

La Palma telescopes

NOT, WHT, ING, TNG, LT, Mercator

Tapio Pursimo

tpursimo@not.iac.es

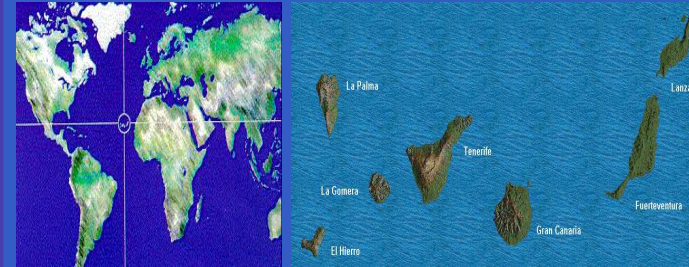
Nordic Optical Telescope



Background

La Palma the west most island of the Canary Islands
Observatory Roque de Los Muchacos run by the IAC

- Altitude about 2400 m, above the inversion layer



ORM

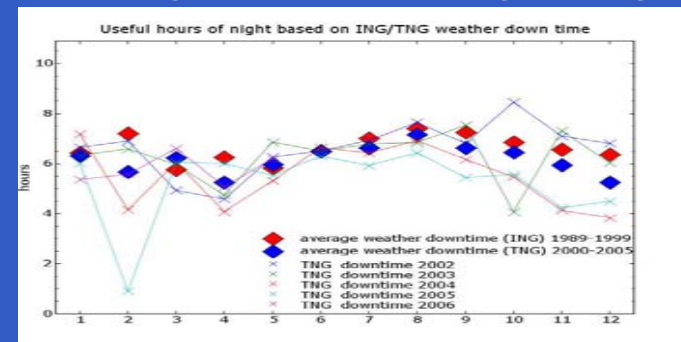


telescopes: INT, LT, Mercator, WHT, NOT, TNG, GTC,
SuperWASP, KVA,
MAGIC I & II, solar towers: Swedish solar tower, DOT



Meteorology

- One of the best astronomical sites in the world.
- The length of night between 7 to 11 hours
- on average; the effective length of night constant



NOT (Nordic Optical Telescope)



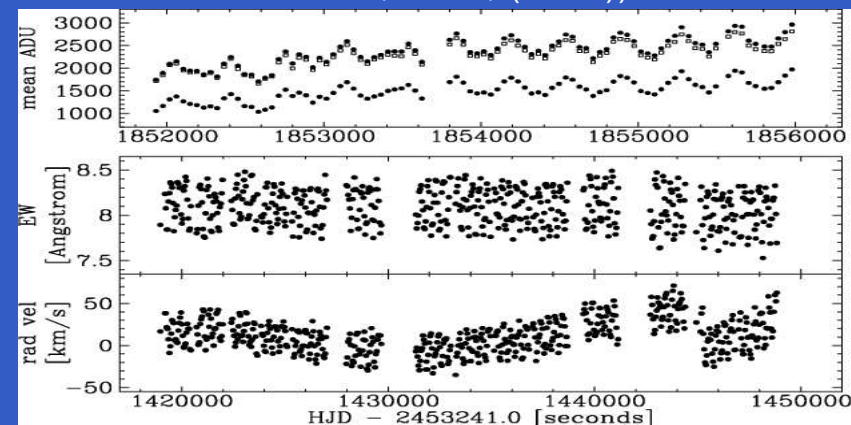
2.56 meter alt-az mount telescope

- instruments: ALFOSC, MOSCA, NOTCam, FIES, SOFIN, StanCam, TurPol, LuckyCam(?)



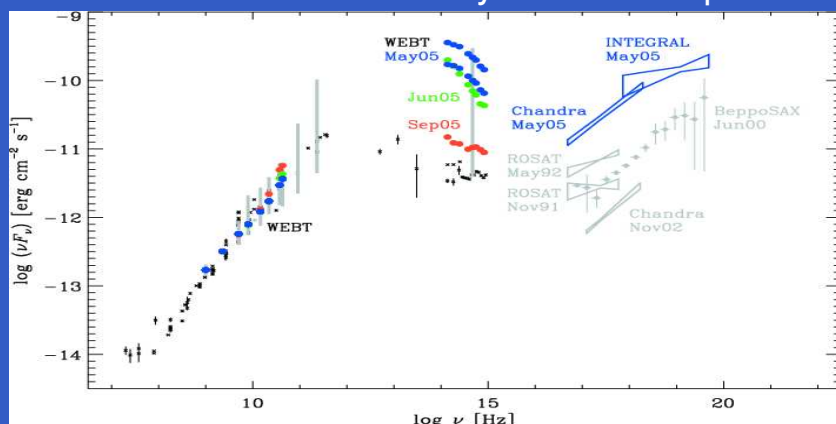
NOT: ALFOSC science example

- Time resolved spectroscopy, resolution 43 sec
- low-spectral resolution (3\AA) 3500-5050 \AA , dispersion $0.77\text{\AA}/\text{pixel}$ (about $54\text{ km s}^{-1}/\text{pixel}$)(grism #16) (Telting & Ostensen A&A 450, 1149, (2006))



NOT: NOTCam +StaCam science example

- broad band SED using NOTCam & StanCam 3C454.3 during the 2005 outburst
A&A 453 cover illustration by Villata et al p821



NOT: Own instrument

- Mounted at the Cassegrain focus
- Weight less than about 250 kgs
- focal plane 200mm below the adapter flange
- Contact staff (staff@not.iac.es)



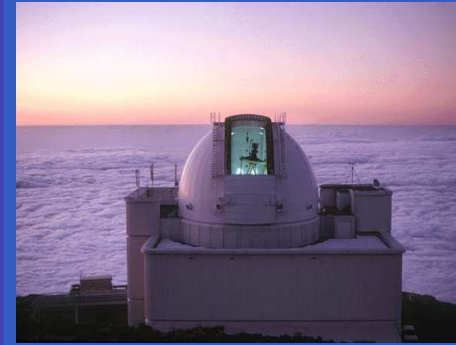
TNG (Telescopio Nazionale Galileo)

- 2 Nasmyth foci hosts 5 instruments
 - ◆ imaging: OIG (2×2k×4k EEV CCD, 4.9' square), Dolores (9.4' field)
 - ◆ spectroscopy: SARG (echelle), Dolores (low res.)
 - ◆ NIR: NICS, 1k Hawaii array, AdOpt (Adaptive Optics module for NIR imaging, tip-tilt)



3.58m Alt-Az telescope La Palma telescopes – p.9/33

ING:INT (Isaac Newton Telescope)



2.5 meter equatorial mount

- Wide Field Camera (WFC), 34 ' square
- Intermediate Dispersion Spectrograph (IDS)



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ING: WHT (William Herschel Telescope)

4.2 meter altazimuth mount

- imaging: PFIP (16' square)
- spectroscopy ISIS (two arm, longslit), AF2/WYFFOS (MOS), NAOMI/OASIS (IFS, 17" field)
- NIR: LIRIS (imager/spectrograph), NAOMI/INGRID (high resolution)
- GLAS:Rayleigh laser



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Mercator

■ 1.2 meter altazimuth mount

■ instruments:

- ◆ P7: photometer with Geneva-filters
- ◆ MEROPE CCD camera: 6.5 ' field
- ◆ HERMES: Echelle Spectrograph R=40000 and 90000



La Palma telescopes – p.12/33



2 meter robotic telescope

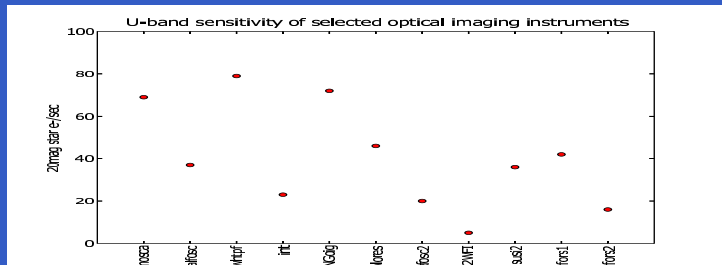
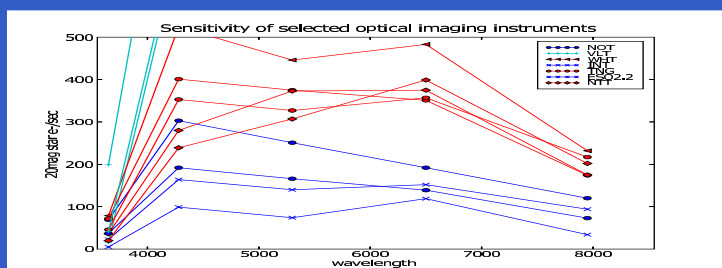
- RATCAM: CCD 4.6' field
- SupIRCam: NIR camera 1.7' field
- Meaburn Spectrograph: 49 x 1.7" fibre bundle



- Wide Angle Search for Planets (WASP)
eight Canon 200mm f/1.8 lenses + Andor E2V 2k CCD
non-standard broad band filter
limiting magnitude 15.5 (1% photometry at 12)
- observing strategy: eight, 500 sq deg fields in succession, with 30 sec integration
the cadence per field is therefore 8 minutes
The whole sky once per night (takes about 30 minutes)



Comparing the ORM instruments



Comparing the ORM instruments

- Polarimetry: NOT
- U-band imaging: NOT
- NIR-optical SED: TNG NOT
- NIR imaging/spectroscopy: TNG WHT
- imaging survey: INT
- lowresolution spectroscopy bright objects: NOT INT
- lowresolution spectroscopy faint objects: WHT TNG
- Deep imaging (B-band and redder): TNG WHT
- high resolution spectroscopy: TNG NOT Mercator
- monitoring: Liverpool



Who can get time?

- NOT-OPC,CAT,PATT,TNG-TAC,NFRA PC, Dr Hans Van Winckel (hans.vanwinckel@ster.kuleuven.be)
- SuperWASP private telescope (so far???)
- Opticon: WHT, INT, TNG, LT, NOT
- CCI: WHT, INT, TNG, LT, Mercator, NOT



THANKS!



NOT: ALFOSC

Andalucia Faint Object Spectrograph and Camera the workhorse at NOT

- imaging, lowresolution spectrograph, polarimetry (linear/circular imaging/spectrophotometry), multi object spectroscopy, fast photometry (on-line analysis)
- three filter wheels (14 slots available), aperture wheel (five slots), grism wheel (six slots)
- CCD E2V 2k×2k one pixel 13.5 μ , 0.19''



NOT: NOTCam +StaCam science example

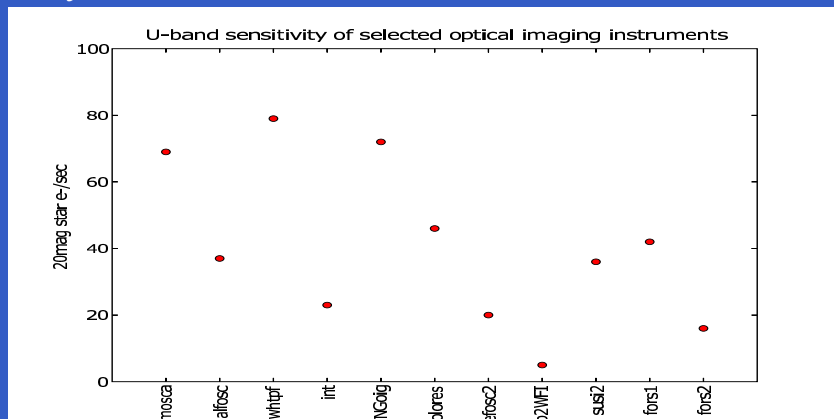
NIR imaging spectrograph

- two modes: Wide Field / high resolution camera
- imaging 22 filters, polaroids, one grism, two slits
- Spectroscopy: intermediate resolution (2-pixel $R=2500$, with dispersion 2.5-4.1 Angstrom/pixel) in J (5th and 6th order), H (4th order) and K (3rd order) when used with the WFC.
HR Camera the resolution will be about 3 times higher, but the sampled wavelength range will be about 3 times less.



NOT: MOSCA

- Mosaic of four Loral 2k CCDs, with FOV of 7.7' square
- Very sensitive in U band



NOT: SOFIN (SOviet FINish spectrograph)

- High resolution spectrograph also spectropolarimetry limited use: contact Ilya Ilyin (ilyin@aip.de)



NOT: TurPol

- photo polarimeter, simultaneous UBVRI for bright objects



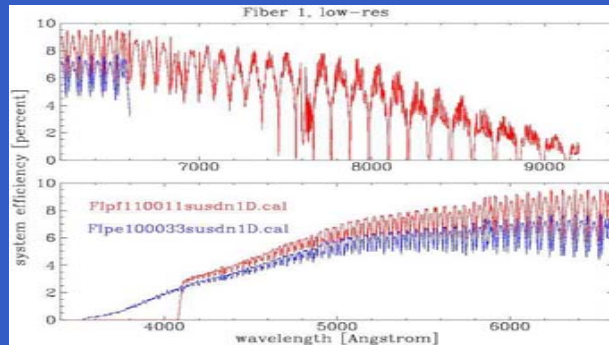
NOT: StanCam

- Stand by optical imager (folded cassegrain) SITE 1k CCD with UBVRIzH α filters
- Imaging instrument when ALFOSC/MOSCA is not mounted
FIES fiber viewer
- longterm monitoring, (almost) simultaneous UBVRIJK photometry with NOTCam



NOT: FIES (high-resolution Fibre-fed Echelle Spectrograph)

- Stand by instrument
- 4000-8300 Å with R=25k,45k,65k, depending on the fibre
- The “sky” fibre about 40 arcsec away
- high degree of mechanical and thermal stability



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NOT: LuckyCam

- L3CCD: H α and redder for high resolution imaging
idea: shift & add the best images
- Diffraction limited I-band images can be achieved in good (< 0.6") seeing. Under poorer conditions the seeing resolution can be improved by as much as a factor of four
- Could be used for high time resolution photometry as well



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TNG

- 2 Nasmyth foci hosts 5 instruments
 - ◆ SARG: cross dispersed echelle spectrograph
3700Å- 1 μ R=29k - 164k
 - ◆ NICS: NIR Camera Spectrometer 1024x1024
HgCdTe Hawaii array FOV 4.2' \times 4.2'
Zero point K 21.8mag per 1ADU/sec H 22.3 J 22.1
(1 ADU about 8 e $^-$)



La Palma telescopes – p.27/33

TNG

- Adopt: The Adaptive Optics module for NIR imaging
corrections tip-tilt and higher orders (future?)
guide star with V/R < 13 within 30" improves the NIR
FWHM by a factor of 2 if seeing 1" or better (K seeing
limit 1.3")
- OIG (Optical Imager Galileo) 2 \times 2k \times 4k EEV CCD, 4.9'
square
- DOLORES (Device Optimized for the LOw RESolution)
low resolution (1.25 - 11.0 Å/pix), 2k Loral CCD
Imaging FOV: 9.38 x 9.38 arcmin with a 0.275
arcsec/pix scale.



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ING:INT

- two instruments Wide Field Camera (WFC) and Intermediate Dispersion Spectrograph (IDS)
- WFC: $4 \times 2k \times 4k$ E2V CCD resulting $34'$ square reading out time 42 seconds ; 22 filters available
- IDS: resolution: from 0.5 \AA to 7.5 \AA FWHM corresponding dispersion from 0.24 to 3.7 \AA per pixel



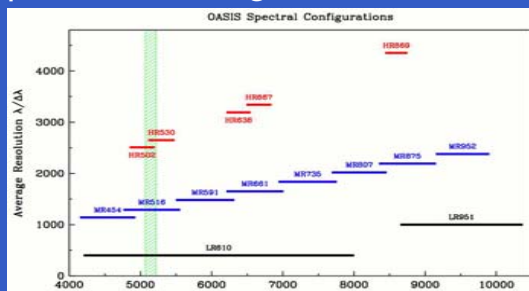
ING:WHT

- ISIS: long-slit ($4'$) double-armed (blue: EEV12, red: Marconi2) spectrograph, medium-resolution ($8 - 120 \text{ \AA/mm}$) $R < 10000$
- AF2/WYFFOS: multi-object fibre-fed spectroscopy, $40'$ field; $150 \text{ } 1.6''$ science fibres, and 10 fiducial bundles for acquisition and guiding $R < 3000$
- LIRIS (Long-slit Intermediate Resolution Infrared Spectrograph) imaging $4'$ field spectroscopy, $R < 4000$
- prime-focus - optical imaging, $16'$ field



ING:WHT

- NAOMI/OASIS: - integral-field spectroscopy with or without adaptive optics (AO), $R < 4000$, $17''$ field
- NAOMI/INGRID - IR imaging with or without AO, $40''$ field $1k$ Hawaii array
- GLAS: Ground-layer Laser Adaptive optics System Rayleigh laser system
A $25W$ pulsed laser will be projected to $15km$ altitude plus a natural guide star



Mercator

- 1.2 m University of Leuven
- P7 : photometer with Geneva-filters
- MEROPE CCD camera: $6.5'$ field ($0.19''/\text{pixel}$) with Geneva-filters
- HERMES (High Efficiency and Resolution Mercator Echelle Spectrograph) $3800 \text{ \AA} - 8750 \text{ \AA}$ $R=40000$ and 90000



Liverpool

- RATCAM: CCD camera with SDSS and Bessell BV filters, 4.6' field
- SupIRCam: NIR camera with JH(K') filters, 1.7', 0.4"/pixel
- Meaburn Spectrograph: prototype low dispersion spectrograph fibre bundle with 49 x 1.7" fibres.
- FRODOSpec: integral-field spectrograph (not yet available)
- RINGO: optical polarimeter permanent VR filters, limiting magnitude: about 16

