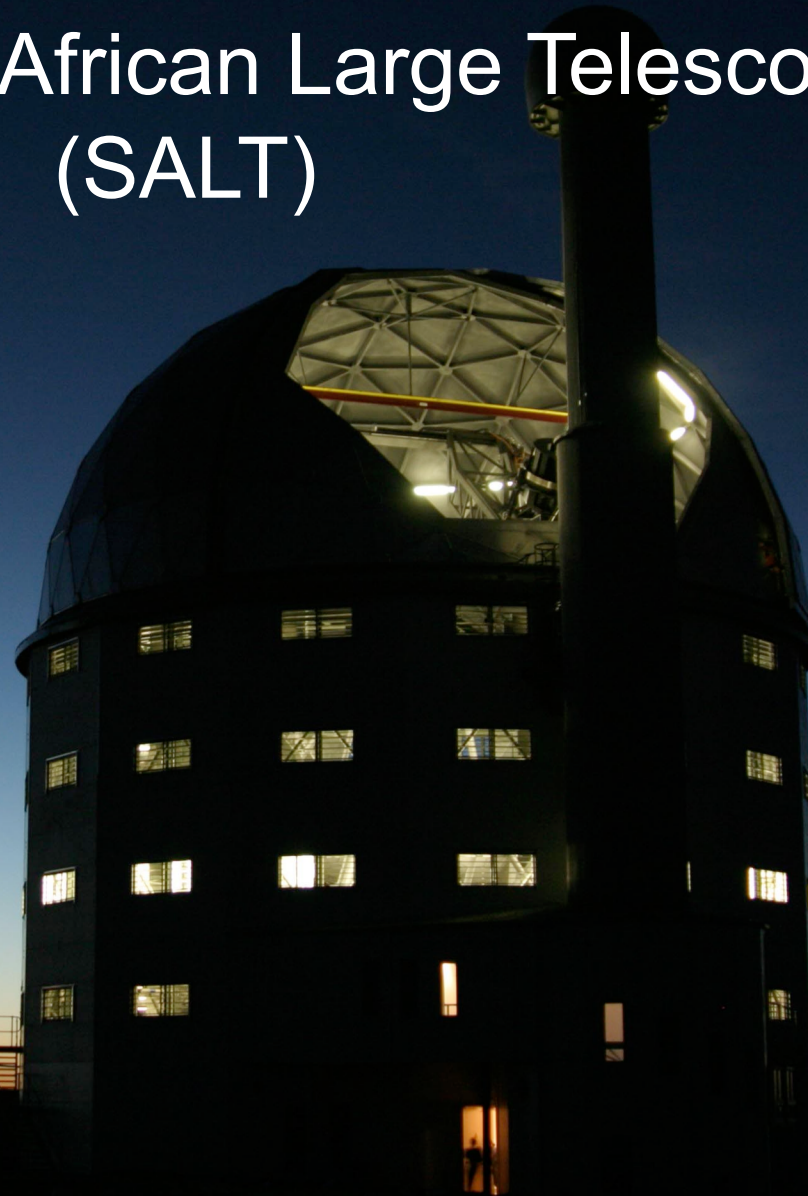


The Southern African Large Telescope (SALT)

By
Encarni Romero Colmenero
SAAO Deputy Director
SALT Director



OPTICON Alliance/ORP Telescope Directors' Forum
Crete, 2024



SALT

10m class optical (+NIR) telescope in the Southern Hemisphere

Private telescope, access only for PIs in partner institutions (+ *collaborators!*), + AFRICAN PIs + **ORP proposals** + soon NOIRLab through LSST + **buying SALT time** eg CMU)



WISCONSIN

Open time: DDT (few hours/semester)
(ddt@salt.ac.za)



Where is SALT?



Headquarters are in Cape Town, at the headquarters of the South African Astronomical Observatory (SAAO) in Observatory

The actual telescope is in Sutherland.

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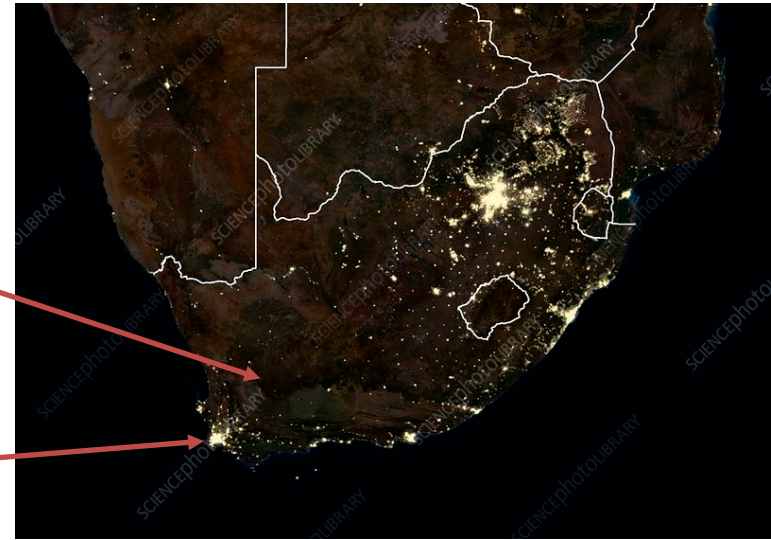
Why Sutherland?

Dark skies!

No strong seasonal weather impact
on sky

Sutherland

Cape Town



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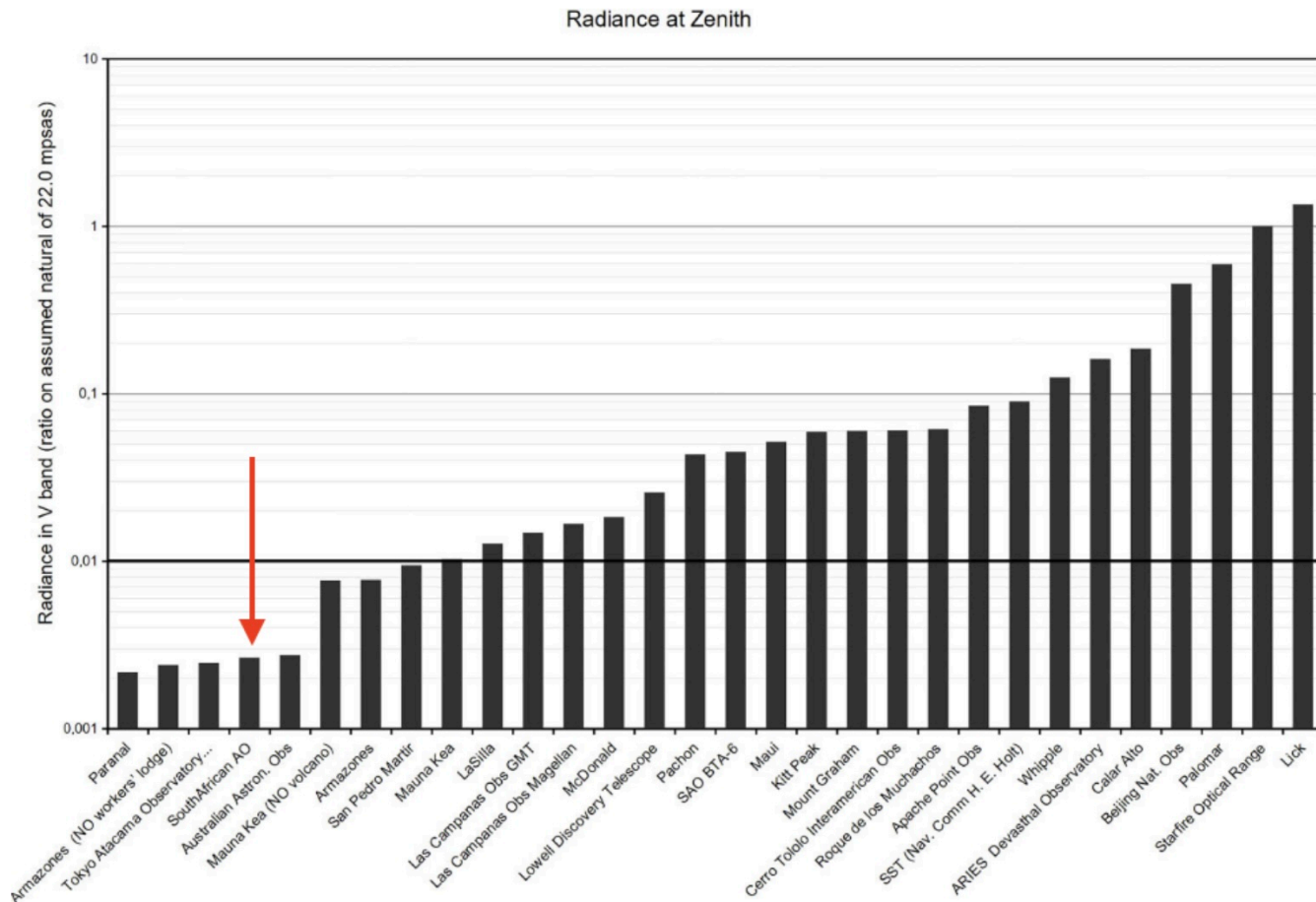


Figure 1. Night sky brightness of all professional observatories in the world. The SALT-site at the SAAO/Sutherland is seen to be among the very darkest together with the VLT and EELT sites in Atacama, and the AAO in Australia. From Falchi et al. (2023), see details therein.



The telescope



WHAT ARE SALT'S SPECIALTIES?

Telescope: Large collecting power.

Site: Skies are very dark (22 mag/arcsec²). Seeing only modest (median 1.4")

Mode: Fixed in Altitude, so fully queue-scheduled. Data pipelined and distributed the following day.

- Diffuse low-surface-brightness spectroscopy.
- Bright objects also observed very efficiently.
- Can change instruments and observing modes during pointing.
- Blocks can be submitted independently at any time -> **Rapid reaction to ToOs.**
- Some rare modes for large telescopes (Polarimetry, mixed modes, high-time resolution)

Other advantages:

- Observations remain in the queue until deemed completed or end of semester.
- Created a SALT API to allow block submissions compatible with LCO system (eg. SAAO IO, LSST)
- **SALT is a *spectroscopic survey telescope*. Most efficient programs are surveys with large pools of targets over the sky or ToO programs**



SALT INSTRUMENTS AND RECENT UPGRADES



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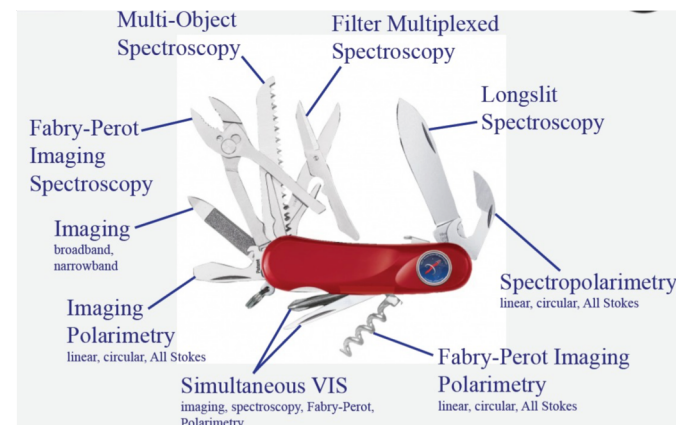
SALTICAM – Acquisition and science

- An imager over 8 arcmin – unfortunately unguided. ☹
- High time-resolution photometry (down to 50 ms).

SALT will be upgrading this instrument in the near future.

RSS: Robert Stobie Spectrograph

- Imaging, long slit and multi-object spectroscopy
- Medium resolution, R to 10,000
- Wide range of resolution and wavelength coverage.
- Imaging polarimetric and spectropolarimetric modes
- High Time resolution ~100 ms spectroscopy

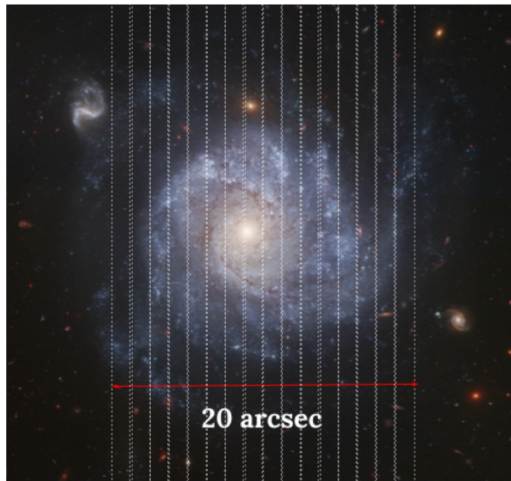


The work-horse instrument on SALT for good weather/dark Moon

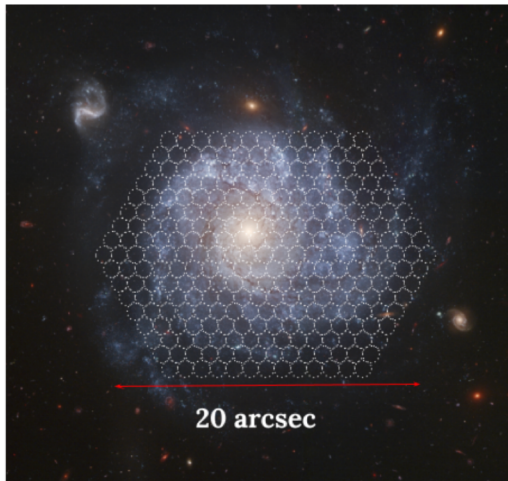


RECENT UPGRADE: RSS SLITMASK IFUs

- Developed in-house, at the new fibre lab at the SAAO
- IFU maps onto a slitmask that fits in the regular RSS slitmask magazine
- Similar on-sky footprint as NIRWALS, our NIR spectrograph
- The first unit (SMI-200) uses 200 micron fibres with **309 0.9-arcsec diameter** fibre cores covering an elongated hexagonal footprint of **18 x 23 arcsec**.
- Engineering commissioning completed, available to PIs next semester (2024-2) on a shared risk basis for observations 1 November 2024-30 April 2025



16 exposures of 1.3 arcsec long slit



Single exposure with SMI-200



Figure 1: Difference in spatial coverage for extended sources for 16 x 1.3 arcsec long slit exposures (left) versus one SMI-200 exposure (right). I.e., the 1.3 arcsec longslit would require 16 exposures to cover the same area of the galaxy covered by SMI-200 in a single exposure.

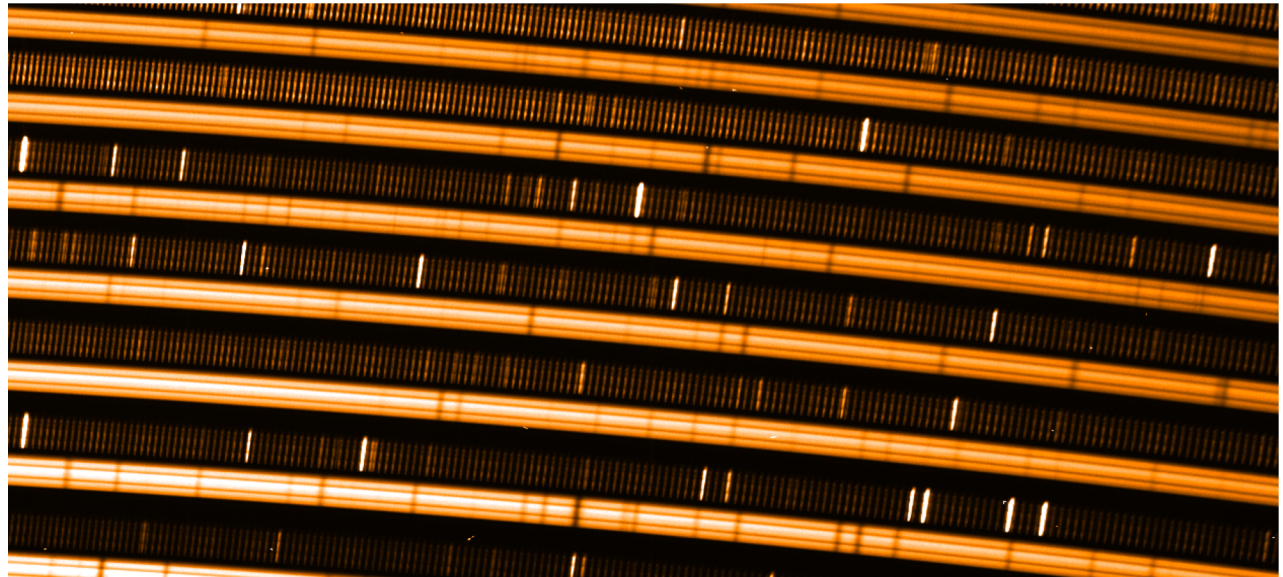
HRS: High Resolution Spectrograph (Echelle)

- Low Resolution (LR) – $R \sim 14000$
- Medium Resolution (MR) – $R \sim 40000$
- High Resolution (HR) – $R \sim 65000$
- High Stability Mode – $R \sim 65000$, but with highest wavelength accuracy, down to ~ 5 m/s using our Iodine Cell or simultaneous ThAr for calibrations [exoplanet science]

RECENT UPGRADE:
LFC coming right up!



First light April 2024
Pipeline in development

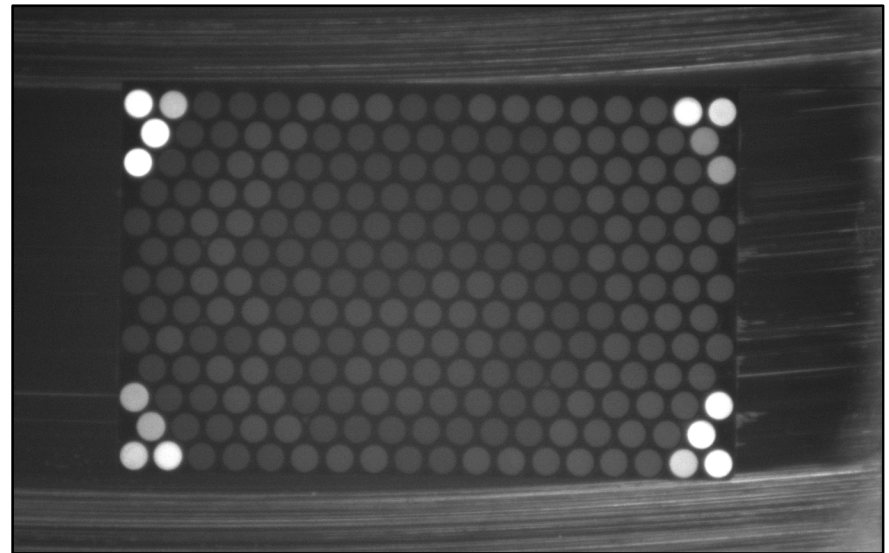


Workhorse instrument for poorer weather/bright Moon

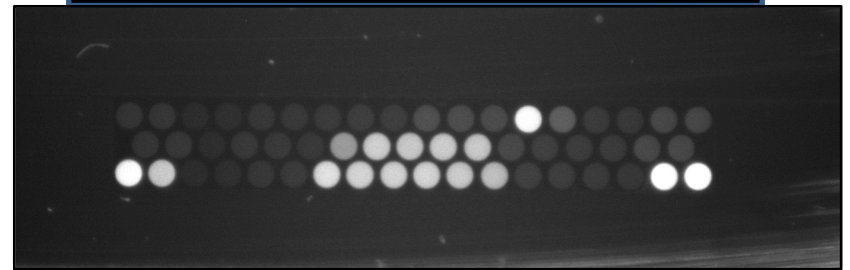


NIRWALS: Near Infrared Spectrograph

- Wavelength Coverage: 800-1700 nm
- Spectral Resolution: 2000 – 5000
- Plate Scale: 4.4 pixels/arcsec
- Fiber Fed
- Resolution Element: 5.8 pixels/fiber
- Science IFU
 - Number of Fibers: 212
 - Field of View: 18 x 29 arcsec
 - Fiber Size: 1.3 arcsec
- Sky Bundle
 - Number of Fibers: 36
 - Field of View: 4 x 29 arcsec
 - Distance from IFU: 49 – 159 arcsec



unused fiber



Currently: shared risk observations

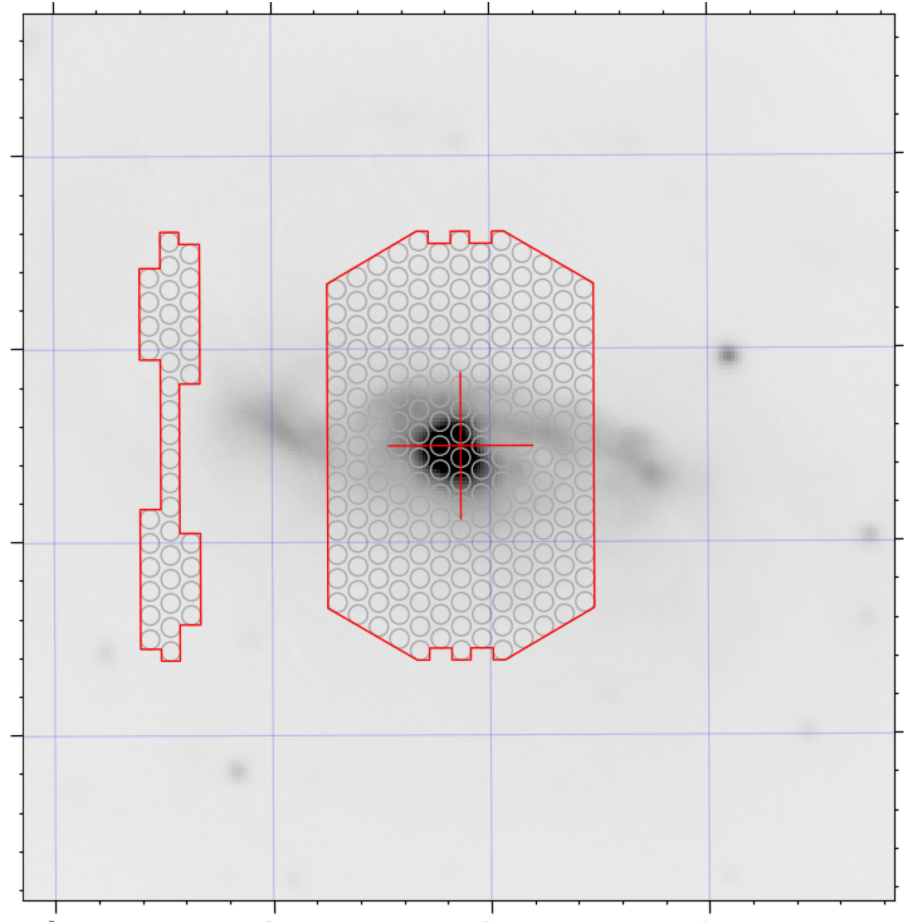
Science observations in Semester 2024-2 (from 1 November 2024)

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SALT AND THE ORP



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SALT and the ORP

- SALT is a closed partnership. It only offers a few hours of “open” time through DDT.
- In 2020, SALT became a member of the OPTICON Alliance/ORP.
- Very little SALT uptake in the first year, increasing significantly over the period to fully taking up the available time over the last couple of semesters.
- We have a public SALT Data Archive (<https://ssda.saao.ac.za>). working on making it VO compatible.

SALT after April 2025

- SALT is looking for a new full partner, ideally at the 10% level.
- They are also willing to consider proposals to buy telescope time.
- It is highly unlikely the SALT Board would agree to award free time. Strategic Board session will happen in early November, will discuss then and confirm.
- We would love to continue to be involved the Alliance



SUMMARY

- SALT is a 10m-class optical telescope, the largest in the Southern Hemisphere, **available** to partner institutions (and collaborators) + **ORP** + African PIs + NOIRLab/LSST
- SALT is an ideal spectroscopic survey telescope. It has large collecting power in dark skies (but modest seeing), able to change instruments 'on the fly', fully queue scheduled with **~rapid response to ToOs and rare instrument modes**. We have extended the wavelength coverage of the telescope to 1700nm and added IFUs
- API for proposal submission from SAAO IO and LSST
- SALT Data archive available
- Would like to stay involved with the Alliance, but unlikely to be able to offer time "for free". ☹️
- Interested in joining SALT or buying telescope time? Please get in touch with me: erc@salt.ac.za

Thank you!

