

Gemini Observatory Update

Subaru Users' Meeting, 2023

Atsuko Nitta / Andy Adamson

Gemini Observatory/NSF's NOIRLab

1. Statistics
2. Gemini North M1 accident
3. Instrumentation news
4. Sustainability projects
5. Science highlights

Statistics

Proposal Routes

Spring (A) & Fall (B) Semester: Regular programs (NTAC, ITAC)

- BI-ANNUAL; queue, classical, ToO, priority visitor, eavesdropping

Large & Long Programs: Large allocation and/or multi semester (LLP TAC)

- ANNUAL; queue, ToO, and priority visitor, eavesdropping

Fast-Turnaround: Immediate, short and/or follow up (Peer review)

- MONTHLY; queue, ToO

Director's Discretionary: Special opportunities (Chief Scientist)

- Open call (worldwide); queue, ToO

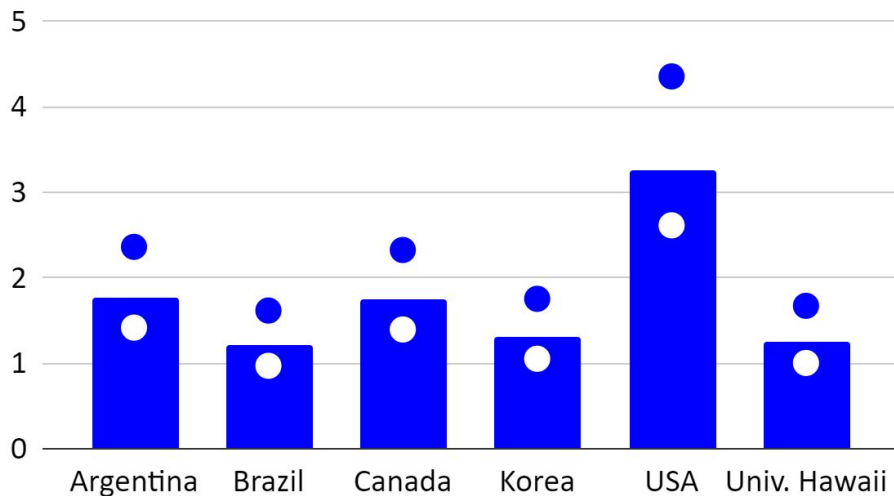
Poor Weather Programs: Bright targets and guide stars (Head of SciOps)

- Open call (Gemini community); queue

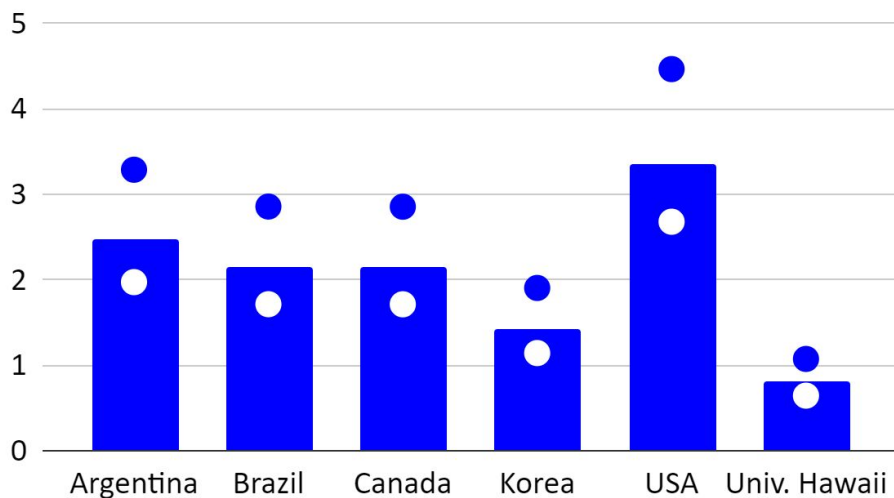
Note - we enable DARP, by Partner choice

Queue and Large/Long Demand

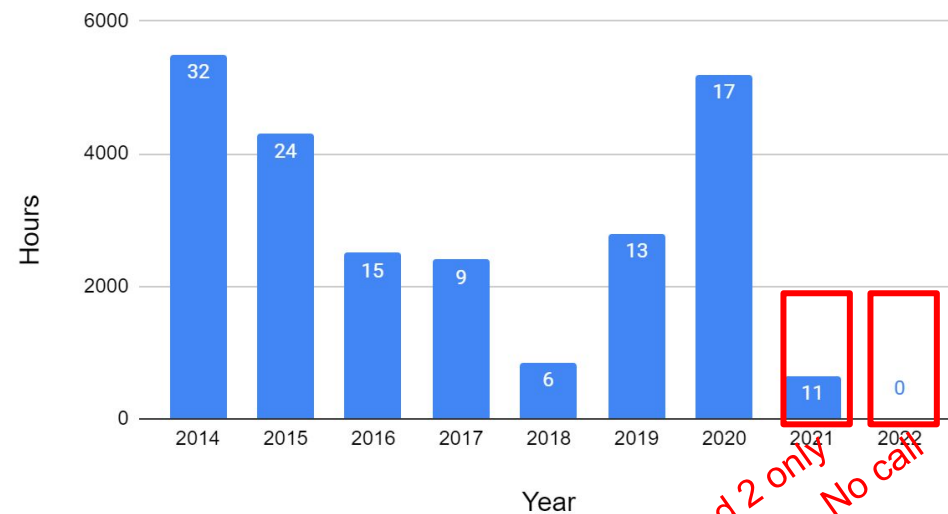
Gemini North 2022A Oversubscription



Gemini North 2022B Oversubscription



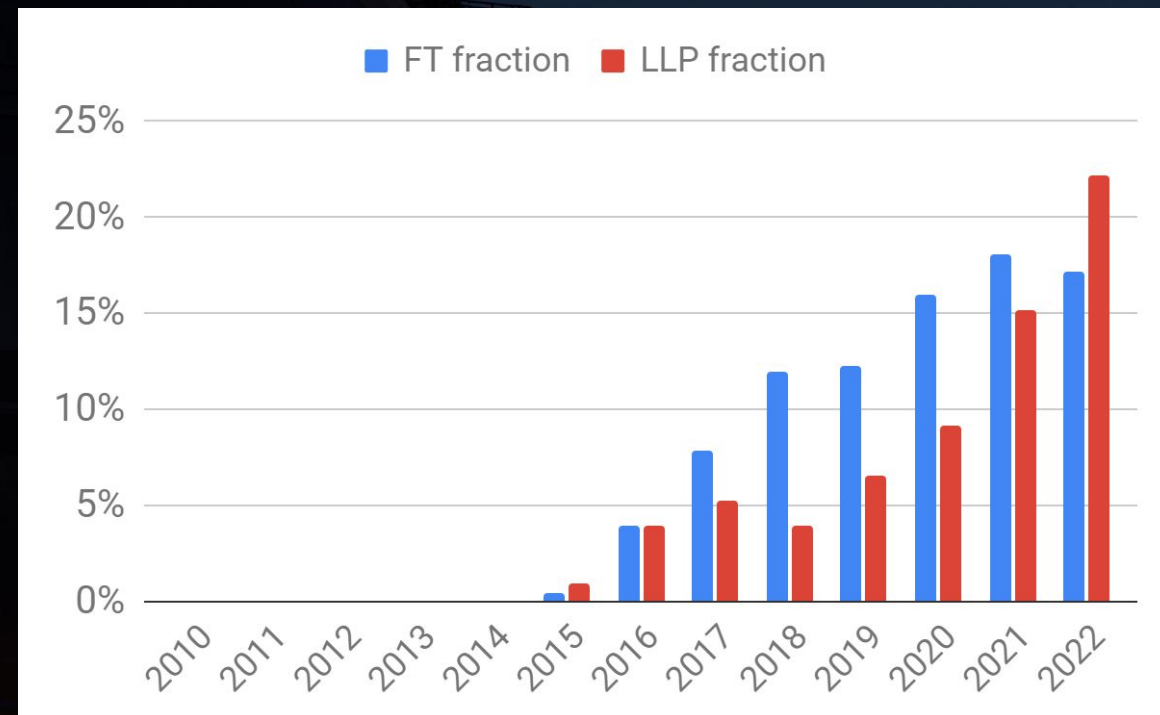
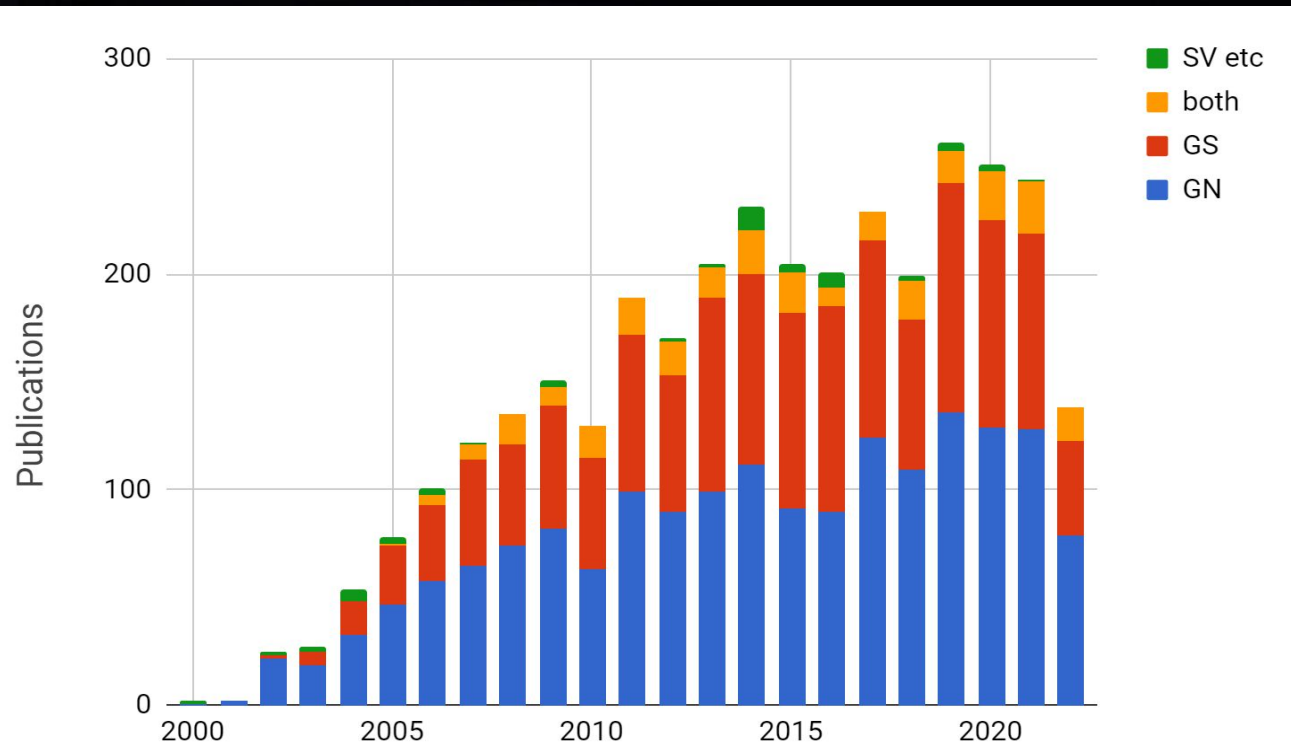
Large/Long Proposals



Exchange Publications

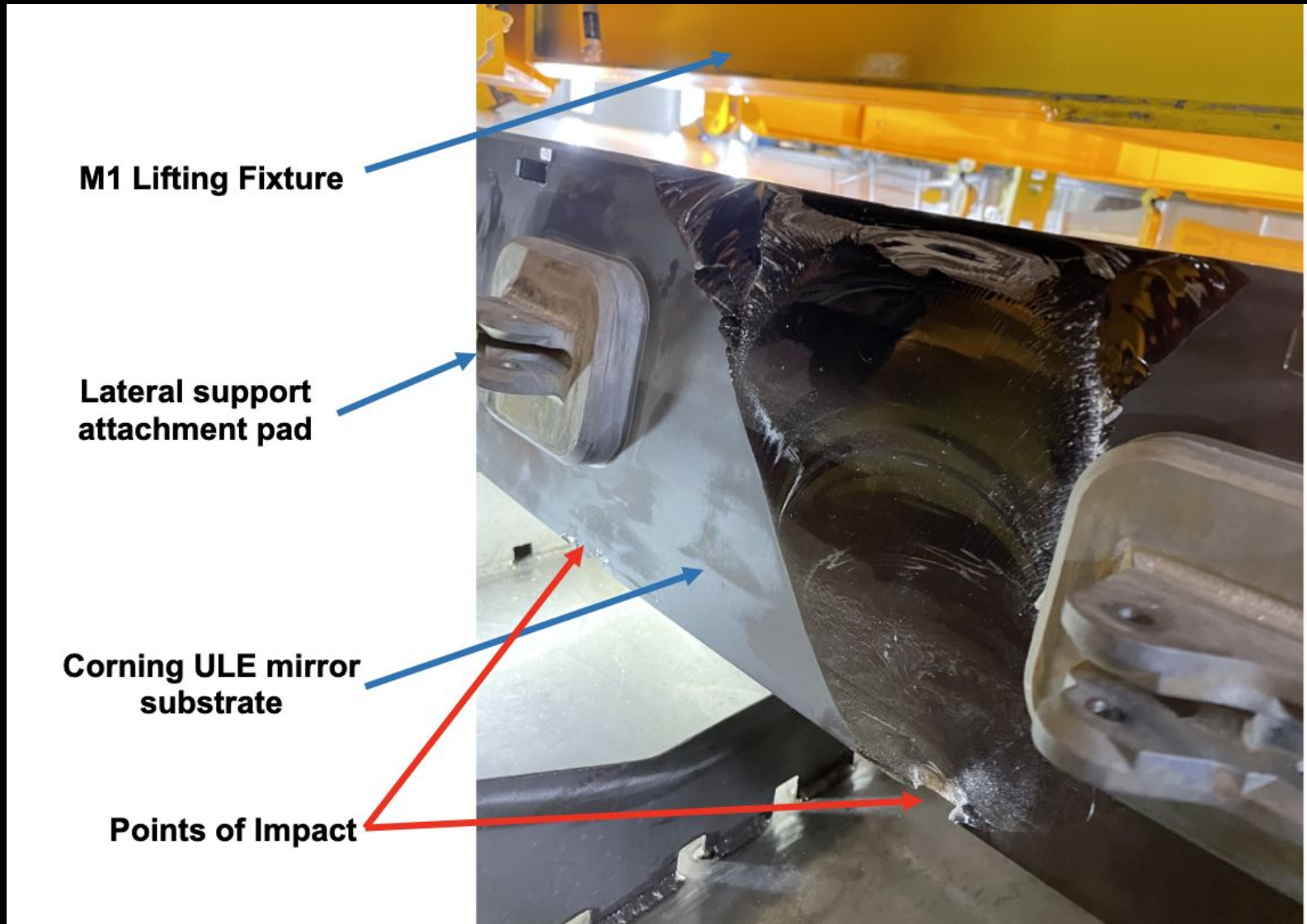
Subaru exchange time on Gemini produced 9 papers in 2022.

Queue:2 Large/long:2
Classical:1 FT+DD:4



Gemini North M1

Damage to GN M1



On 20 October 2022, while moving the primary mirror in preparation for stripping, the mirror contacted an earthquake restraint on the facility's wash cart, chipping the edge at two points. No-one was injured.

Multiple contributing factors culminated in human error via a radio communication mishap.

Lessons are being learned and a report will be issued once the repair is complete.

Recovery Plan

- We have completed the incident review and the damage assessment.
- We have convened an Independent Review Board (chair: Jim Oschmann) to review these reports, the updated mirror handling procedures, and path for repairs.
- Safran-Reosc (France) will carry out the glass repair; initial work is under way at their facility.
- We have almost completed the on-site preparatory work needed to start repairs.



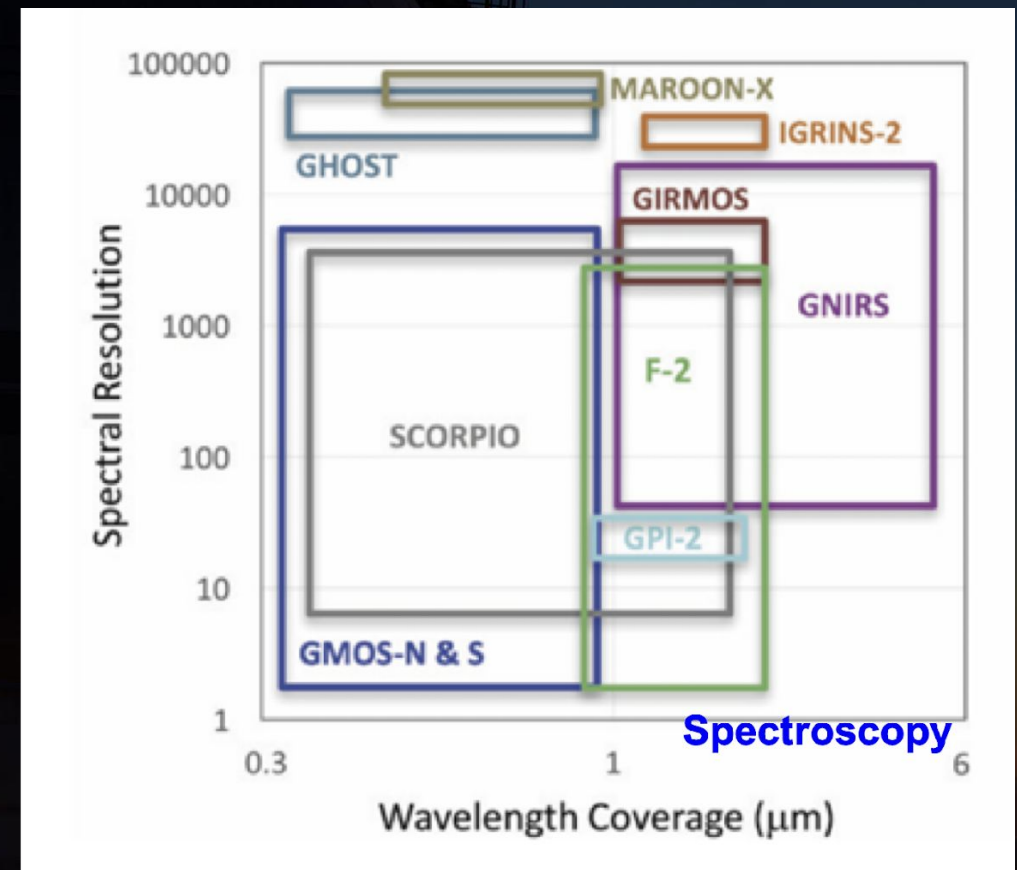
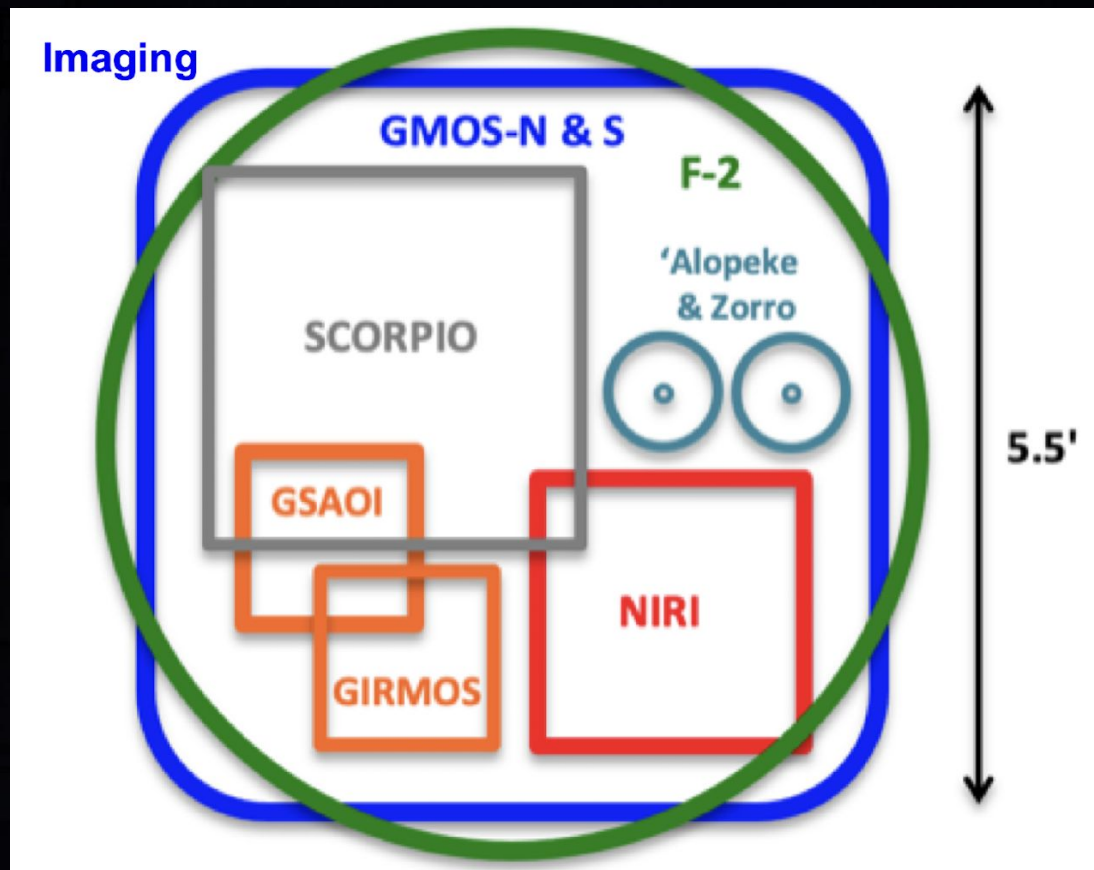
Affected Programs

Our current schedule has our return to science operations at Gemini-N in **late March/early April**.

- Band 1 programs from 22B and 23A will persist consistent with policies adopted during COVID shutdown and prior unanticipated closures.
- Transfers of observations to Gemini-S have been supported where needed and possible.
- We will time the Gemini-S coating shutdown to ensure that at least one Gemini telescope is on-sky (e.g. for the next LIGO run).

Instrumentation

Current and Future Gemini Instruments



2023: GHOST, GNIRS IFU
 2024: IGRINS2, SCORPIO, GPI-2
 2028: GNAO + GIRMOS

GHOST: Gemini High-resolution Optical SpecTrograph

**High-resolution optical spectrograph
to study chemical composition of
stars, distant quasars, and exoplanet
systems.**

$\lambda = 0.36 - 0.95 \mu\text{m}$

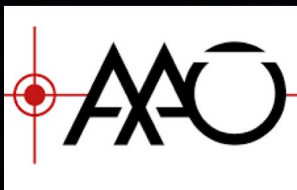
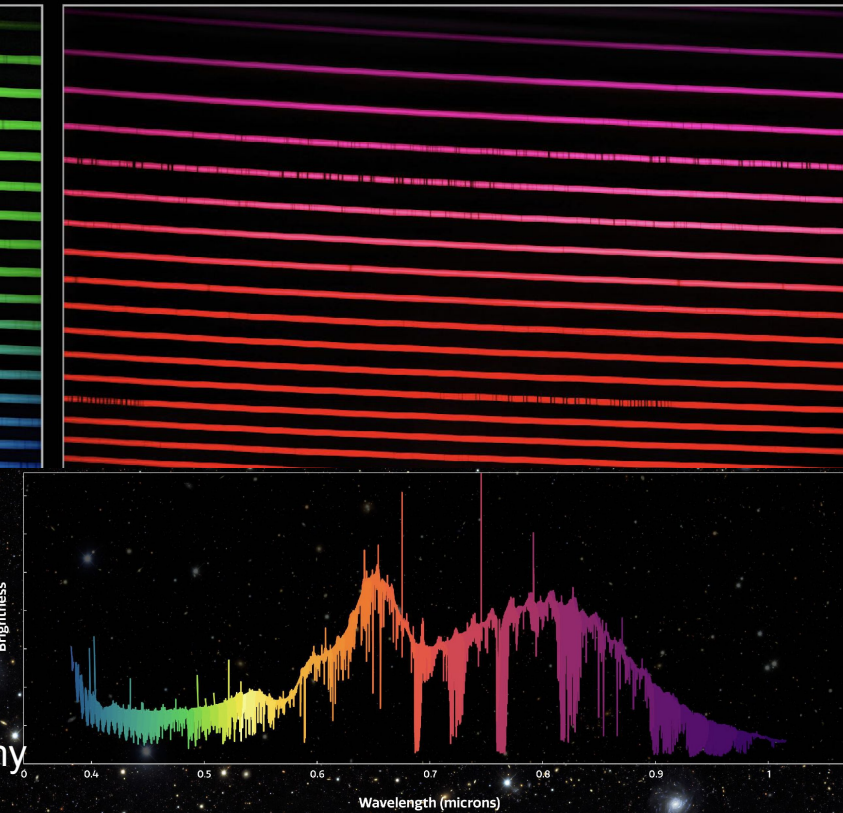
$R > 50,000$ (standard, 2 targets)

$> 75,000$ (high-res, 1 target)

installed at Gemini-South
additional commissioning Jan 2023

**Feb 2023 decision point for
23B Call for Proposals,
shared-risk fast-turnaround**

McConnachie et al 2022, Nature Astronomy



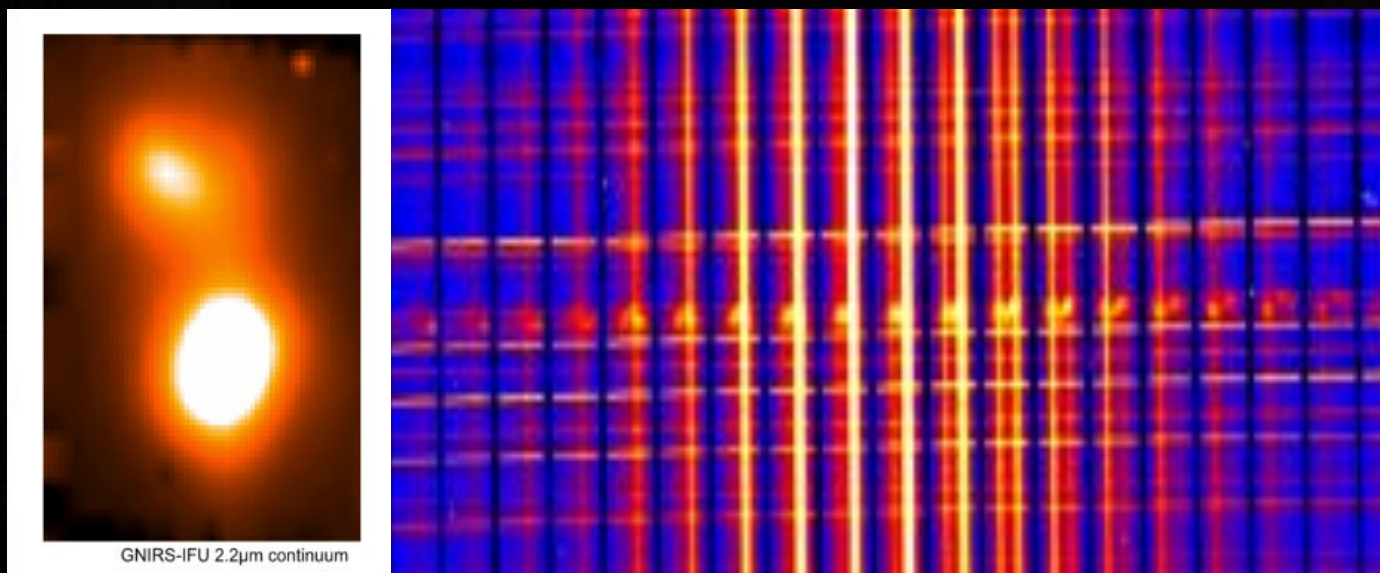
GNIRS's new IFUs

Instrument/mode	NIFS	GNIRS LR IFU	GNIR HR/AO IFU
Spatial Sampling	0.103" x 0.043"	0.15" x 0.15"	0.05" x 0.05"
Field of View	3" x 3"	3.2" x 4.8"	1.25" x 1.8"
Number of Spatial Elements (Slices x detector pixels)	2000	672 (21x32)	900 (25x36)
Resolving Power	< 4,500	< 7,200	< 19,000
Spectral Range (μm)	0.94-2.4	1.0-5.0	1.0-5.0

GNIRS upgrade with 2 integral field units for galaxy evolution, star-formation

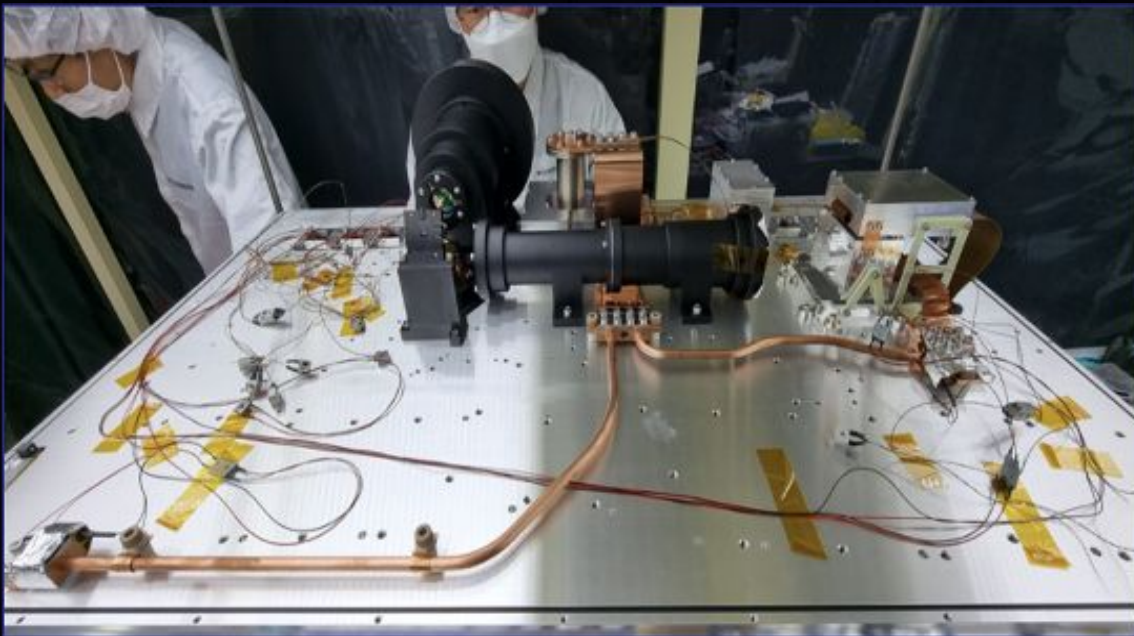
Built by Durham University, installed on Gemini-North in 2022

Commissioning will continue after Gemini-North is back on-sky.



LR-IFU: H2 1-0S(1) emission @ 2.12 μm

IGRINS-2



IGRINS-2 bench with fully assembled Input Optics and the Slit Viewing Camera.

High resolution infrared spectrograph for interstellar medium, young stellar objects, exoplanets, and Galactic evolution studies.

R=45K, simultaneous coverage of H+K coverage

Built and funded by KASI, based on IGRINS visiting instrument.

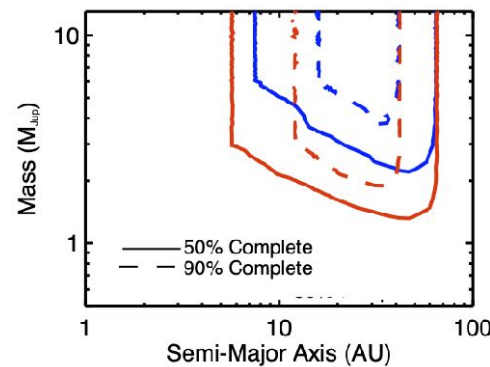
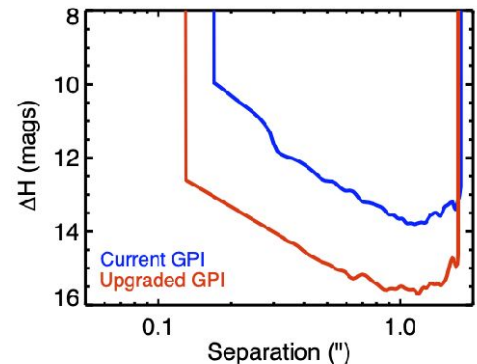
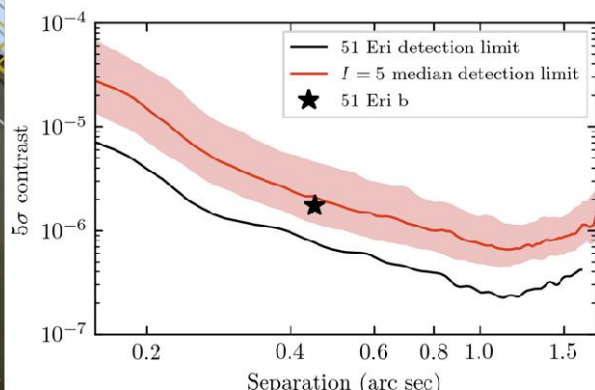
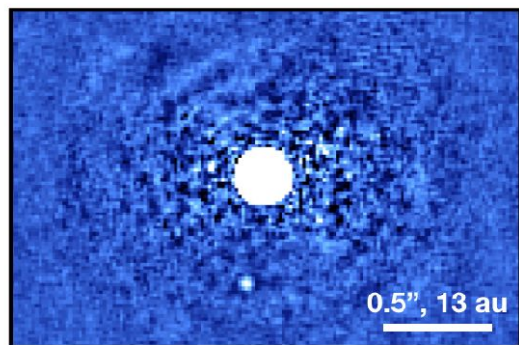
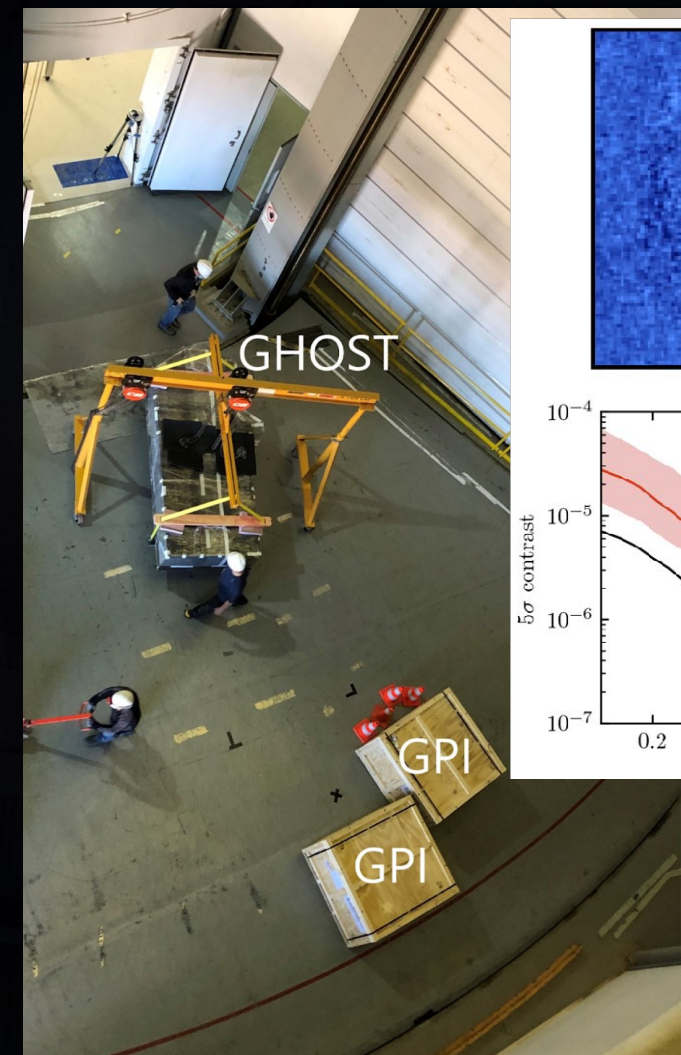
Delivery to Gemini-North expected in 2023, followed by commissioning.

Gemini Planet Imager 2.0 (GPI-2)

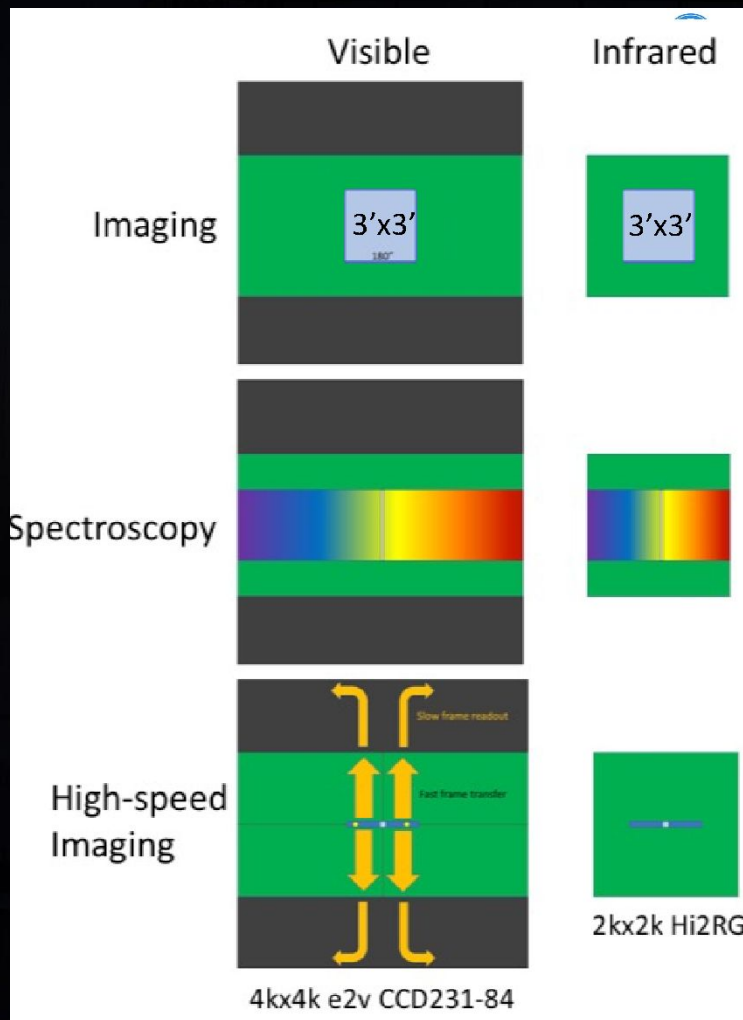
The Gemini Planet Imager is an **extreme adaptive-optics imaging polarimeter/integral-field spectrometer**, to study **exo-planets, brown dwarfs and dust around stars**.

GPI is being upgraded by Notre Dame, UC San Diego and HAA to improve contrast ratio and sensitivity; funded by NSF, Heising-Simons, NRC

GPI-2.0 to ship to Gemini-North in late 2024.



SCORPIO



Work-horse capability for time-domain science

Simultaneous 8-band optical/near-infrared imager and spectrograph built by SwRI, FRACTAL, JHU, STScI.

$\lambda = 0.38 - 2.3\mu\text{m}$ grizYJHK 3'x3' imaging or R~4000, 3' long slit

Rapid target acquisition and readout

Currently in the integration phase at FRACTAL

On track for commissioning at Gemini-South in mid-2024

Sustainability

NOIRLab Projects

NOIRLab/Gemini Sustainability Projects - Summary

In 5yr plan and funded:

- High efficiency transformers
- LED lights
- Window replacements
- Data centers hot/cold zones
- Photovoltaic systems: 1.8MW Total
- **CO₂ Neutral Gemini S.**

Future Priorities:

- Battery storage for 810 kW PV system
- More efficient transformers, windows, HVAC at all sites
- EV chargers - all sites
- Larger PV system to fully power Rubin summit operations

Will Reduce our CO₂ Footprint by 50% Relative to 2019 Levels

Towards zero CO₂ emission at GS



Gemini North:
100 kW system
Production ~650 kWh/day
~12% of usage.
Online September 2015

This image shows the Gemini North telescope dome, a large white structure with a silver-colored upper section, situated on a mountain peak. Below the dome is a large, rectangular solar panel array mounted on a building. Several vehicles are parked in a dirt lot in front of the solar panels. The background shows a clear blue sky and distant mountain ranges.



Gemini South:
207 kW system
Production ~1000 kWh/day
~ 20% of usage.
Online July 16, 2016

This image shows the Gemini South telescope dome, a large white structure with a silver-colored upper section, situated on a mountain peak. Below the dome is a large, rectangular solar panel array mounted on a building. Several vehicles are parked in a dirt lot in front of the solar panels. The background shows a clear blue sky and distant mountain ranges.

Funded: 810 kW PV System – Study and implementation plan under review

Science Highlights

Comet/Centaur 29P/Schwassmann-Wachmann

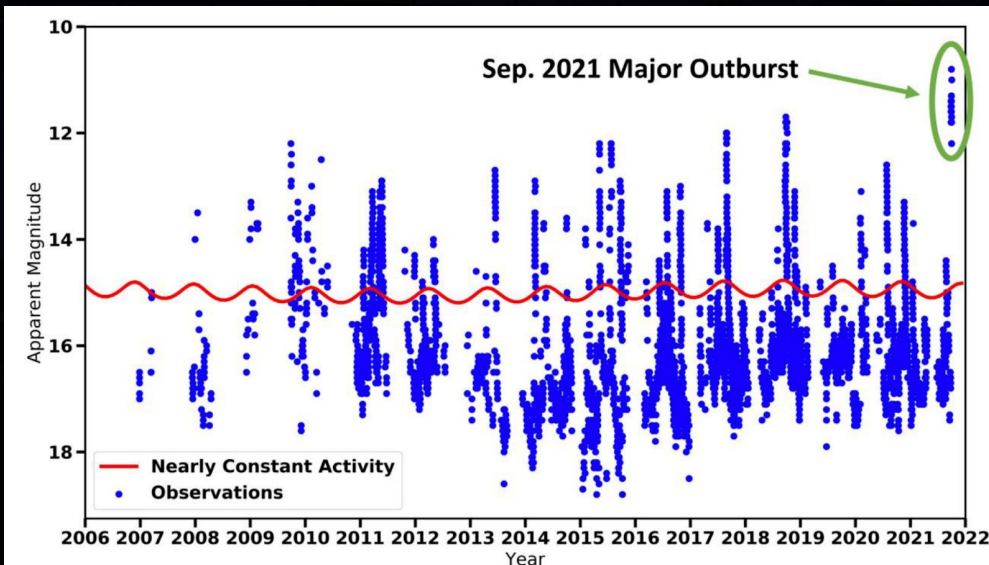
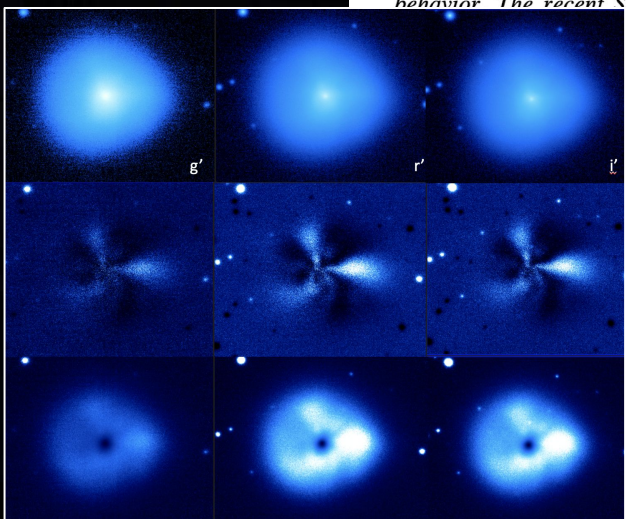


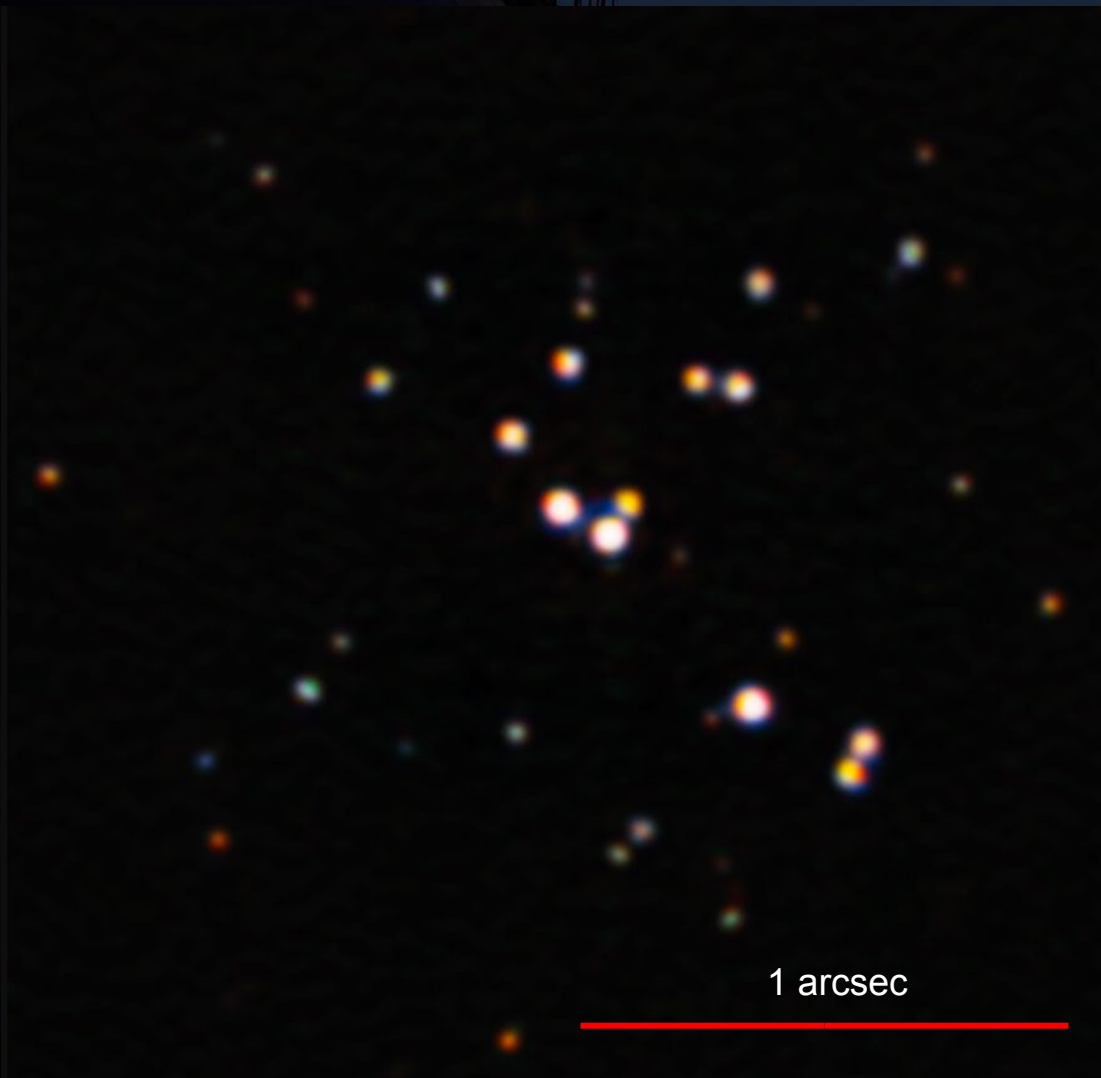
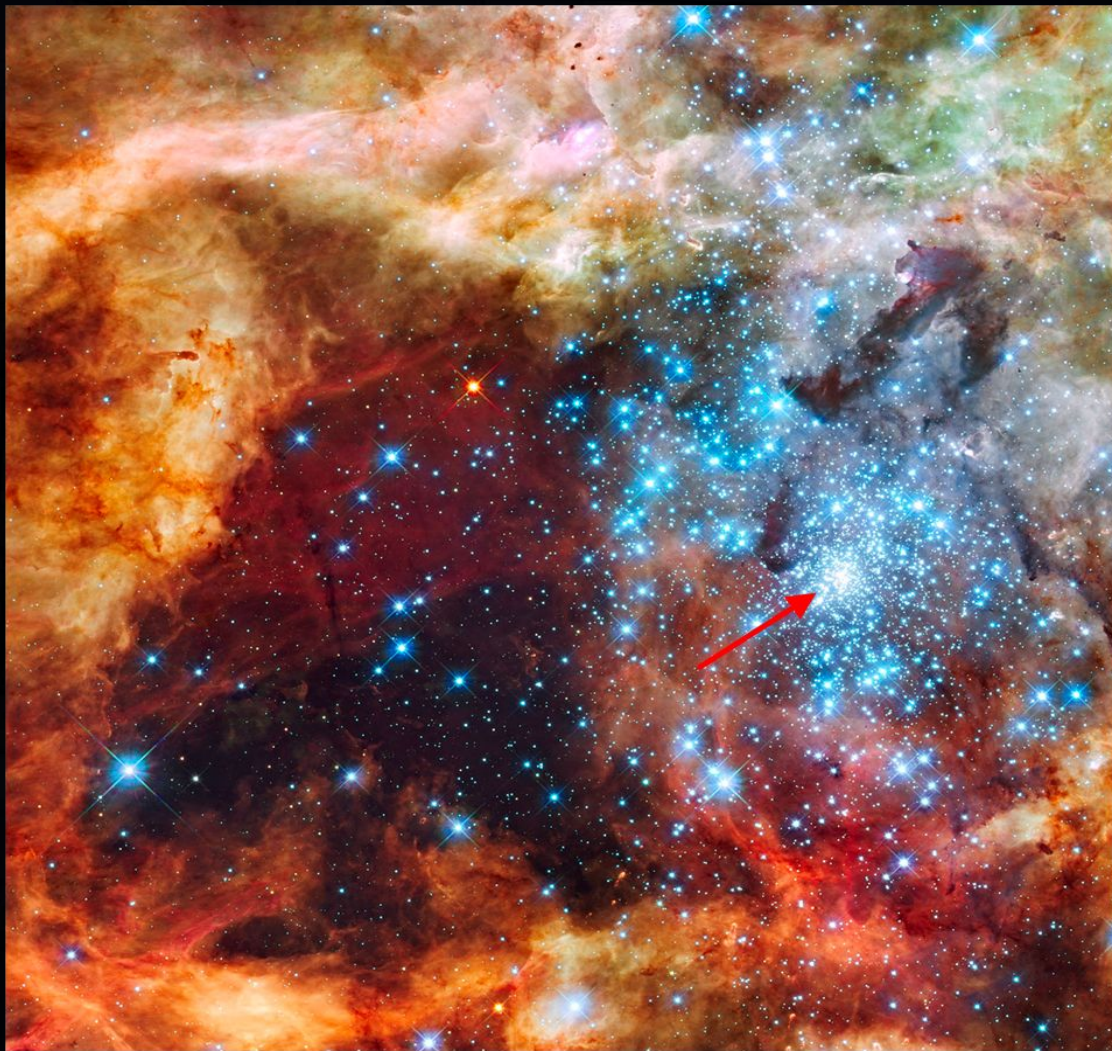
Figure 1. Reported IAU Minor Planet Center (MPC) magnitudes highlighting 29P's activity behavior. The recent Sep. 2021 outburst is the largest such event in nearly 40 years and is the first detection of the dust material ejected during such an energetic event.

29P's largest outburst in 40 years

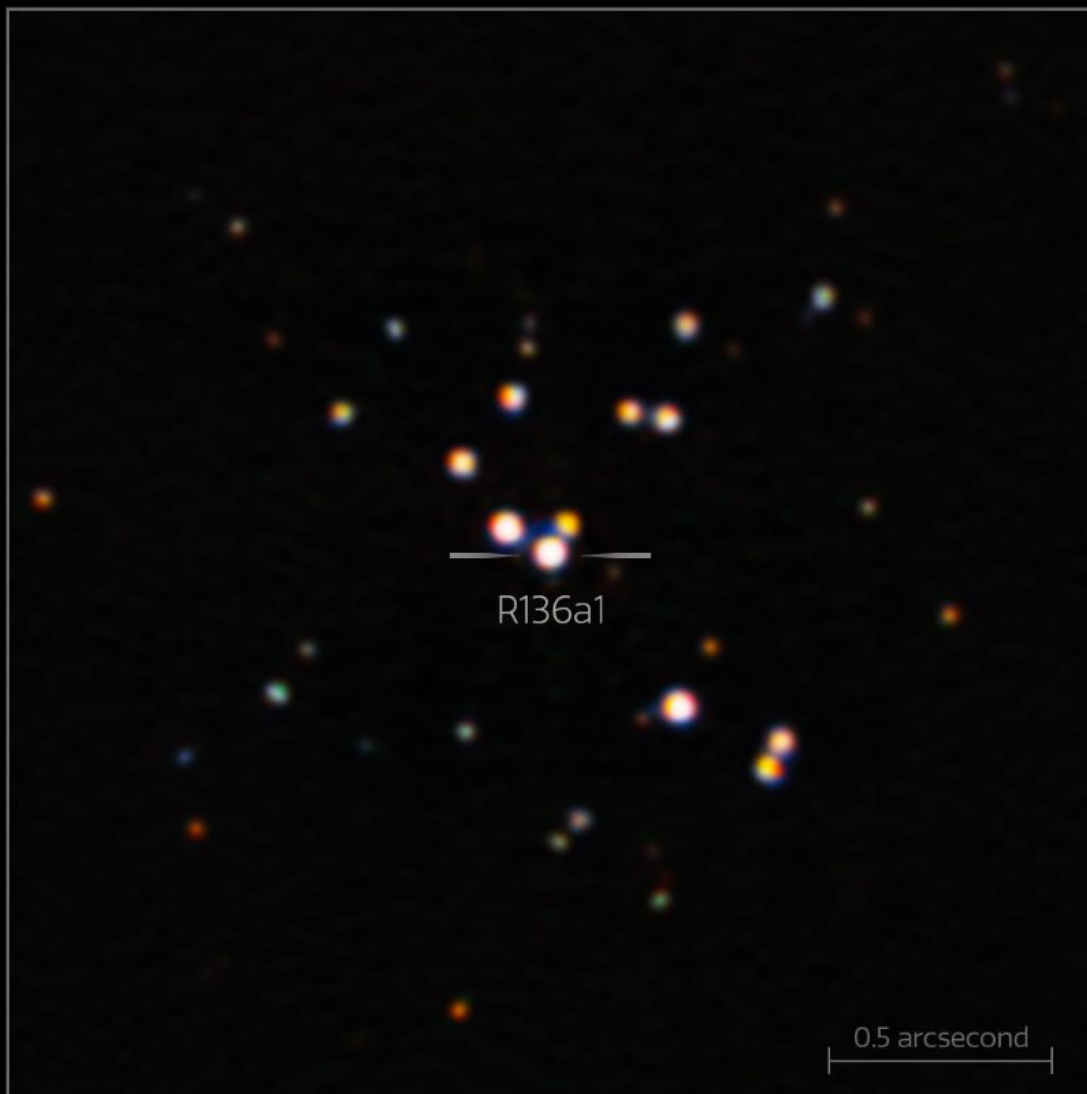
- Rare major outbursts thought to be frozen volatiles from pristine subsurface reservoir
- Urgent DD request observed on same night as post-shutdown check-out, and presented by PI (P Schambeau) two days later at the AAS DPS
- Joint analysis with contemporaneous IRTF, ARO data to measure coma's water-ice content, grain size distribution, gas-to-dust ratio, constraints for thermophysical modeling of physical mechanisms driving outburst.



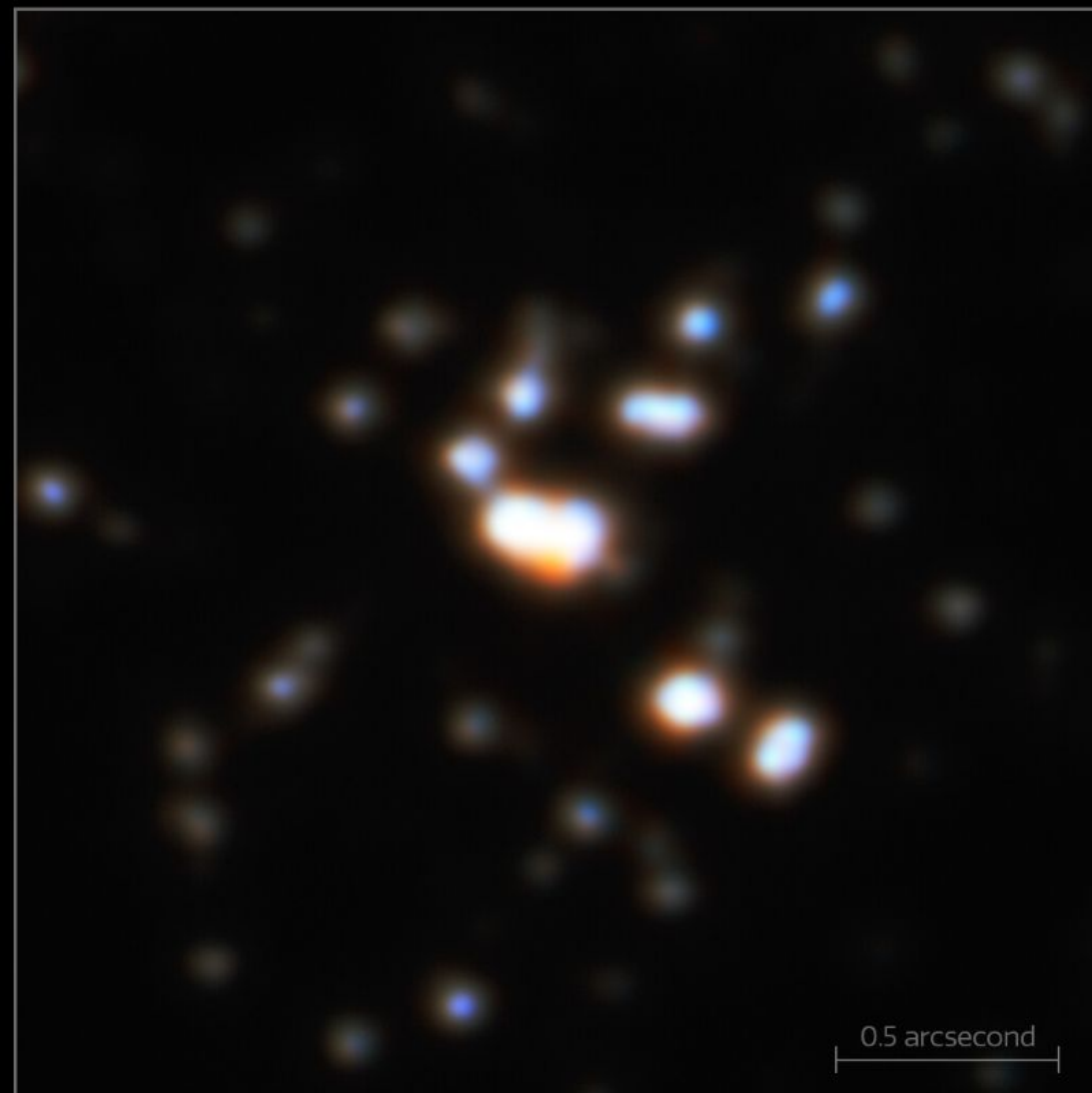
LMC R136a1 - Zorro (GS)



LMC R136a1 - Zorro (GS)



Gemini South/ Zorro



Hubble Space Telescope/ WFPC2

And Finally...

Gemini Science Meeting 2022

originally planned for 2020

June 25-29, 2022
@ Millennium Hilton Seoul



164 participants! (43 virtual)
51 talks. female:male speakers = 40% : 60%



Thank you!

