

The Advanced Instrumentation Technology Centre (AITC)

David Brodrick
Research School of Astronomy and Astrophysics
2021-05-28



Australian
National
University

AITC @ Mount Stromlo Observatory



- Within the ANU Research School of Astronomy and Astrophysics.
- ~40 AITC staff - professionals and academics. ~140 total staff in RSAA.
- Largely self-funding through instrumentation contracts for global clients.
- Long experience in astronomical instrumentation (visible and IR).
- Growing involvement in space applications.

Adaptive Optics

The incoming wavefront from a point source reference (guid star) and the nearby object of interest has been distorted by the atmosphere

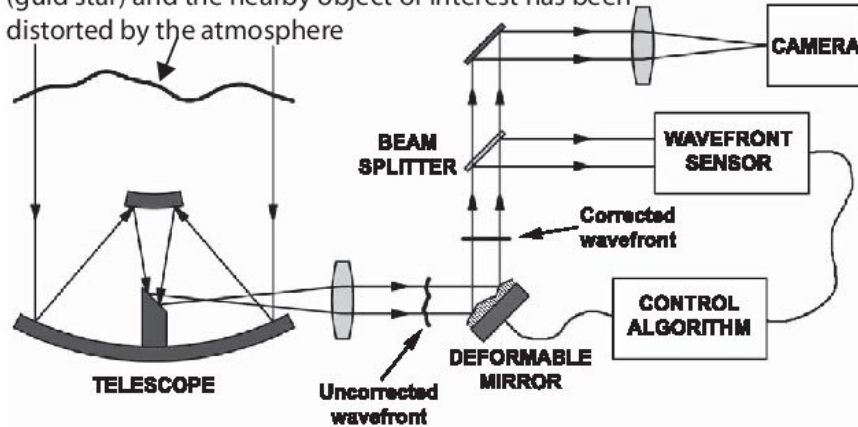


Image: Tani, Mishra, Wen (2013).

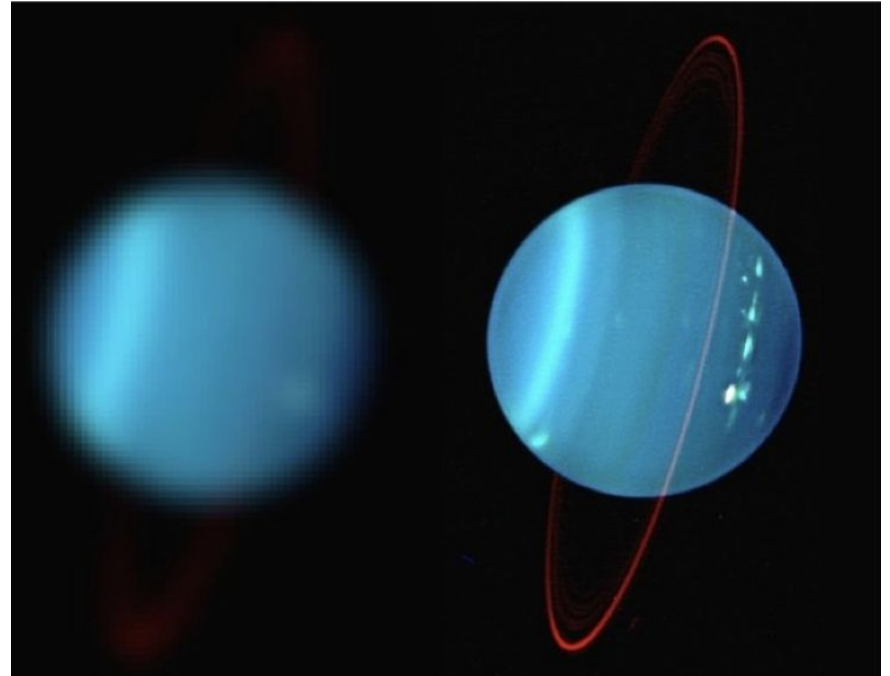


Image: Uranus without, and with AO (Keck II).

Sodium Laser Guide Stars (Celine D'Orgeville)

- Natural guide stars are not always available where you want them.
- 589nm lasers excite sodium in the upper atmosphere.
- LGS provide high order distortion information but still need tip-tilt.
- World leading expertise at AITC.
- Involvement in projects to develop next generation guidestar lasers.

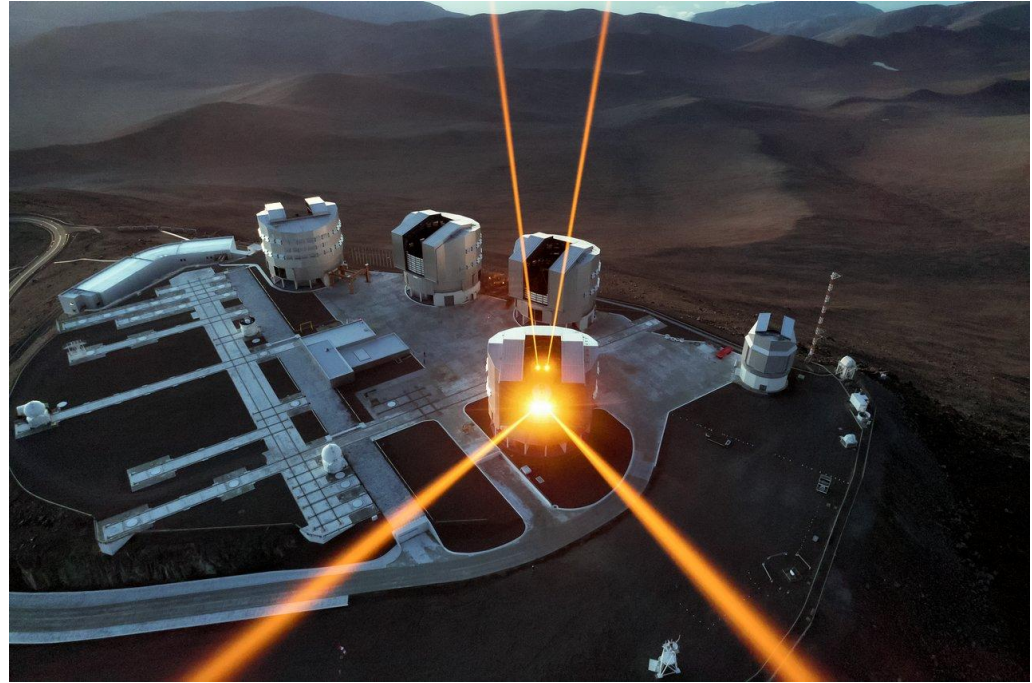


Image: 4LGSF on VLT UT4 (ESO).

GMTIFS for the Giant Magellan Telescope (PI: Rob Sharp)

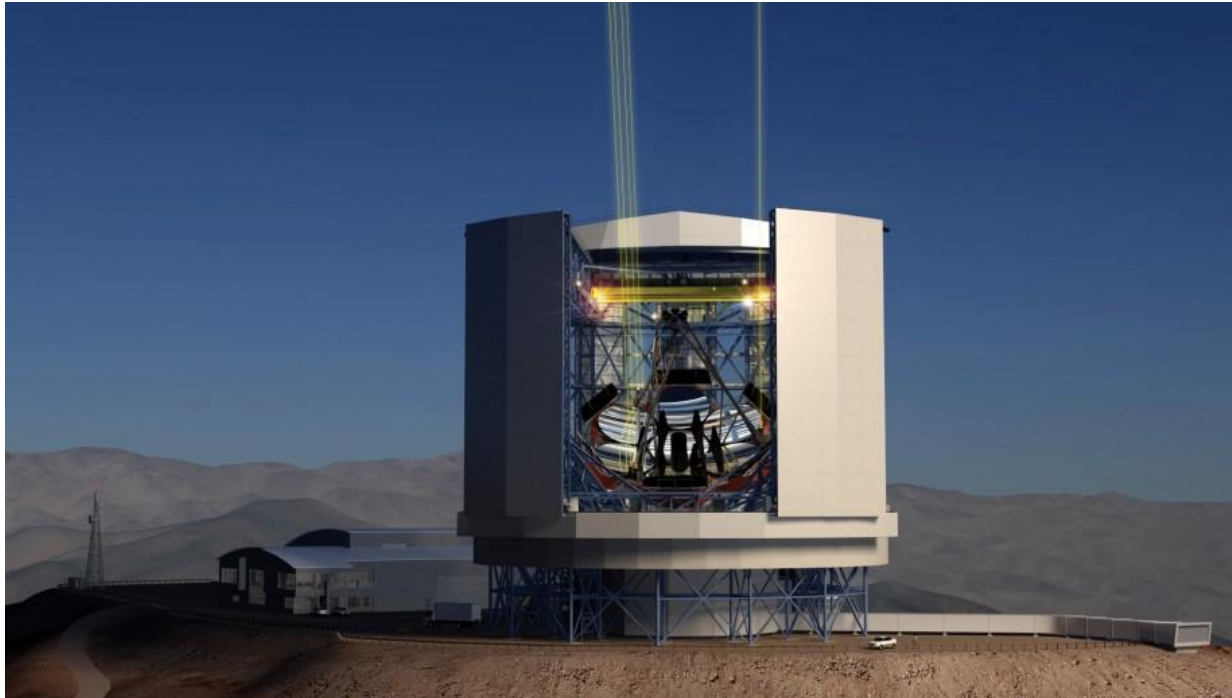
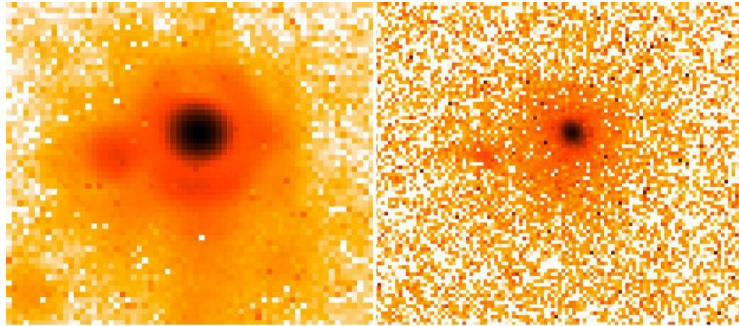
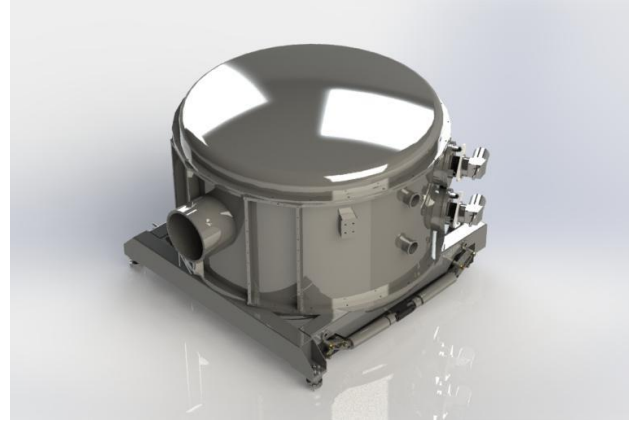


Image: Giant Magellan Telescope Organization

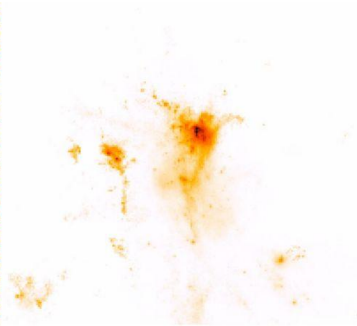
GMTIFS

- Imager and Integral Field Spectrograph for the GMT.
- Wavelength range 0.9 - 2.5 microns.
- 20.4x20.4" field of view.
- 4mas pixels.

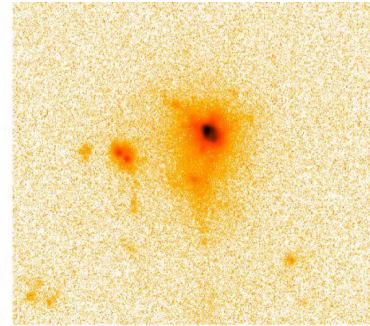


JWST

GSAOI



Simulation



GMTIFS

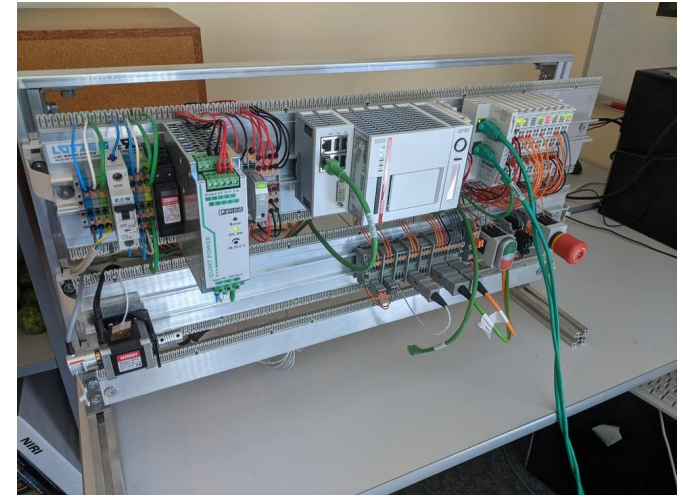
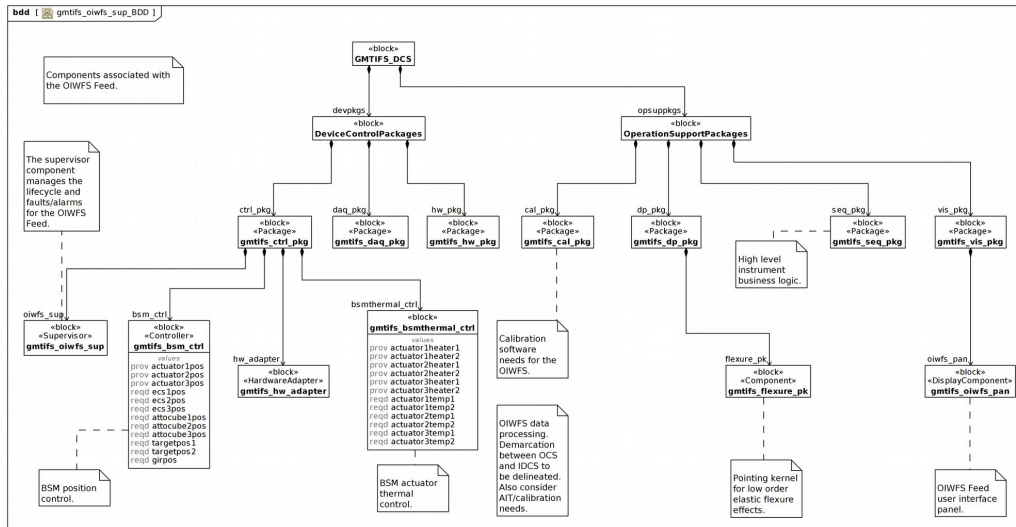
30 hours on
source - $z \sim 8$
galaxy
simulation.

GMTIFS Controls



Australian
National
University

- Uses GMTO Software and Controls System (SWCS) SDK (Filgueira et al.).
- Prototypes and conceptual design completed in 2020/21.



MAVIS

Sharper than JWST, Deeper than HST

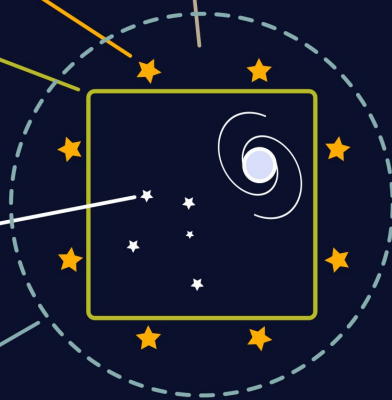
8 Laser Guide Stars

30"×30" Field of View

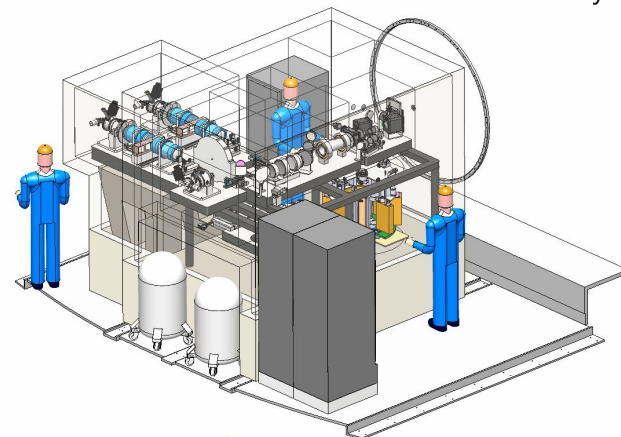
**Resolution 3×
sharper than HST
(18mas @ V band)**

**4k×4k imager and
4k-15k λ resolution IFU**

VLT 8-m \varnothing
Adaptive
Optics Facility
optical feed



Australian
National
University

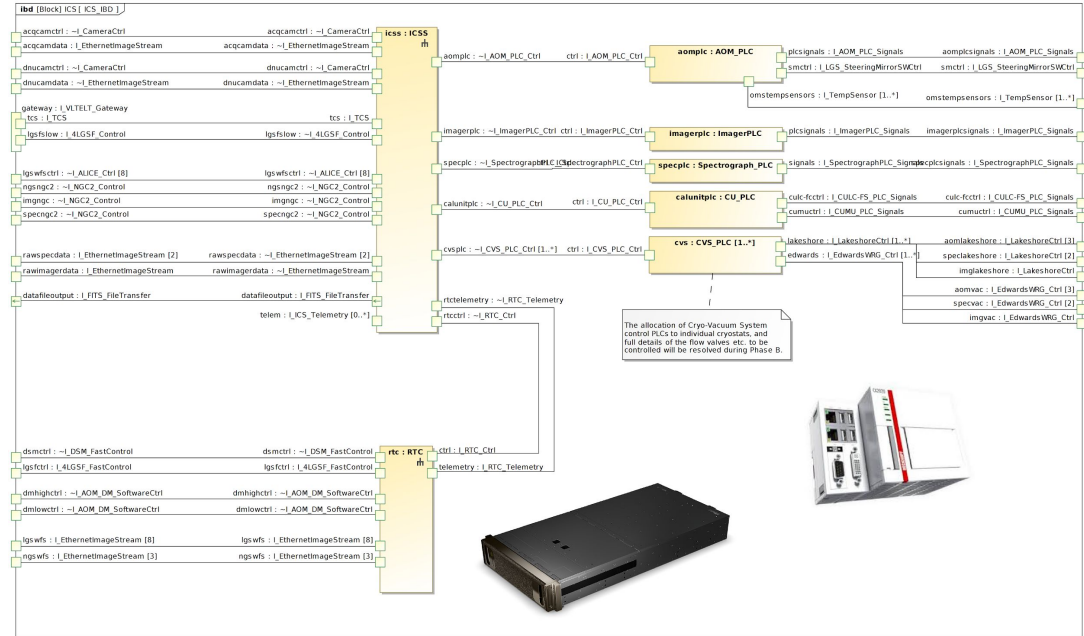


MAVIS

Project PI: François Rigaut

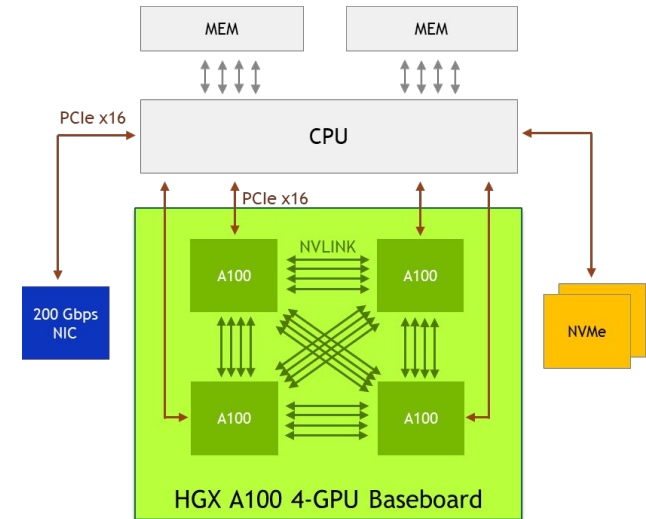
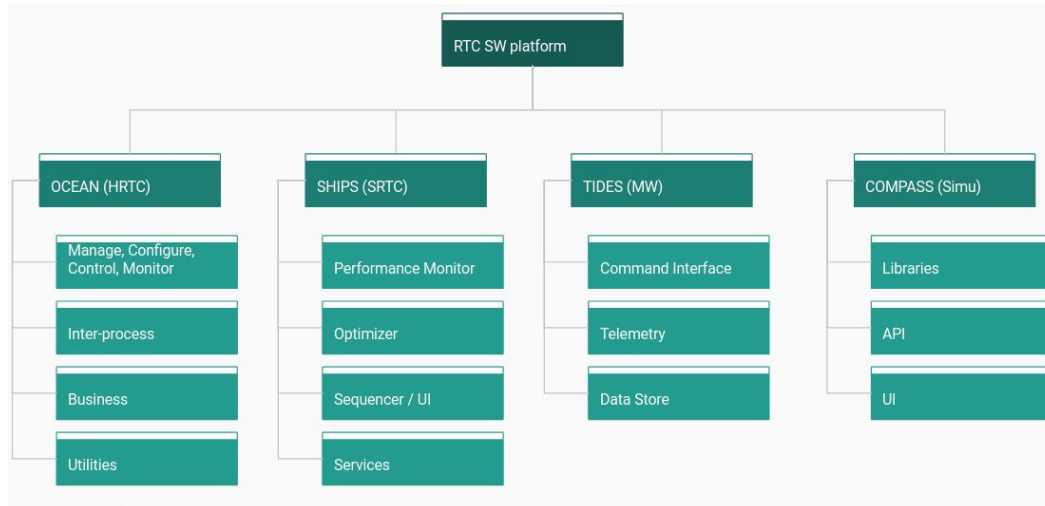
MAVIS Controls

- MAVIS controls are being developed using the new E-ELT controls framework developed by ESO.
- Controls effort led by our partners at INAF Padova in Italy.



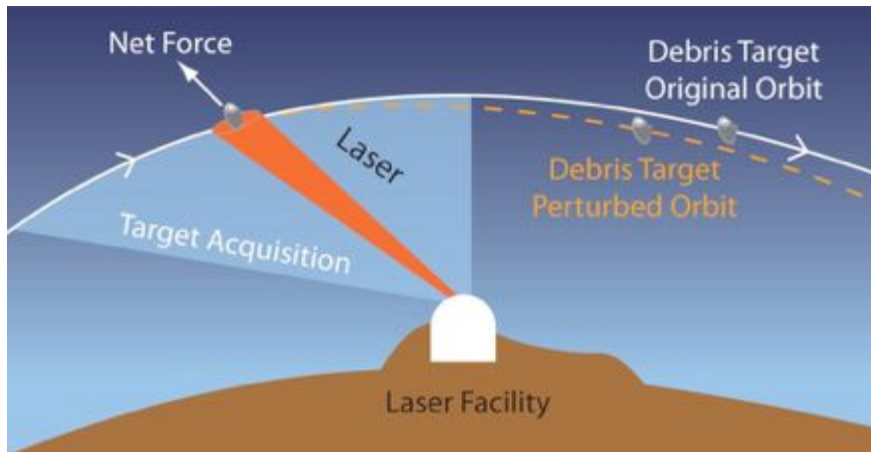
COSMIC - AO Control (Damien Gratadour)

- Next generation *Real Time Controller* for AO.
- Will be used for MAVIS.
- Recently commissioned for Keck.



Space Environment Research Centre

- Applying AO to the near-Earth space environment.
- Including project to use photon pressure to modify space debris orbits to prevent collisions.



Siding Spring Observatory



3.9m AAT

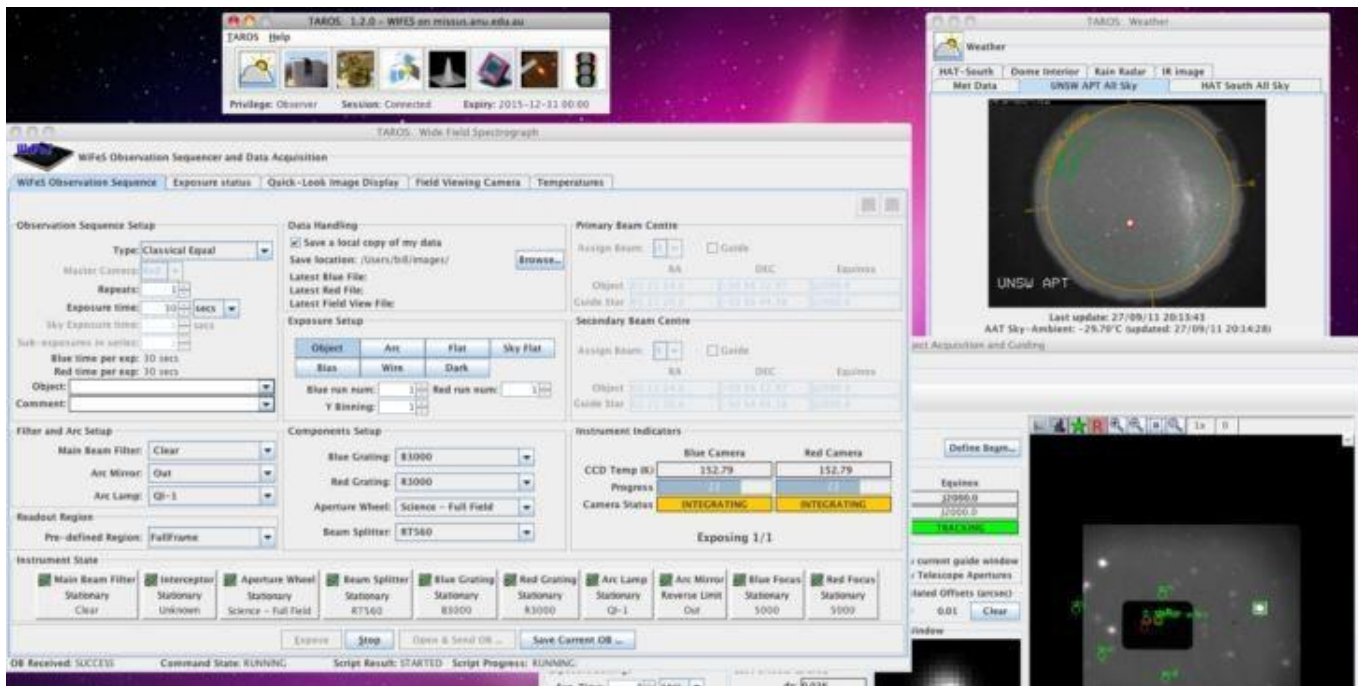


2.3m ANU

TAROS - for ANU 2.3m



Australian
National
University



DRAMA - for AAT



Australian
National
University

D R A M A



DRAMA - An Environment for Instrumentation Software

The DRAMA system is designed to meet the [AAO's](#) requirements for a fast, distributed environment for writing Instrumentation Control Systems.

DRAMA allows low level instrumentation software to be controlled from user interfaces running on UNIX, MS Windows or VMS machines in a consistent manner. Such instrumentation tasks can run either on these machines or on real time systems such as VxWorks.

DRAMA uses techniques developed by the AAO while using the Starlink-ADAM environment, but is optimized for the requirements of instrumentation control, portability, embedded systems and speed. A special program is provided which allows seamless communication between ADAM and DRAMA tasks.

We believe DRAMA will port easily to any version of Unix and the layering is such that most operating systems with a C compiler can be supported.

DRAMA has actively maintained ports to Solaris, Linux, Mac OS X and VxWorks. VMS and WIN32 versions are also supported through at a lower level of effort.

At the AAO, graphical user interfaces to DRAMA systems are normally written in [Tcl/Tk](#) and [Java](#). Many other possibilities exist, including Motif, MS Windows and Perl Tk.

Scripting can be done in command line scripts, [Tcl/Tk](#) and Perl (Perl support is not part of the standard release but is available if requested).

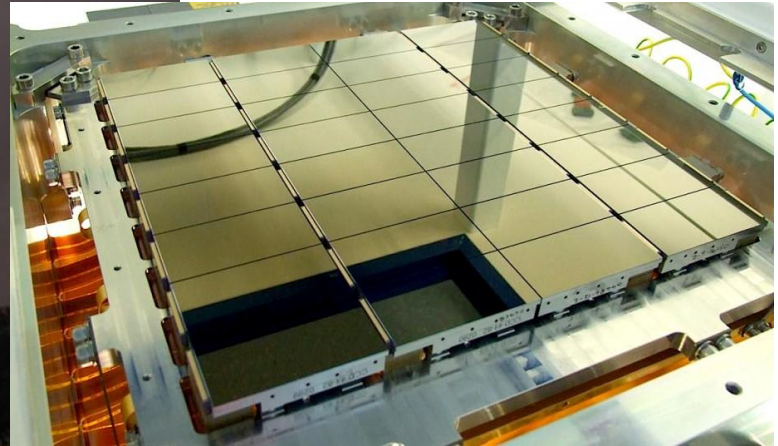
DRAMA is used by the AAO on its instrumentation projects, such as [AAOmega](#), [HERMES](#), [IRIS2](#).

DRAMA is also being used by the Isaac Newton Group of Telescopes and by the Joint Astronomy Center Hawaii. (JACH has been a significant contributor to the development of DRAMA).

The DRAMA copyright is held by the Australian Astronomical Observatory and DRAMA is generally available for non-profitable uses. Commercial use requires approval from the AAO.

Image: <http://drama.aao.org.au/>

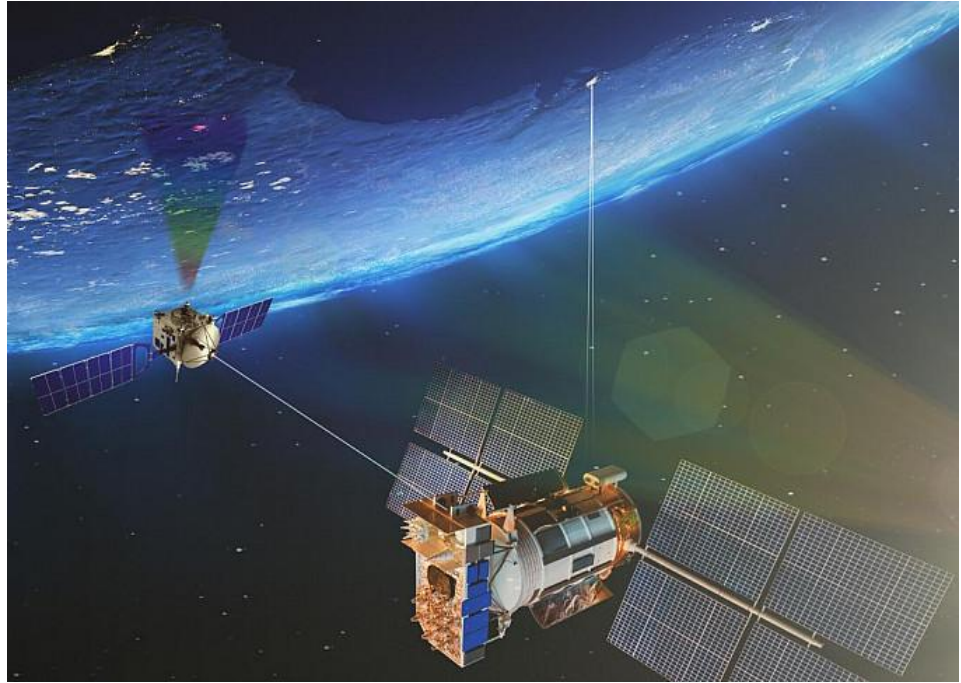
SkyMapper (B. Schmidt, C. Wolf, et al.)



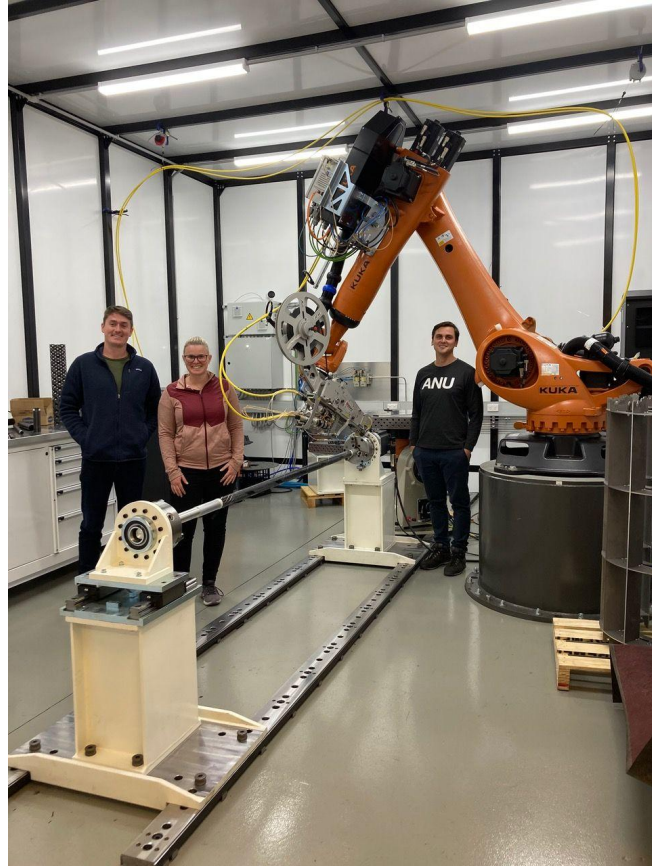
- AITC now developing DREAMS (wide FoV IR) (Anna Moore, Tony Travouillon)

Satellite Laser Communication (Francis Bennet)

- Secure communications using quantum key cryptography.
- ANU leading the field.
- New ground station under construction at Stromlo.



ANU CECS Advanced Composite Material Manufacturing



National Space Test Facility (Eduardo Trifoni)

