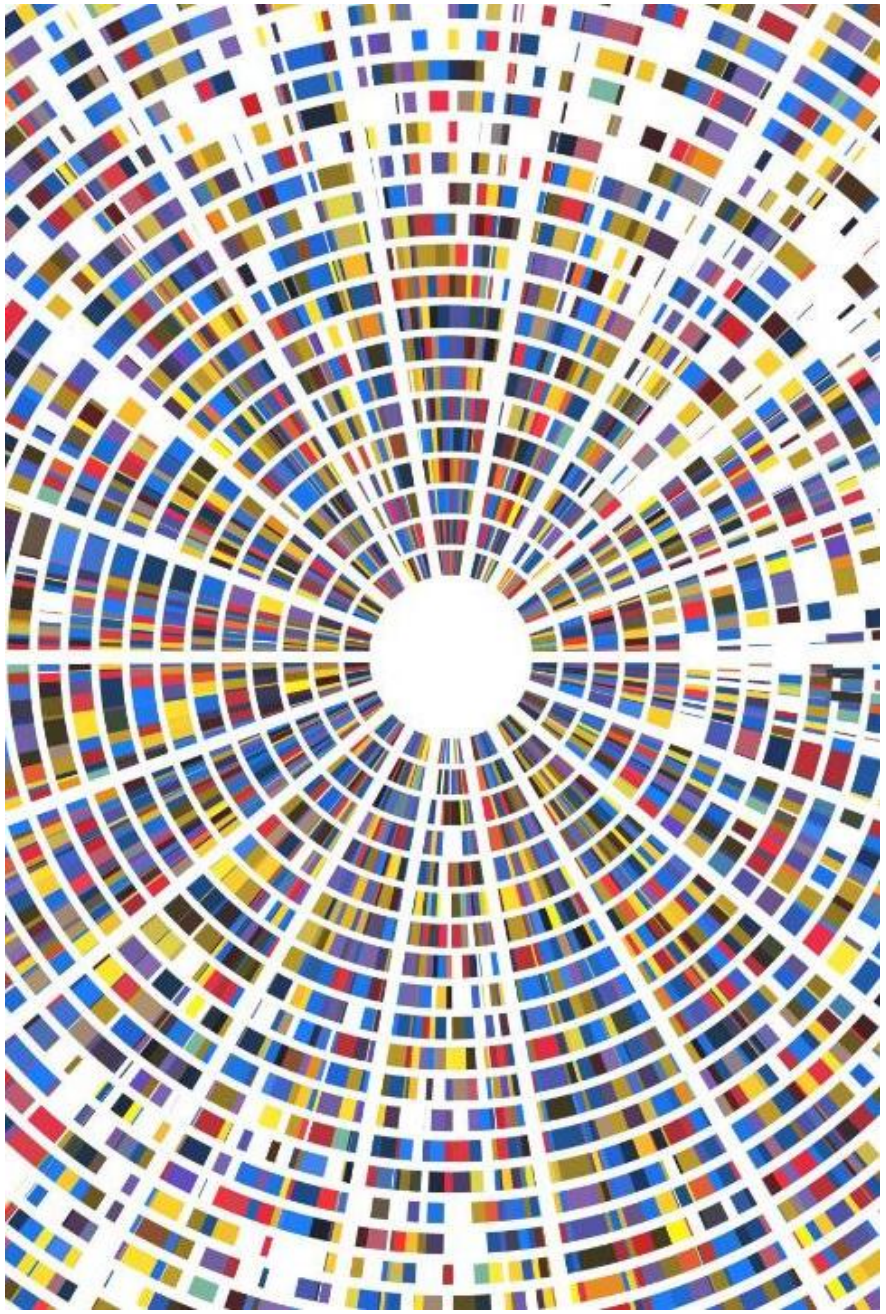

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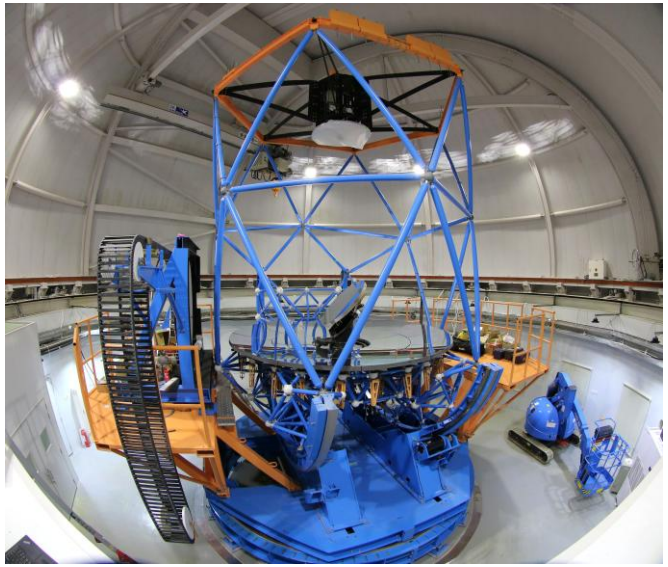

Collaboration on Timau Observatory, Domestic and International, and Future prospect

Emanuel Sungging Mumpuni [Research Manager for Timau]/ PR Antariksa – ORPA, BRIN

Seimei User Meeting 20250903, Institute of Science Tokyo,

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Introduction

- Indonesia is establishing a modern astronomical observatory on Timor Island, East Nusa Tenggara, Indonesia. This future observatory aims to answer fundamental astronomical questions and to strengthen the nation through education, research, science and technology.
- This facility is located on Mount Timau (9° 35’ 50.2” S, 123° 56’ 48.5” E) at an altitude of around 1,300 meters above sea level. Current measurements show seeing of 1.2 arcseconds in median and as low as 0.6 arcseconds, but the humidity varies and may reach 70–95%.
- With its unique location near the equator with annually dry climatology, equipped with Optical and NIR camera, this facility open the opportunity for study toward the center of the Milky Way galaxy during the dry season, in which the center of the Milky Way galaxy is high above the sky, this situation will give low air mass, and longer time observation. Although study on the center of the Milky Way galaxy is one important aspect that will be conducted with the new facility, however in this state of statu nascendi, there is much potential of this facility needed to be explored.

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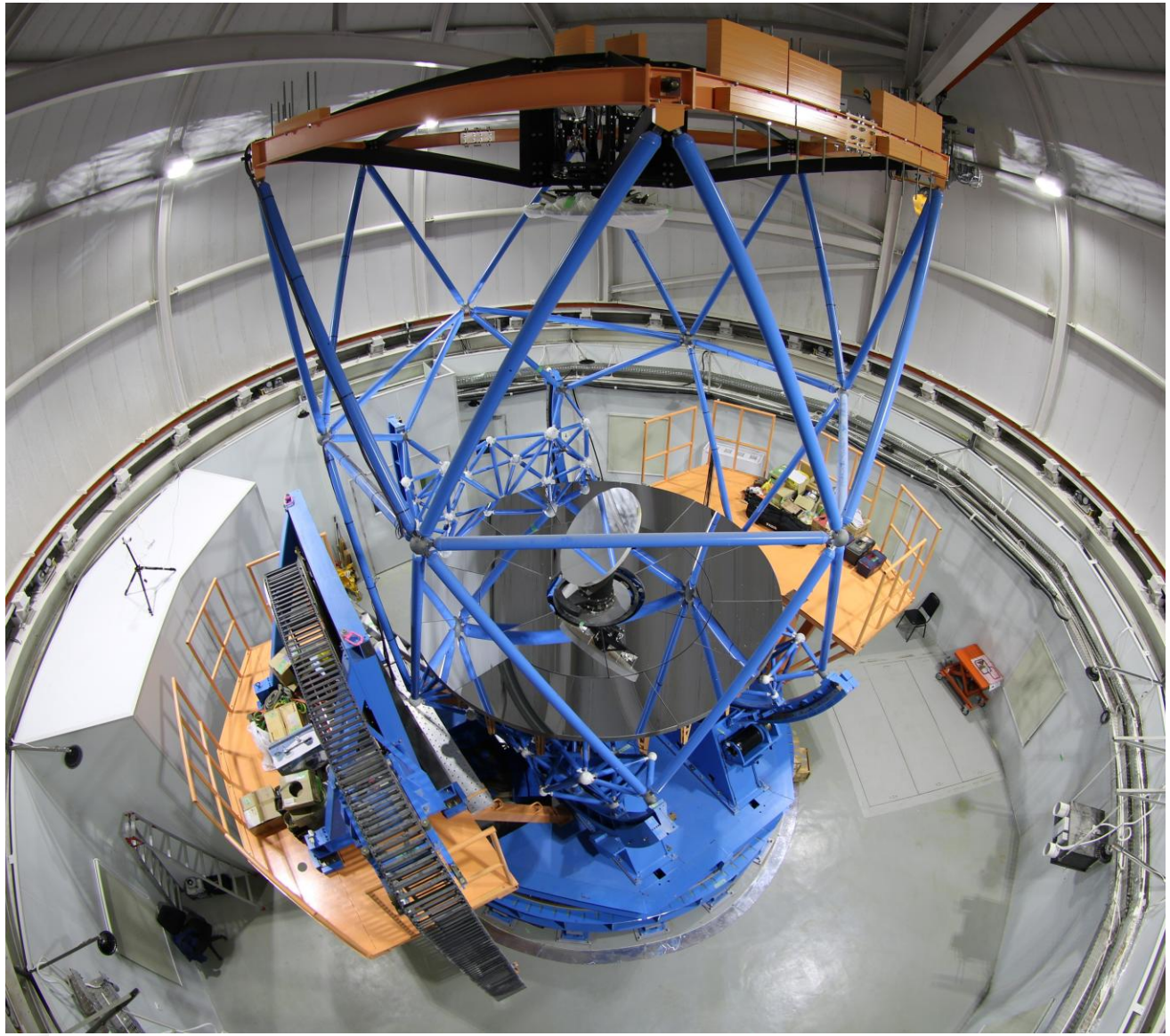
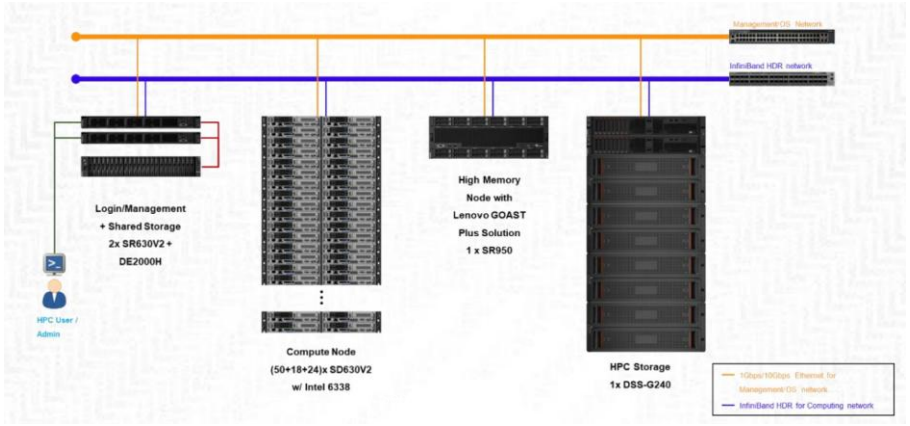
INFRASTRUCTURE

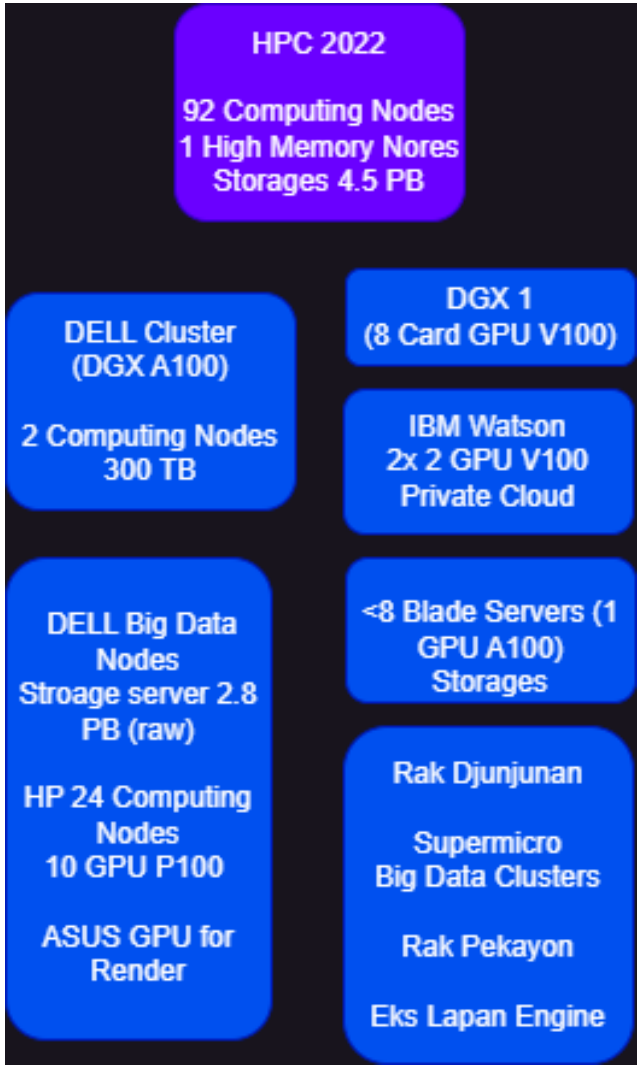
- Dormitory (Established),
- Class-Room*,
- Telescope 380 cm:
  - 3Optika: CCD 450-820 nm in sdss g,r, and i, 12’×12’,
  - **NIRKA: Filter wheel Y (1020 nm), J (1220 nm), H (1530 nm), 8’.74 × 8’.74,
  - **Low-resolution Fast Transient Spectrograph
- Magnetometer (Established),
- Smaller instruments (optical, radio Callisto),



Computing Resource



- 92 Computing Nodes (2*36 cores, 256 GB)
- 1 High Memory Node (8 * 28 cores, 1.5 TB)
- 2 Login/Management Nodes



Spec GPU Clusters

	Sistem Cluster GPU			
	NVIDIA DGX A100	**NVIDIA DGX 1**	**IBM WATSON**	**HUAWEI ATLAS** (hibah)
GPU Node	A 100 (8) Network 10x 200Gb RAM 2 TB Storage SSD 30 TB	V 100 (8) Network Dual 10 GbE, 4 IB EDR Storage 4X 1.92 TB SSD RAID 0	2 x IBM AC 922: V 100 (2) Cores cpu 160 RAM 256 GB Storage SSD 2x960 GB	NPU (2)
Computing Nodes	2x Intel Xeon Gold 5218 (16 cores) RAM= 256 GBytes	Stand alone	AC 922 (node computing)	
Kapasitas Cold Storage	Qumulo NAS Cluster 293 TB (usable)	Stand alone	IBM Cloud Private for Data 3453-C2A	
Connection	HPE SN2010M Port 18 x 1/10/25GBE + 4x40/100GbE	Stand alone	IBM SAN24B-6 Sd 8,16,32 Bps	
OS	UBuntu	UBuntu	Ubuntu/Redhat	
Aplikasi	Platform untuk AI-Big Data analytic	Platform untuk AI-Big Data analytic	Platform untuk AI-Big Data analytic	

Recent Condition (per-2024)

- Extinction coefficient: ~ 0.48 mag/air mass,
- Associated with aerosol content of Equator 0.48 ±0.04,
- 40%/ annually for photometry study,
- Sky brightness ~ 21.9 mag/[“]2,
- Up to 25 km still dark with background estimated on ~ 22 mpsas,

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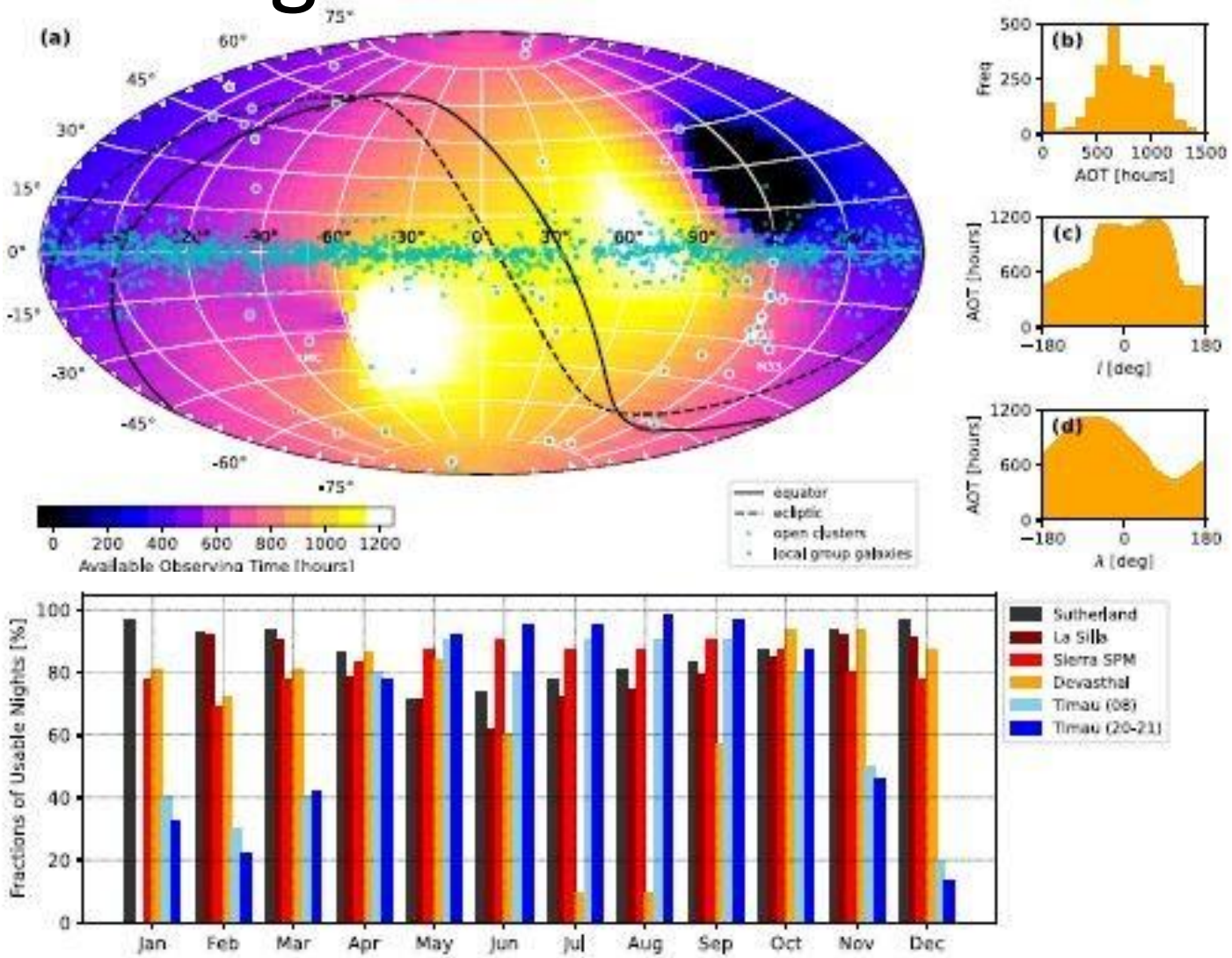
Brightness in Timau



https://doi.org/10.1093/mnras/stac3349

Monthly Notices of the ROYAL ASTRONOMICAL SOCIETY
MNRAS 518, 4073–4083 (2023) https://doi.org/10.1093/mnras/stac3349

Characterization of Timau National Observatory using limited *in situ* measurements

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ABSTRACT

A new astronomical observatory in south-easte
will host a 3.8-m telescope for optical and near-i
of the site needs to be appropriately performed
instruments for comprehensive site testing. Fort
available for almost 2 yr. Based on the data acqu
mag arcsec^{-2}. Additionally, we evaluate the m
level of scattering on site. We find an elevated
It is considered regular for an equatorial area s
brightness and infrared images from *Himawari-*
and the yearly average percentage of usable n
analysis correlate with $R = 0.82$. In terms of t
During the wet season (November–April), the
due to the limited capability of Himawari-8 in
Timau to complement other observatories great

Key words: atmospheric effects – methods: da

Highlight:

- Himawari-8 2020-2021.
- 66% observable night annually, 8 hours/night,

First Generation Instrument

Instruments	Capability	Cases
3OPTIKA / trɪ-op-tɪ-ka: /	450-820 nm 12’×12’	Time domain astrophysics Astrometry Generic Photometry
NIRKA / nɪr-ka: / (**)	Filter wheel Y (1020 nm), J (1220 nm), H (1530 nm) 8’.74 × 8’.74	+ NIR domain, + ‘cool objects’,
LoFTS (Low-resolution Fast Transient Spectrograph) (***)	Tbd. Spectroscopy.	Time domain astrophysics

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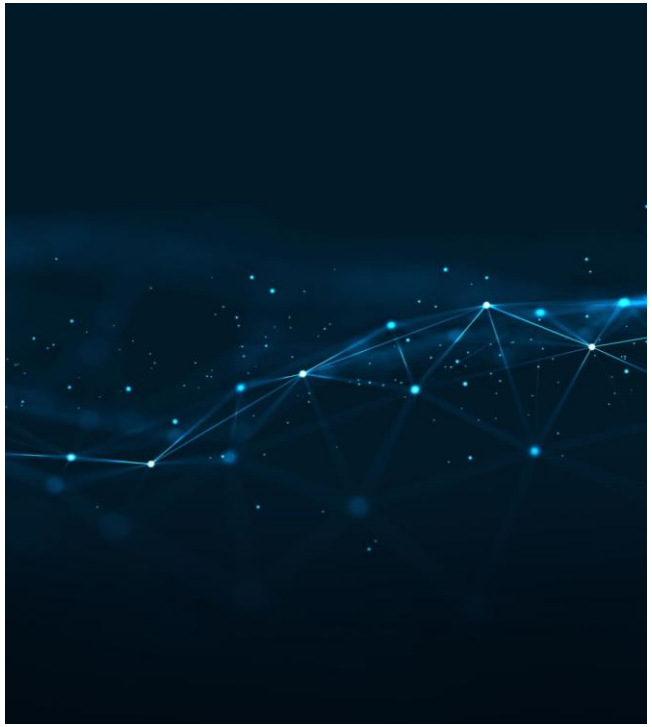
Cooperation on Using Timau Site: on the process



- China: USTC. **Cooperation on transient and time-domain astrophysics research, operation and its implementation - Low-resolution Fast Transient Spectrograph (LoFTS)**,
- Russia: Moscow State University and Irkutsk State University. **MASTER-Timau Robotic Telescope at The National Astronomy Observatory of Timau,** (Smaller robotic network telescope in MASTER Network),
- MAGnetic Data Acquisition System (i-SPES, Kyusu University),

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Scientific Program

- **Super-flares**:
  - Super-flares in late type stars – Doctor candidate in Kyoto University/MZN,
  - Stellar super-flares, joint research : Kyoto University – ITERA – ITB – BRIN , funding: JSPS – BRIN (Tbd),
- MERAKp (Multiband Exploration of the Regions Around the **Key constellation of Pavo**) – Inhouse (Postdoc)/RP,
- Study on satellite observation / AbdR,
- **Supernova**: Kyoto Uni + USTC + Turku Uni),
- **Near Earth Asteroid**: NARIT + ITB + ITERA + UPI,
- Dark and Quiet Skies, astronomy and large constellations: addressing emerging issues and challenges – Inhouse/CYY, GPP,
- Galaxy & extra galaxy study – BRIN + ITB/TDj,

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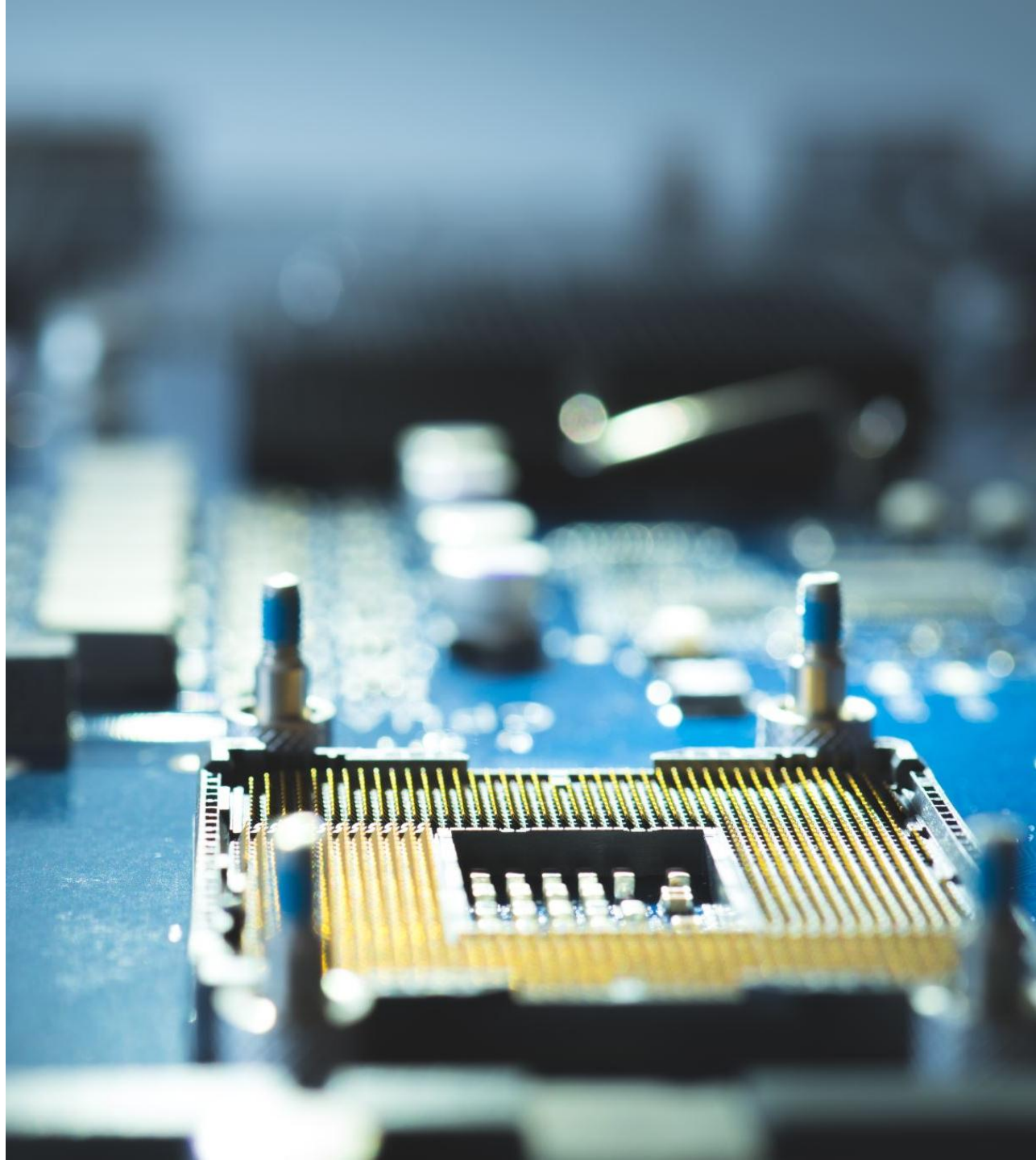
Instrumentation

- System integration for telescope control & subsystem (BRIN – Smart Mechatronic Research Center),
- GUI, pipeline, and data processing,
- Other smaller telescopes robotic telescope development, and other new idea for instrumentation development,



BRIN Program

- RIIM (Indonesian Research Funding): 3-5 years, (platform) – Including JSPS – RIIM.
- Scholarship: LPDP Targeted (for young students under 27 years): one priority on aerospace, and LPDP regular (more competitive and open). Currently, one young Indonesian awarded LPDP Scholarship in Kyoto University, hope more to come,
- Postdoctoral (up to 2 position in Timau),
- Visiting Researchers/Professor (1-3 months),

Collaboration with Astronomy ITB

- The establishment of Timau observatory is the long collaboration between ITB, BRIN (previously LAPAN), and Nusa Cendana University (trained in ITB on astronomy),
- The theme of collaboration is on all theme on Astronomy and Astrophysics (Solar System, Stellar Physics, Galaxy, etc.),
- Currently the collaboration including the scholarship for young students to study and working in Timau Observatory (expected to start in 2026) and obtaining degree in ITB,
- Other involvement of students (Research Assistant, Internship) is also prepared,

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UPI: Center for Excellence of Astronomical Data Science and Light Pollution

- **Photometry:**
  1. Old globular cluster study.
  2. Near Earth Asteroids (NEAs) with PHAs sub-km size and its rotation period to model evolution with Yarkovsky's effect.
- **Astrometry:**
  1. Population of NEAs with PHAs sub-km size to study its orbit.
  2. Study of 50 cm telescope development for continuous patrol of NEAs with other institutions in Indonesia,
- **Instrumentation:**
  1. Self-development IoT SQM.
  2. Meteor camera study to reconstruct source of meteor outside the atmosphere.

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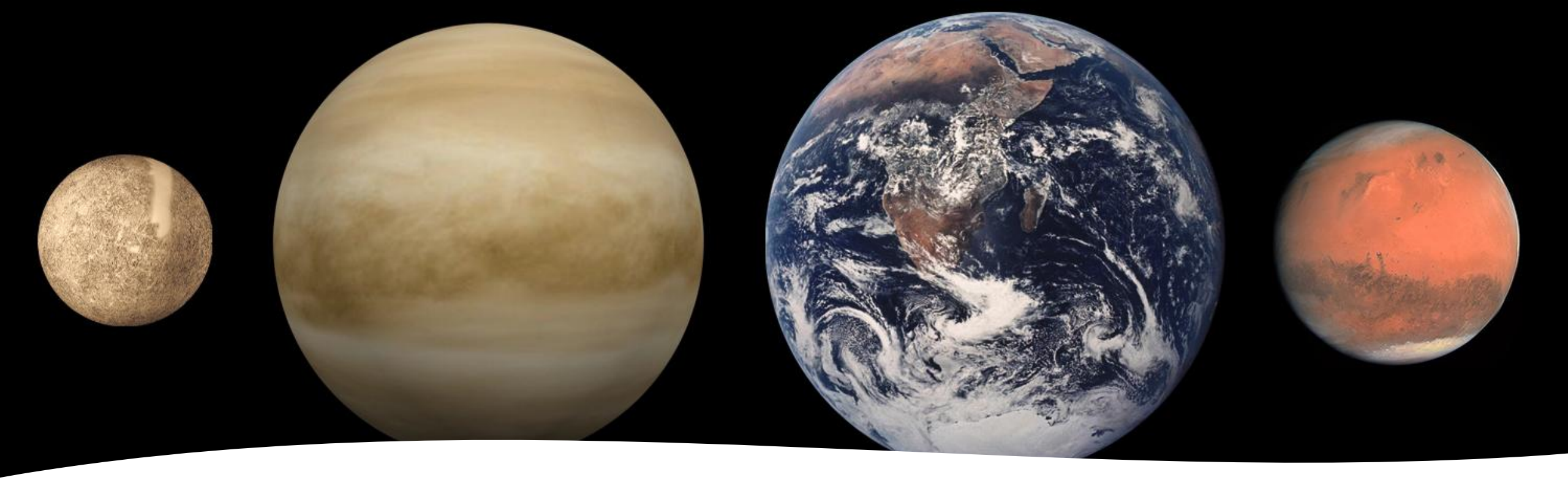

ITERA: Study on Planetary Science

- ITERA focus on the planetary science and atmosphere,
- There are several undergraduate students have experienced on also observing in Timau observatory,
- Currently there is a proposal between ITERA – Kyoto University – BRIN - ITB to access the fund of RIIM – JSPS on the Stellar Super-flares,
- Internship program is discussed for ITERA students to work in Timau,

ITERA

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Future Collaboration

- UGM (Gajah Mada University) on attracting students on astrophysics and astronomy instrumentation,
- Inviting more other Indonesian universities which providing Physics,

Astronomy & Society Studies

- From the Astro-tourism study (Mardita & Perwitasari, DKP, 2023), it is difficult to determine new Astro-tourism areas due to several overlaying stakeholders:
  - Conservation forest under the Ministry of Forestry and Environment – central government
  - Rural area in the vicinity – regency of Kupang
  - Enclave – residential areas inside the forest area belong to the natives
  - Native People
- The Importance of Dark Sky Park to Support Sustainability: A Philosophical View of Technology, (Wibowo, tbp),
- Ethnoastronomical Knowledge Surrounding Timau National Observatory (Sunarti et al., 2025, https://doi.org/10.1007/978-981-96-1344-1_17
- Societal Impacts of Timau National Observatory, Indonesia: an Exploratory Study, Pramono (thesis),

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What To do? 2025 - 2029

- BRIN will make the call for domestic universities to look for talent (Barista, MBKM, Thesis) – Fund: DSDMI BRIN, Estimated started in the end of 2025,
- Scholarship & Other Training scheme (like APCTP), 2026,
- Master & doctoral degree in ITB from BRIN scheme, and LPDP Targeted abroad (for doctoral degree) – DSDMI & LPDP, 2025,
- The students can continue to work in BRIN as postdoc after finishing study,
- Timau will also open for international *Telescope Time* proposal, instrument installation, & other research activities are welcome, so Timau can be an international hub for international research activities.

ありがとう

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