The 3.8 m telescope at Timau National Observatory of Indonesia: User's perspective

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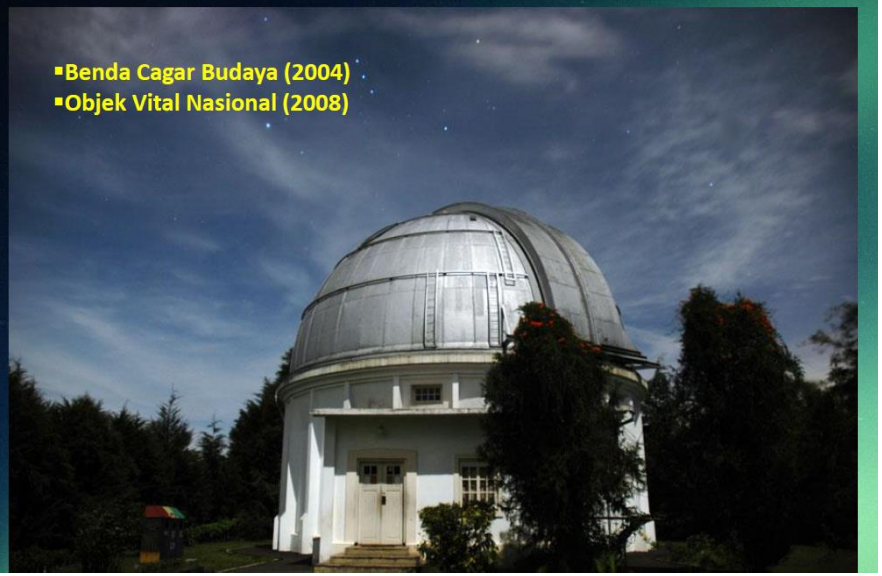
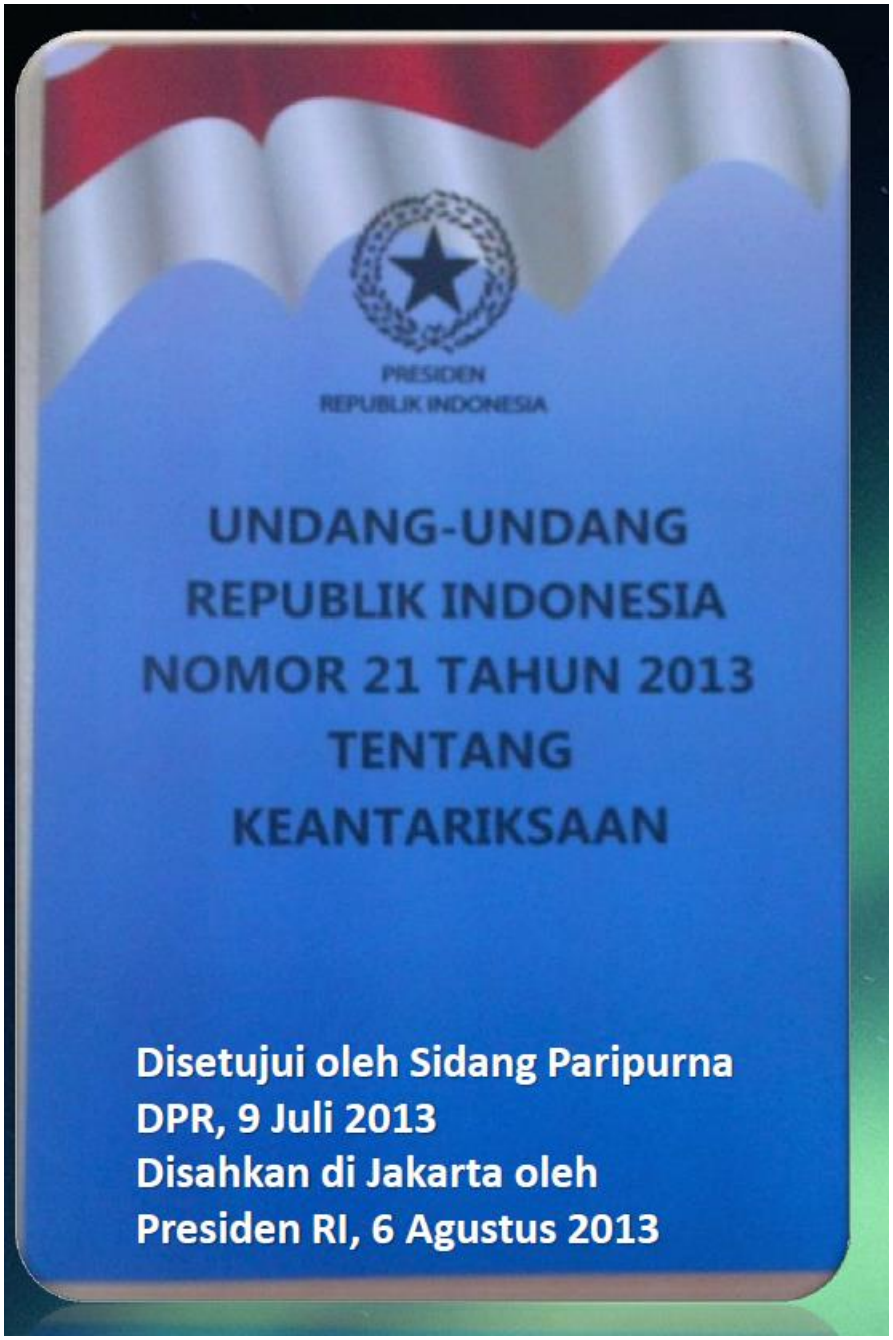
A new national observatory at **Mt. Timau, East Timor, Indonesia** where clear sky fraction reaches 70%.

The Precursors

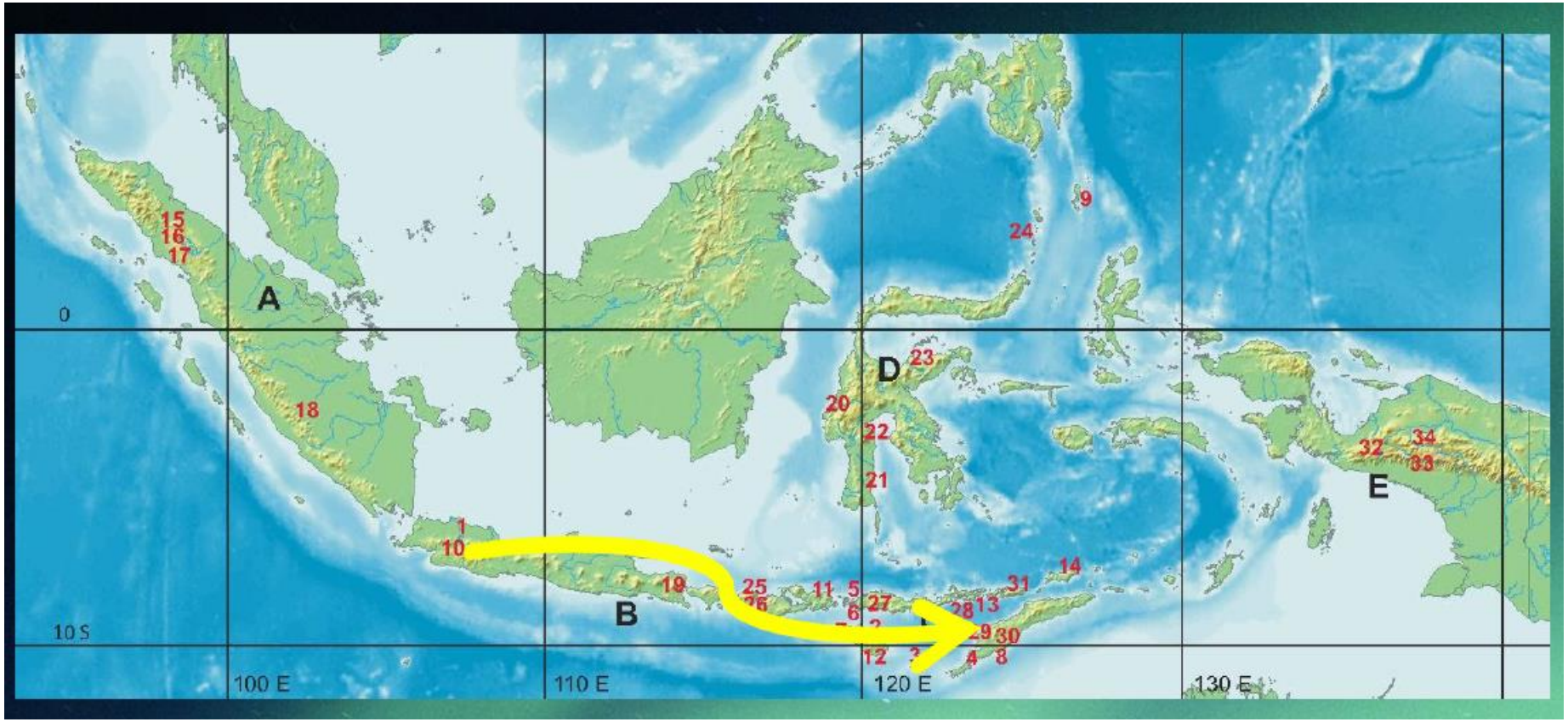
OBSERVATORIUM BOSSCHA - ITB: 1923

Awalnya adalah teleskop-teleskop Optik





Potential sites: 30 candidates since 1980-s



Clear sky fraction above Indonesia: an analysis for astronomical site selection

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Report on Sky Brightness, Seeing, and Weather Measurements at Timau Observatory, East Nusa Tenggara

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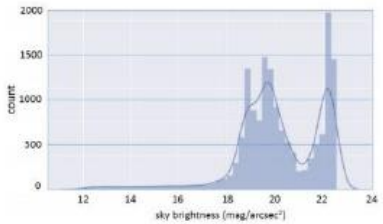
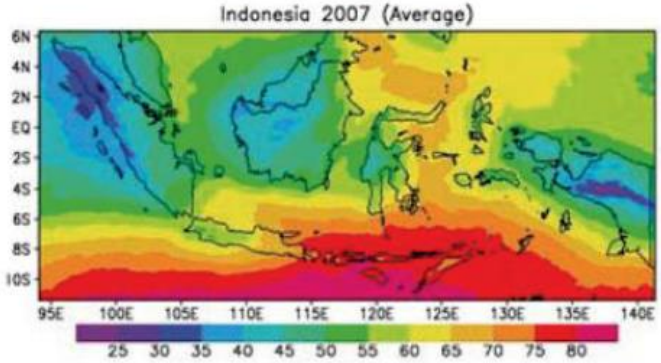
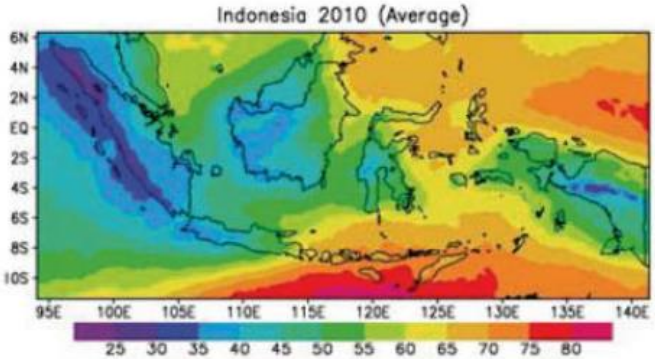
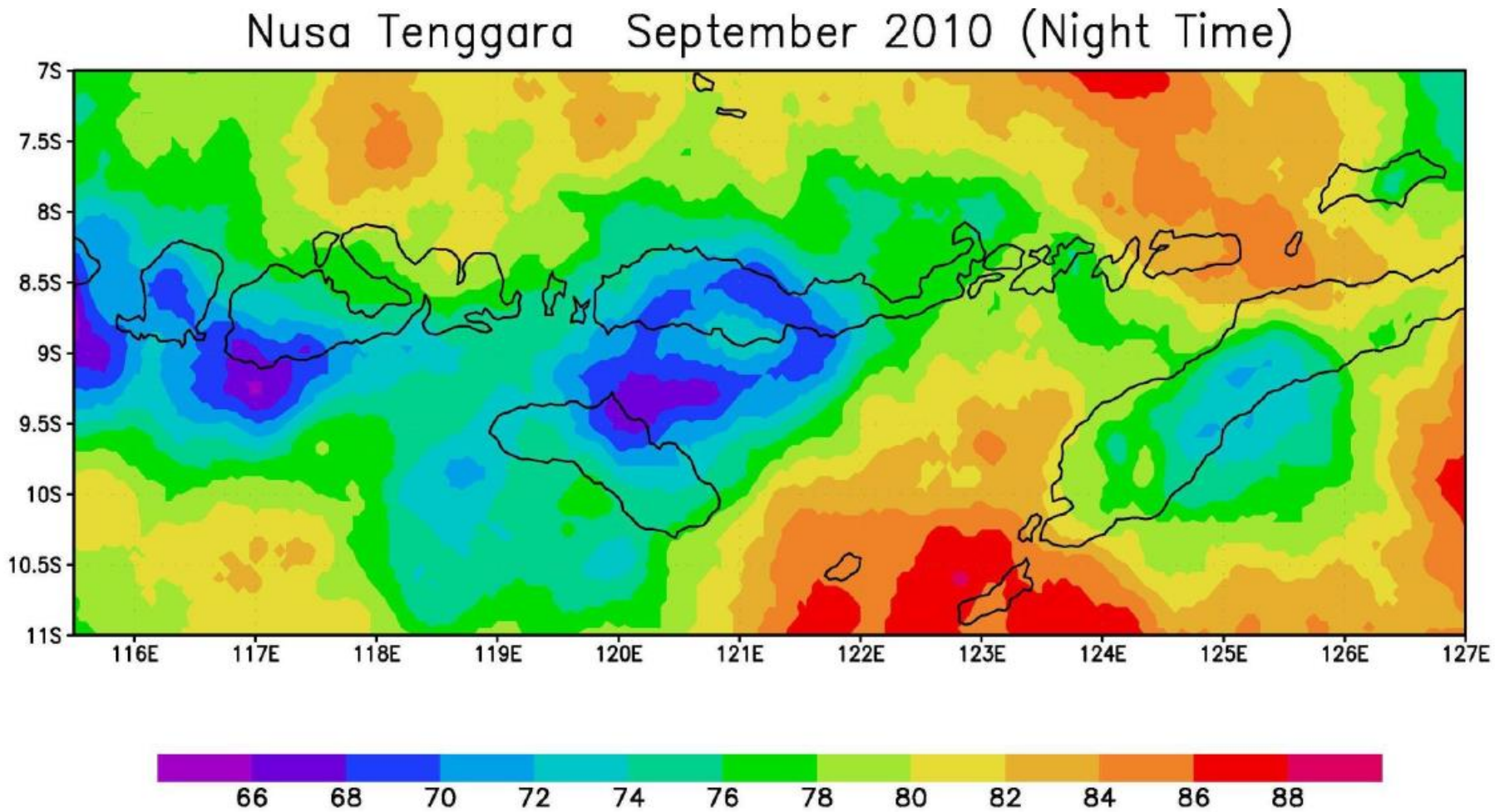


Figure 6. Histogram of sky brightness from 18 to 24 July 2018. Two data clumps are fitted using frequentist approach.



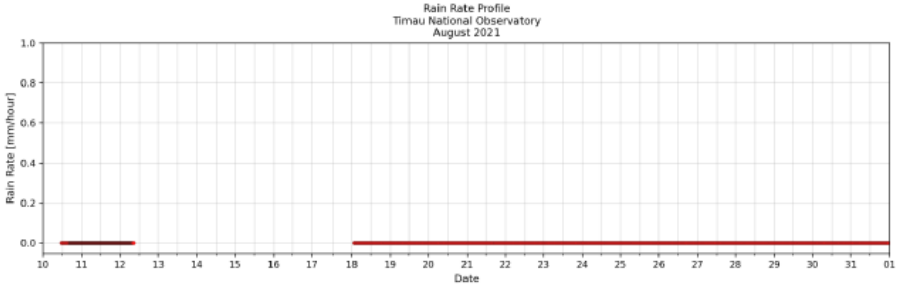


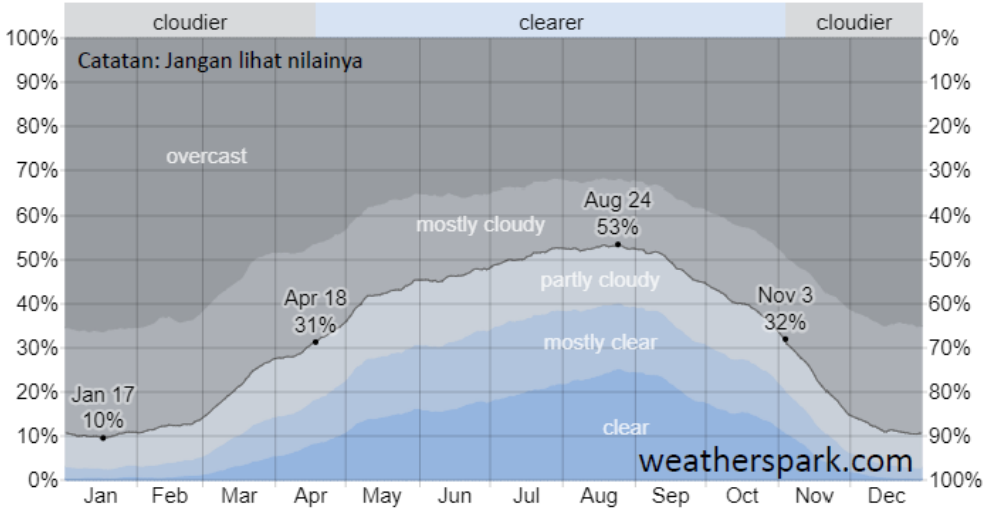
Clear sky fraction over Nusa Tenggara Timur

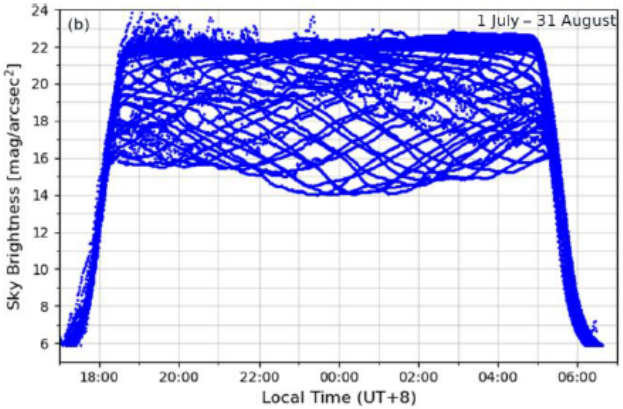


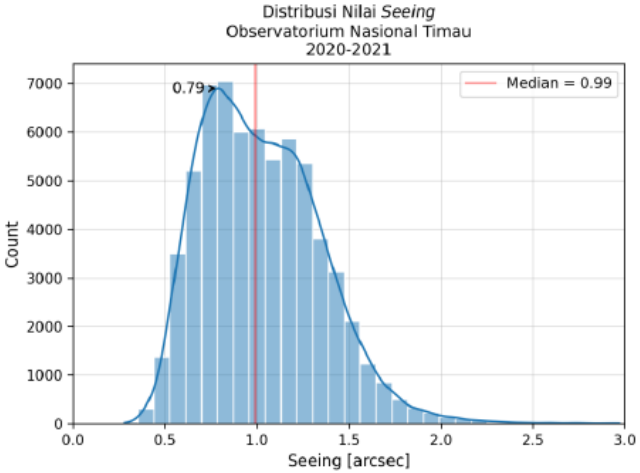
Potential site for astronomical observation

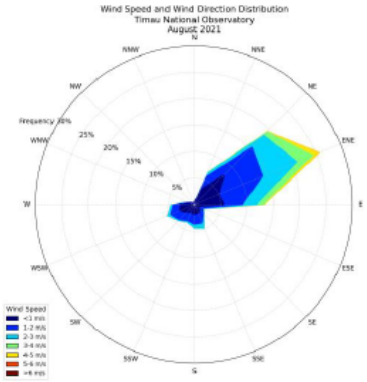
Situs Obnas Timau











M. B. Saputra, et al (2021, in review)

Observatorium Nasional Timau

Sebuah fasilitas pengamatan antariksa akan dibangun bagian Tenggara Indonesia, tepatnya di lereng Gunung Timau, Kabupaten Kupang, Nusa Tenggara Timur.

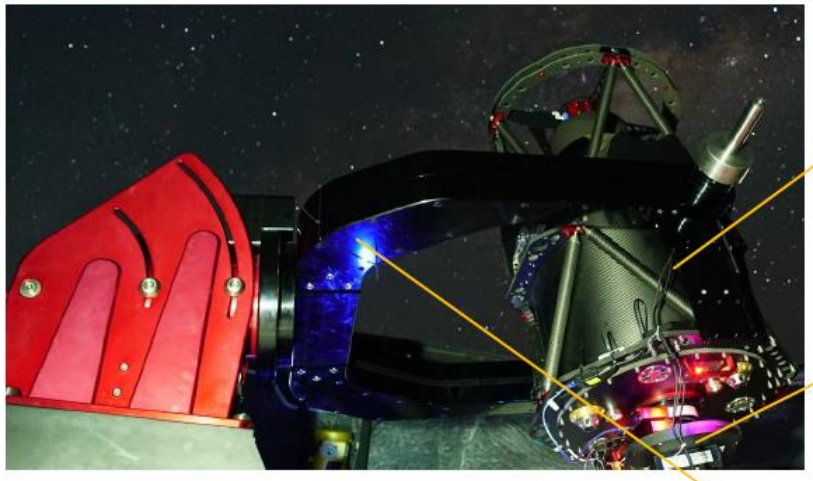
Iklim Pulau Timor yang banyak

Tilong Science Center


#235

Sky brightness in *V*: 20.3 mag/arcsec^2
Extinction coefficients
0.51 mag/airmass (*V*)
0.19 mag/airmass (*B*-*V*)
0.12 mag/airmass (*V*-*R*)

Set Teleskop 50 cm F/3.8



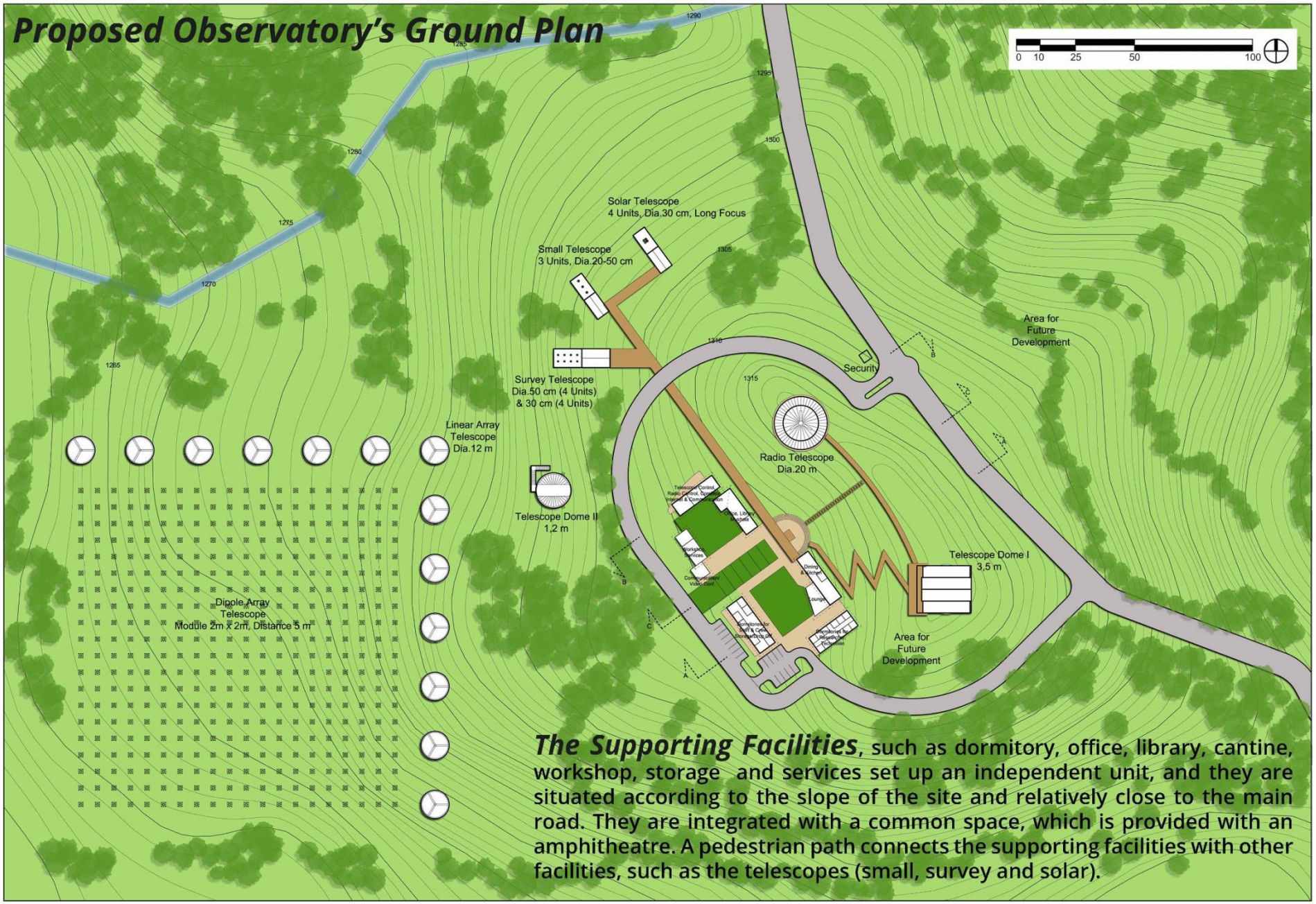
Officina Stellare RiFast 500
Aperture: 500 mm
Focal length 1900 mm
Optics: Ritchey-chretien
Full corrected field: 90 mm
Control: ATC-02

FLI ProLine CCD camera KAF-16803
Resolution 4096 x 4096
Pixel size 9 µm
Operational cooling temperature: ~-20°C
Filter: Johnson-Cousins B-R-I, L-RGB

Paramount Taurus 500
Fork Equatorial Mount
Brushless DC motor
On-axis encoders
Max slew speed: 3.5°/s
Control: Joystick (manual slew only)
The SkyX (robotic)

Other components
Astrohaven dome
Rotofoc V2 focuser-rotator
AAG Cloud Watcher

Proposed Observatory's Ground Plan



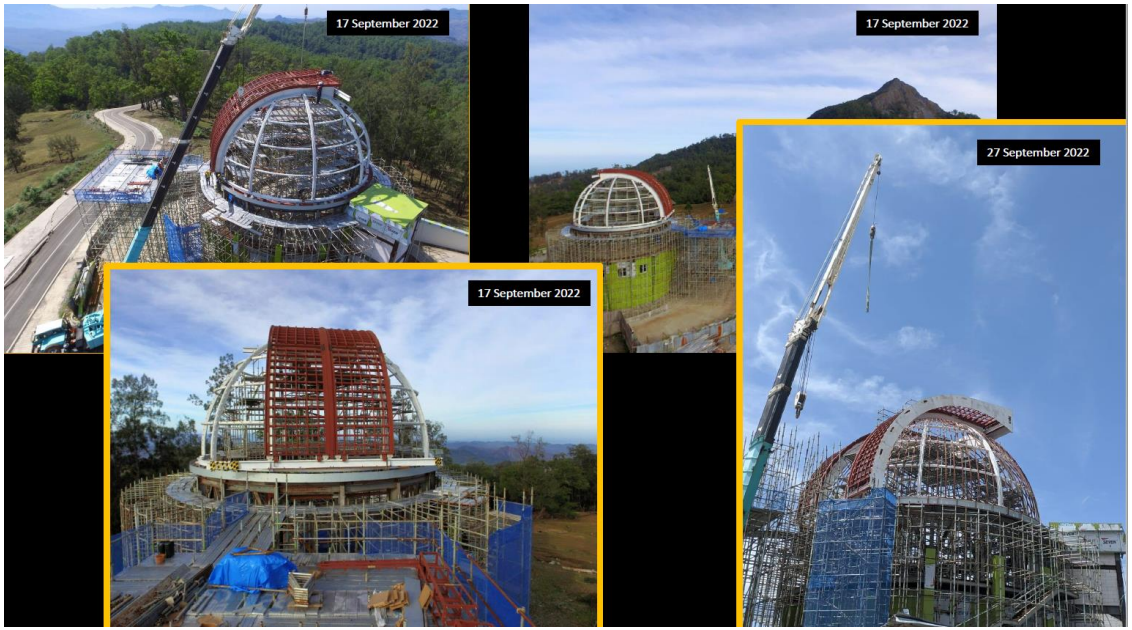
The Supporting Facilities, such as dormitory, office, library, cantine, workshop, storage and services set up an independent unit, and they are situated according to the slope of the site and relatively close to the main road. They are integrated with a common space, which is provided with an amphitheatre. A pedestrian path connects the supporting facilities with other facilities, such as the telescopes (small, survey and solar).

Time line

Mid-2023 : Telescope installation

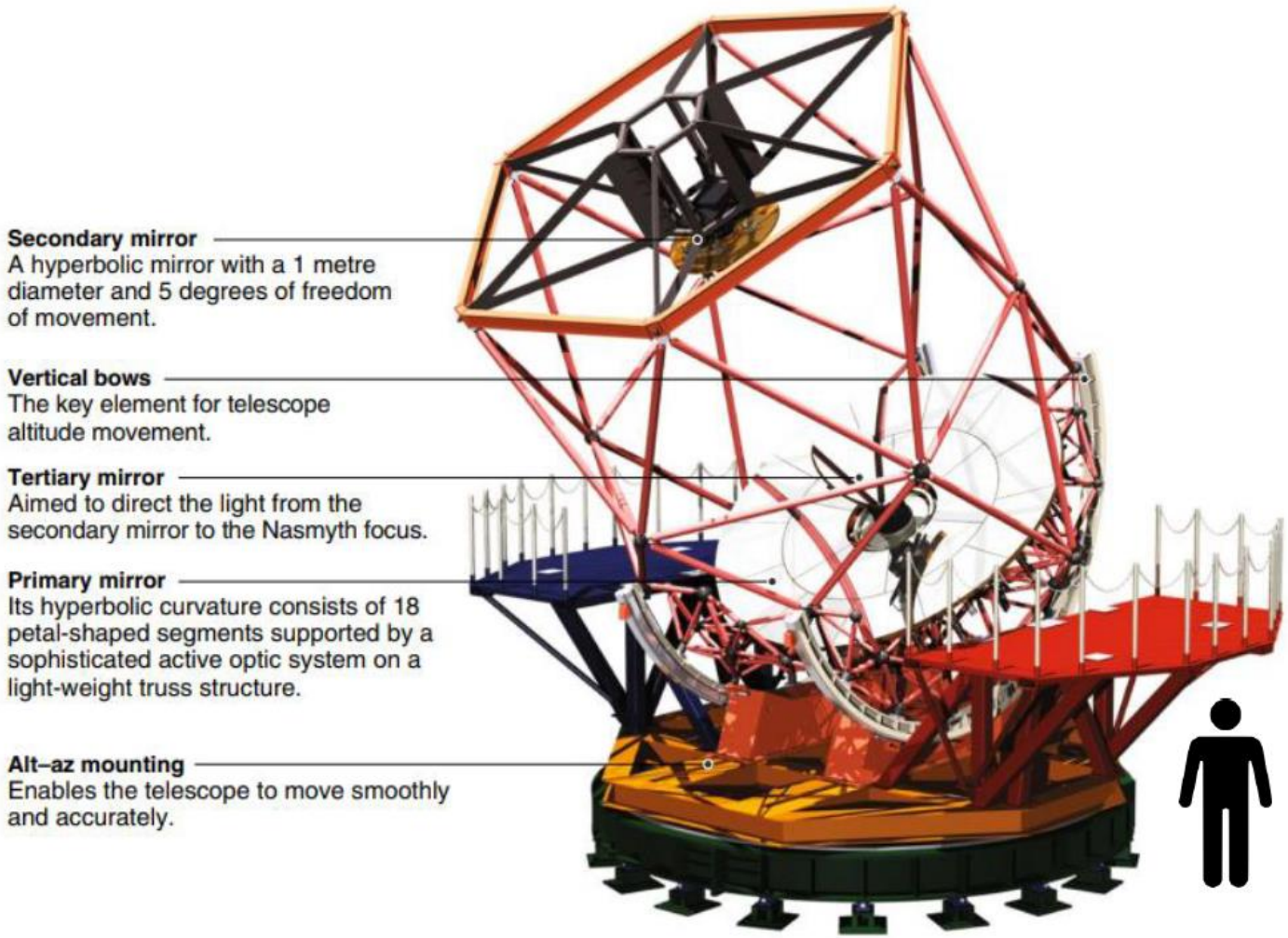
The 3.8 m telescope

Construction of dome September 2022

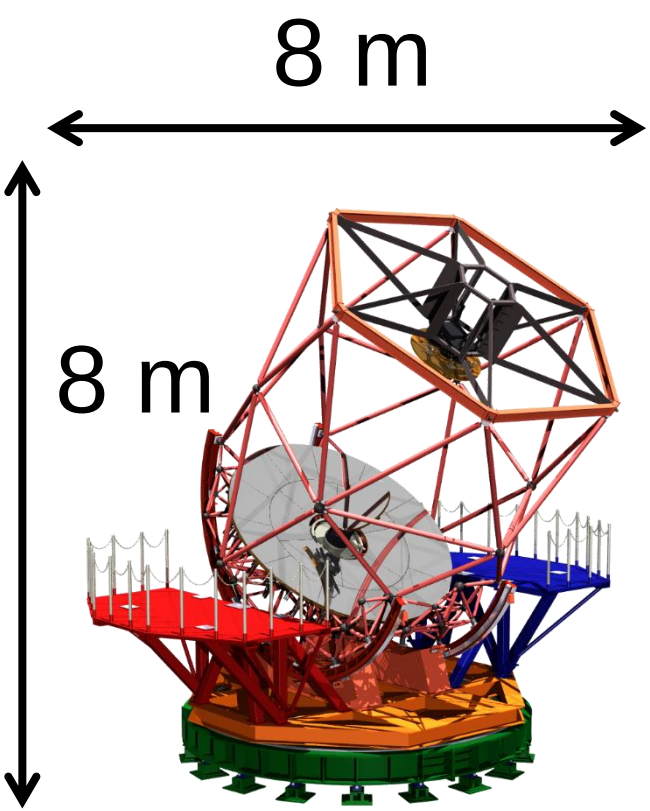


Strong “Seroja’ typhoon in 2021

The Telescope and initial instrumentations



The Main Telescope

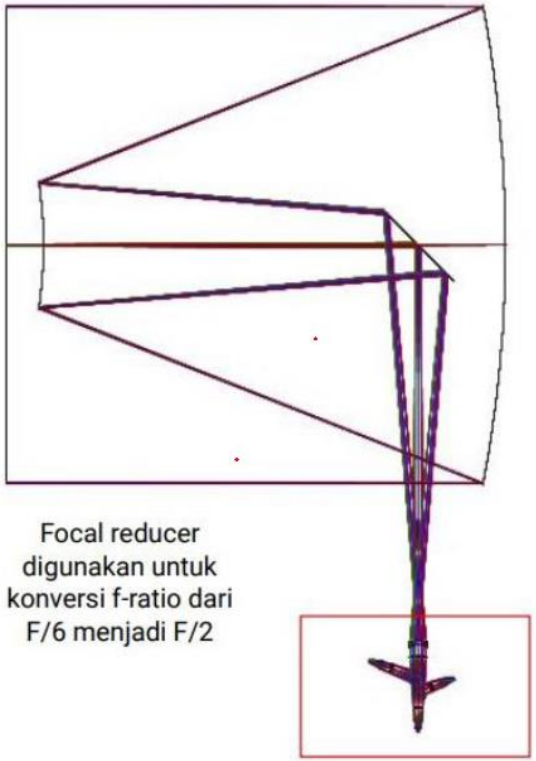


20 ton

Aperture:	3.8 m
Focus:	Nasmyth × 2 F/6
Field of view:	10’ , 1°
Observational Wavelength:	0.4 to 4.2 um
Adaptive Optics:	Near-infrared
Pointing speed:	< 1 min (whole sky)
Elevation speed:	2°/s
Azimuth speed :	3°/s

Instruments

Jejak sinar di teleskop 3,8 m



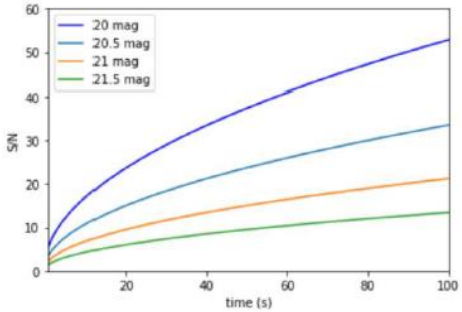
Focal reducer digunakan untuk konversi f-ratio dari F/6 menjadi F/2

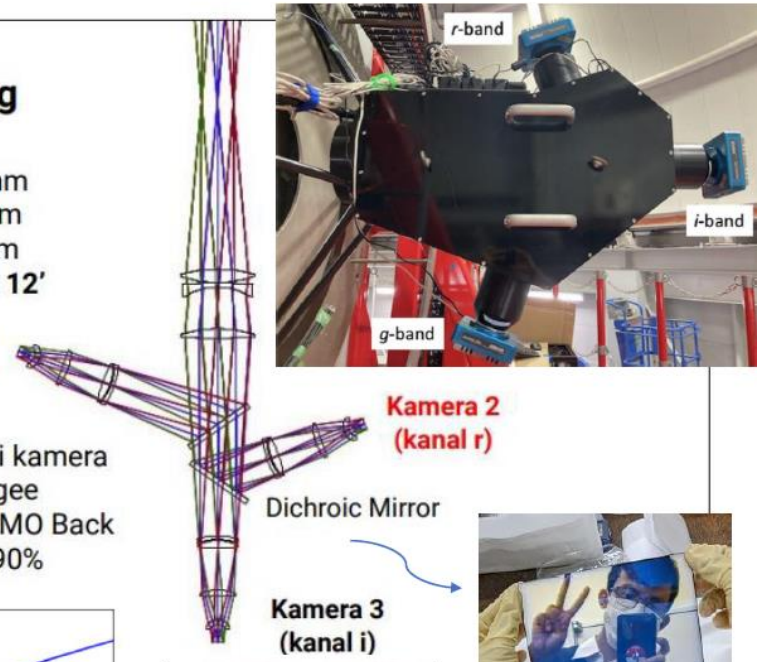
3-Bands Imaging Camera

- Kanal g: 450-530 nm
- Kanal r: 550-680 nm
- Kanal i: 700-820 nm

Medan pandang **12' x 12'**

Efisiensi kuantum dari kamera yang digunakan (Apogee CCD42-40 Ceramic AIMO Back Illuminated) adalah >90%

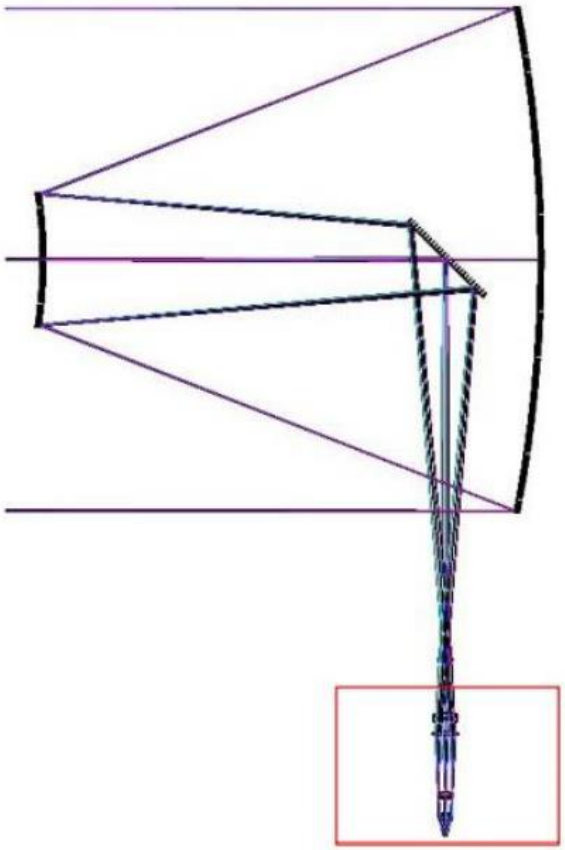




Sumber: Maruo (2021)

R Priyatikanto

Jejak sinar di teleskop 3,8 m



Near Infrared Camera

Optics

Field of view	**8.74 x 8.74 arcmin**
Pixel scale	0.41 x 0.41 arcsecond
F-ratio	2
Focal length	7,560 mm
Cold stop	270 K
Filter wheel	Y (1020 nm), J (1220 nm), H (1530 nm),
Dark, 3 Blank	

Detector

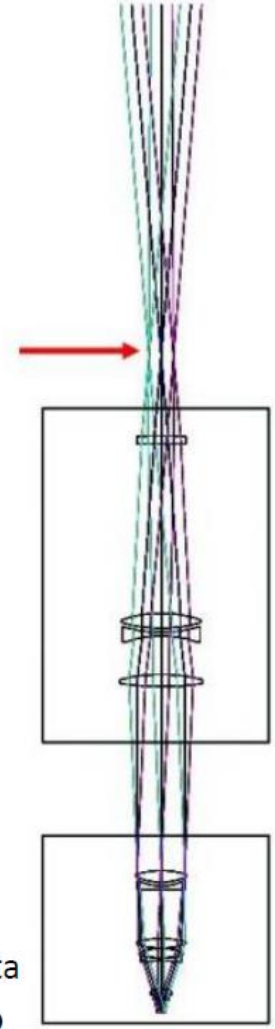
Type	InGaAS
Pixel size	15 micron
Format	1280 x 1280
Effective area	19.2 x 19.2 mm
Operational temp	120 K

Refrigerator (Cryotiger)

Cooling capacity	35 W@180K
Cold head temp	70 K
Power consumption	500 W (100, 120, 220, or 240V can be selected by external switch)
Chiller	included

Vacuum Pump (ST050F)

Pre pump	Rotary
Main pump	Turbo molecule



Sumber: Kurita

R Priyatikanto

Sciences with 3.8 m telescope

Instrumentation :

- Characterization, performance analysis of telescope, control system design
- Development of new instrument and new observing method
- Data reduction pipeline and standardized database/archival

Astronomy and Astrophysics:

1. Time domain astrophysics
2. Flare stars
3. Cold matters in infrared
4. Galactic structure and interstellar matter
5. Extrasolar planets
6. Nova network, transients and multimessengers
7. Asteroid and planetary defense

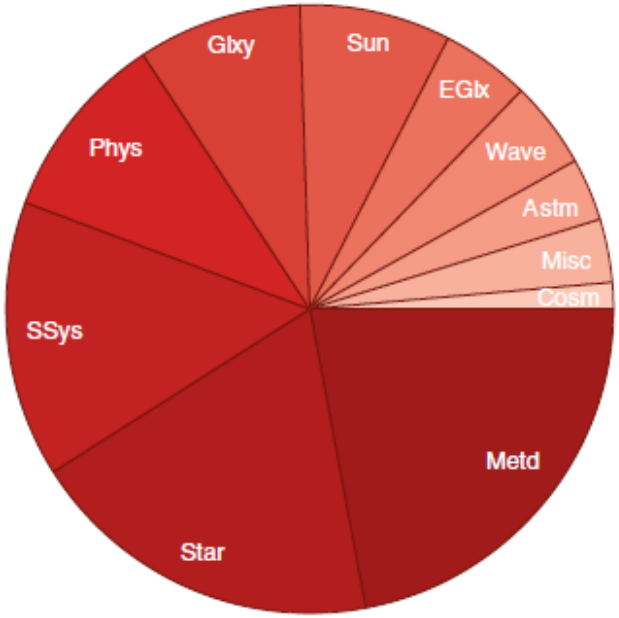


Fig. 3 | Themes of research conducted in Indonesia based on keywords in published works between 2005 and 2016. 'Methods/instrumentation' (Metd), 'Star' and 'Solar System' (SSys) dominated more than 50% of the total scientific output, followed by 'Sun', 'Galaxy' (Glxy), 'extragalactic' (EGlx), and 'multi-wavelength astronomy' (Wave) research. The distribution was constructed from publications over 2005–2016 indexed by the NASA Astrophysics Data System (ADS), and the classification is adapted from the *Monthly Notices of the Royal Astronomical Society* keywords list. Phys, 'physical data and processes'; Astm, 'astrometry and celestial mechanics'; Misc, 'miscellaneous'; Cosm, 'cosmology'.

Thank you very much ...