/s

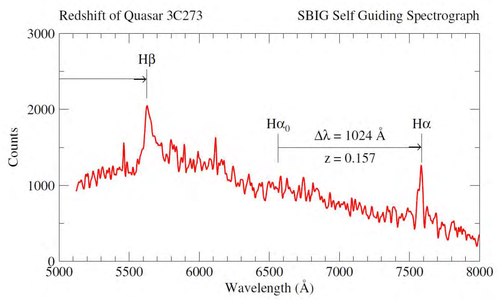


Photometry and Redshift of Quasar 3C273

Quido Kuiper, Hilmar van der Veen

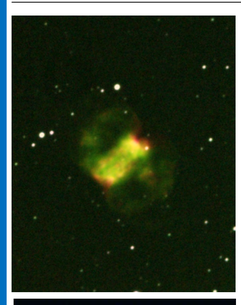
Exp Time spectrum 2x1h, Recession velocity = 47000 km/s from Hα and Hβ

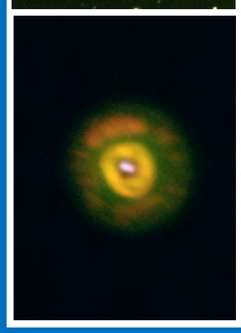




Imaging and Spectroscopy of Planetary Nebulae

Matthijs Damen, Hans Pluk, Sophie Heethuis, Steven Oosterhuis

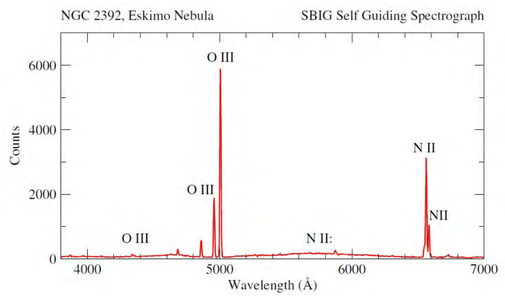




Images: L, Hα, OIII, SIII (total 36 min)
Exp Time Spectra: 3hr for M76, 1 hr for NGC 2392
Analysis of emission line ratios gives for the temperature and electron density:

M 76: T = 12500 K, Ne = 600 cm^{-3}

NGC 2392: T = 20000 K, Ne = 10^4 cm^{-3}



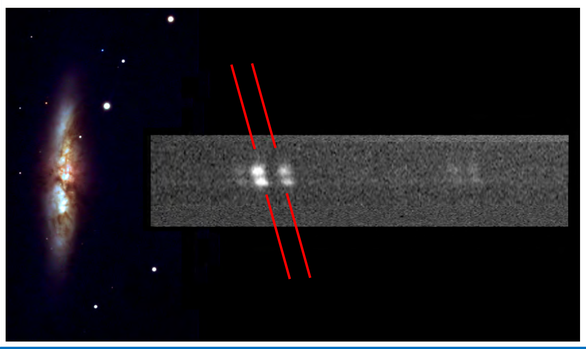
Spectroscopic Mass of Starburst Galaxy M 82

Daniel Hartkamp, Nanning Poelsma

Images: L, R, V, B (total 48 min)

Exp Time spectrum: 30 min

Doppler analysis of slanted lines gives a central mass of 20 x 10^6 M_{Sun}

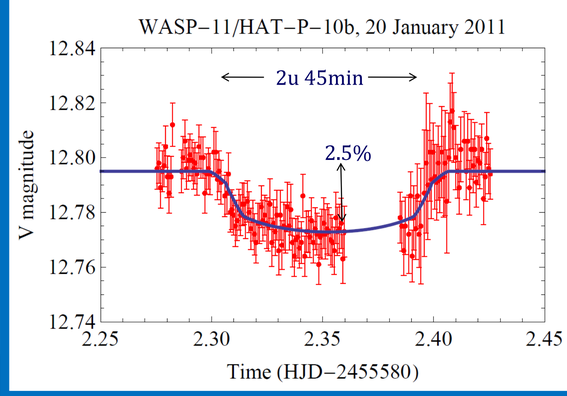


Transit of Exoplanet Hat 10b

Margot Brouwer, Bart Vos

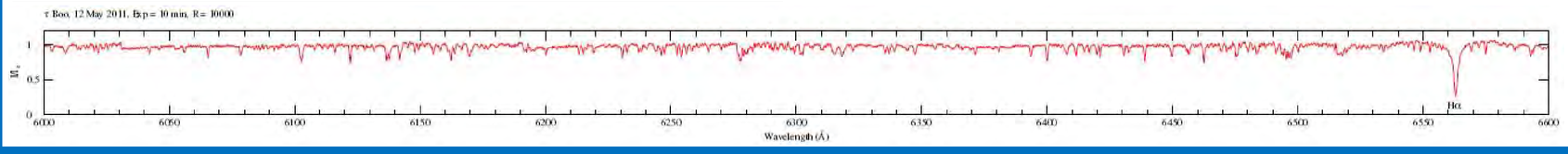
Exp Time 1 min, 156 images

Modeling gives R = 1.15 (15) R_{Jup}, i = 88(1)°, a = 9.45(1) R_{Sun}, u = 0.6(1)



Echelle Spectroscopy of the Exoplanet Companion τ Boo

Jaromir Camphuijsen, Bruno Eijsvoogel, Nils Vollenhoven, Willemijn van Woerkom



Acknowledgements

Results shown are also contributed by students Frank Tramper, Franka Buurmeijer, Dirk Boonzajer-Flaes, Ed Buijs, Florien Stoel, Ferdi Zoet, Niels Ferguson, Rik van Lieshout.

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Abstract

The Anton Pannekoek Observatory (APO) in Amsterdam, in operation since 2010, is with its 50 cm Ritchey-Chrétien telescope, imager and spectrographs the most advanced optical observatory in the Netherlands.

In spite of the high sky-background level, UBVRI photometry, deep-sky imaging and spectroscopy are well feasible. The average seeing is 2.4", but has been down to 1.1".

Photometry reaches V=17.5 in one minute exposure with astrometric accuracy of 0.2 arcsec.

Several spectrographic modes are available. The full wavelength range can be covered by a low-resolution spectrograph and by a fiber-fed echelle spectrograph with R = 10000. High-resolution spectra up to R = 17000 can be taken with limited coverage.

The observatory can be operated remotely. A robotic mode has been also designed, but is still under construction.

The observatory is primarily meant for students who can work under professional-like and convenient circumstances. APO has also participated in international projects.

Highlights are presented from student projects, which include exoplanet transit and orbital observations, spectra of planets, comets, stars, planetary nebulae, supernovae and galaxies, solar system and deepsky broad- and narrow-band filter imaging.

All images and spectra shown were obtained at this observatory.

Instrumentation

Telescope: Ritchey-Chrétien D = 50 cm, f = 417 cm, f/D = 8.2

Automated dome, telescope and instrument control by ACP

Imager: - FLI Proline 16803, 4048x4048 pixels 9μ square, 0.45" per pixel

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Spectrographs , all with autoguider

- SBIG Self Guiding Spectrograph, R = 500-2000

- Shelyak eShel, R = 10000, 4450 – 6750 A

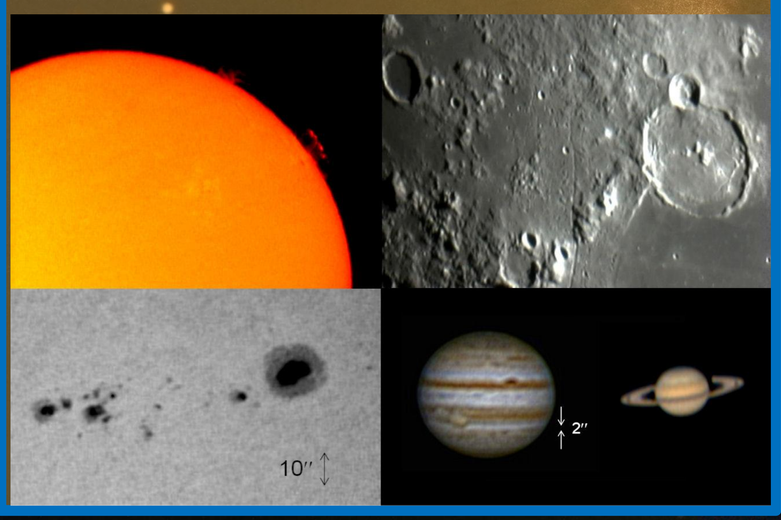
fiber-fed, with internal ThAr and Flat Field lamps

- Shelyak LHIRES III, R = 17000, 85 A coverage

Imaging of Solar System objects

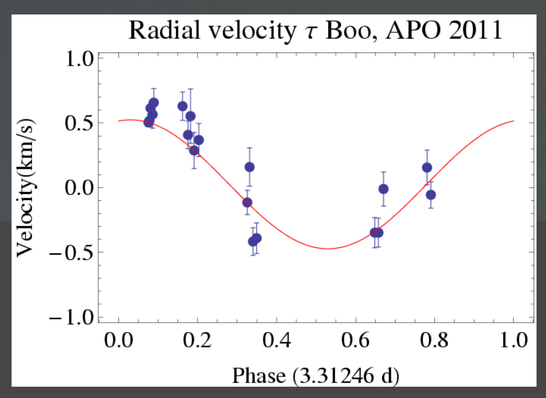
Sharpened average of 300 stacked webcam frames,

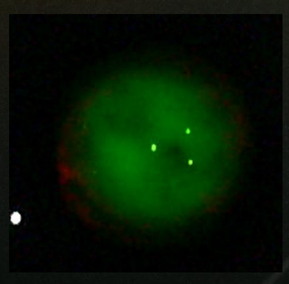
1" details are visible.

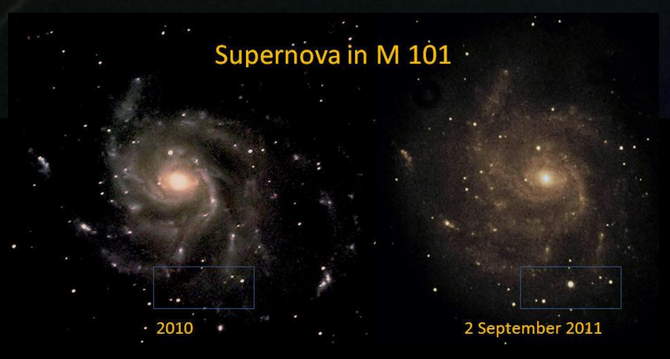


Echelle Spectroscopy of the Exoplanet Companion τ Boo

Note: typical error bars 100 m/s

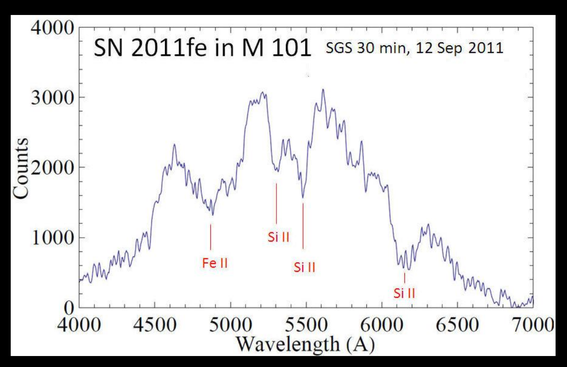






HII regions in M 33

Image: L, Hα, V, B (total 3h45m)



APO Amsterdam

Acknowledgements

Results shown are also contributed by students Dirk Boonzajer-Flaes, Yarah Bot, Sarah Brands, Franka Buurmeijer, Jaromir Camphuijsen, Erik de Bok, Romy Dhillon, Boaz Dubbeldam, Adri Duivenvoorden, Bruno Eijsvoogel, Niels Ferguson, Bert Haalboom, Timo Halbesma, Erik Hogenbirk, Niki Klop, Kim Pronk, Cyriana Roelofs, Joep Rouwhorst, Odile Smits, Florien Stoel, Samayra Straal, Ruud van der Beek, Willemijn van Woerkom, Nils Vollenhoven, Eline Wieldraaijer, Ferdi Zoet

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Utrecht 370 years

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