

Local, Domestic and International Collaboration on Education and Research at Nayoro Observatory

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2017 Asia-Pacific Regional IAU Meeting
3-7 July 2017 TAIPEI, TAIWAN
Venue: Taipei International Convention Center

<http://www.aprim2017.tw/>

Outline

1. Introduction of Nayoro Observatory
2. Collaboration at Every Level
3. Summary

1-1 Overview of Nayoro Observatory



- ◎ Foundation/Operation: by Nayoro City
- ◎ Facilities:
 - ✦ Observation rooms (dome & sliding roof)
 - ✦ Planetarium (8-m dome, 50 seats)
 - ✦ Exhibition room (solar system, meteorite, etc.)
 - ✦ Multipurpose room (lecture, music event, etc.)
- ◎ Telescopes:
 - ✦ 1.6-m Pirka telescope of Hokkaido Univ.
 - ✦ 0.5-m Kitaterasu telescope
 - ✦ 0.4-m Meili & Chura telescopes, etc.
- ◎ Members: 3 permanent staff+ (total: 6)
- ◎ Activities:
 - ✦ Stargazing party (everyday, except Monday)
 - ✦ Planetarium show (4 times/day)
 - ✦ Observation and research
 - ✦ Astronomical/music events, etc.



- ▶ Nayoro Observatory is a public observatory founded in 2010, which is originated from a private Kihara observatory and is now operated by Nayoro City.
- ▶ There is the 1.6-m Pirka telescope (the 2nd largest public telescope in Japan).
- ▶ A concept of the observatory is "Enjoy stars and music!"

1-2 Location of Nayoro Observatory

1-m class telescopes in Japan



Nayoro Observatory

Longitude: 142° 28' 58" E
 Latitude: 44° 22' 25" N
 Altitude: 161 m

N44°



Nayoro Observatory
 Hokkaido University
1.6-m



Kiso Observatory
 The University of Tokyo
1.05-m



Kyoto University
(3.78-m)



Nishi-Harima Astronomical Observatory
 University of Hyogo
2.0-m



VERA Iriki Station
 Kagoshima University
1.0-m



Ishigakijima
 Astronomical Observatory
1.05-m



MITSuME Telescope (Akeno)
 Tokyo Institute of Technology
0.5-m



Saitama University
0.55-m



Okayama Astrophysical Observatory
 NAOJ
1.88-m



Higashi-Hiroshima Observatory
 Hiroshima University
1.5-m



Associate Institutions
 Gunma Astronomical Observatory
 Koyama Astronomical Observatory, Kyoto Sangyo University
 Risai Spaceguard Center



The University of Tokyo
 Atacama Observatory
 Project
1.04-m



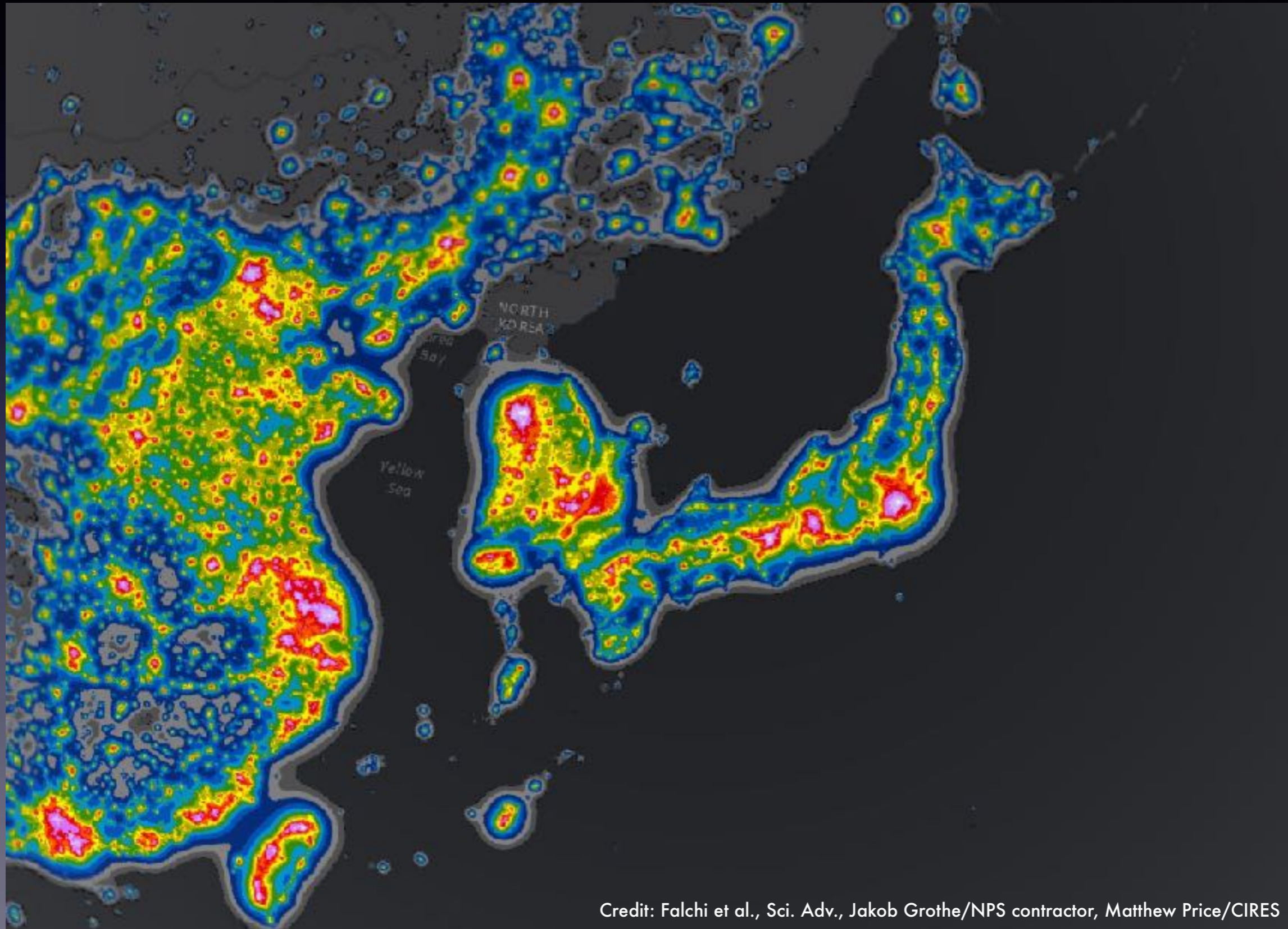
South African
 Astronomical Observatory,
 Nagoya University
1.4-m



N25°

1-2 Location of Nayoro Observatory

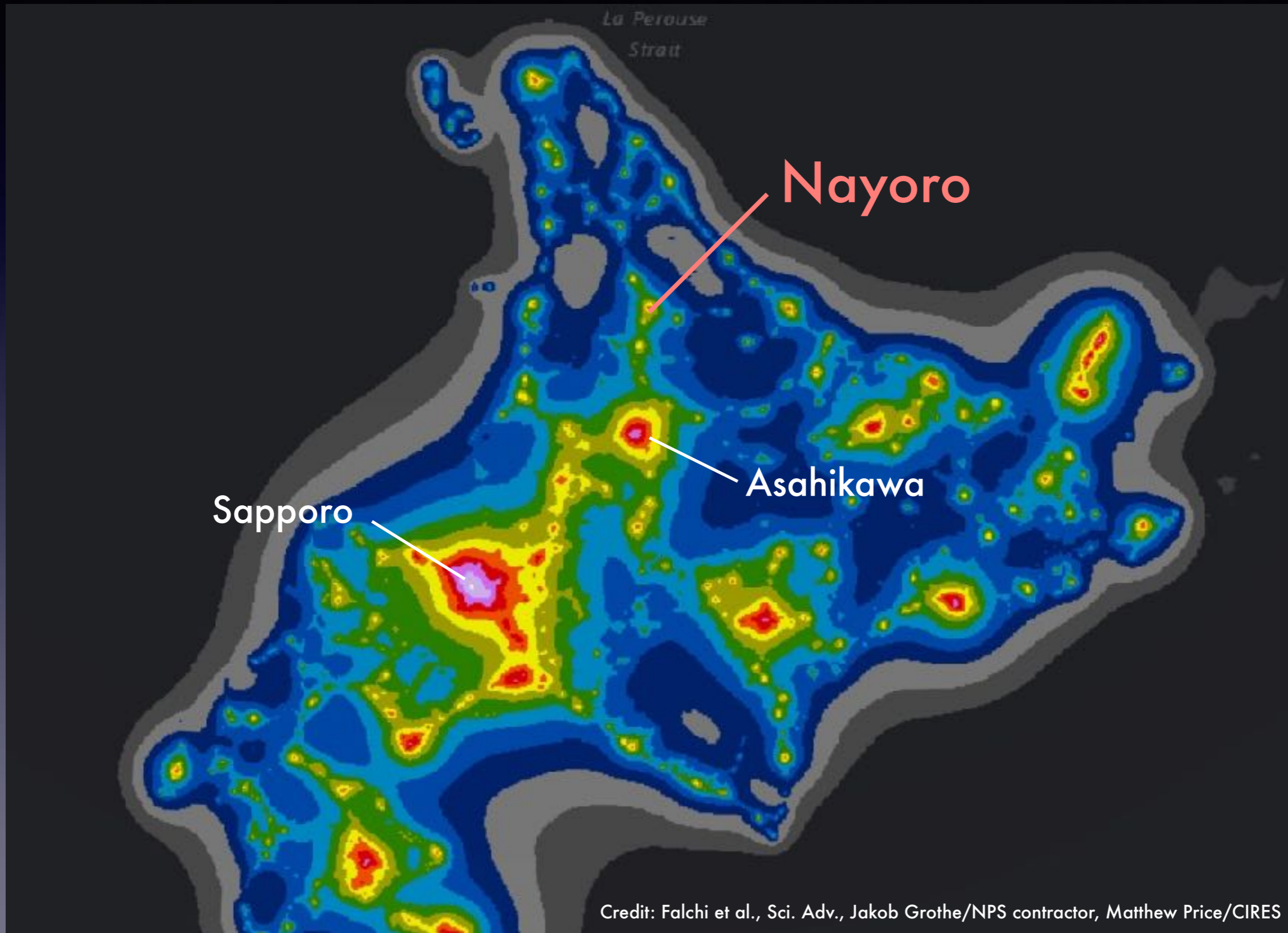
Artificial Night Sky Brightness



Credit: Falchi et al., Sci. Adv., Jakob Grothe/NPS contractor, Matthew Price/CIRES

1-2 Location of Nayoro Observatory

Artificial Night Sky Brightness



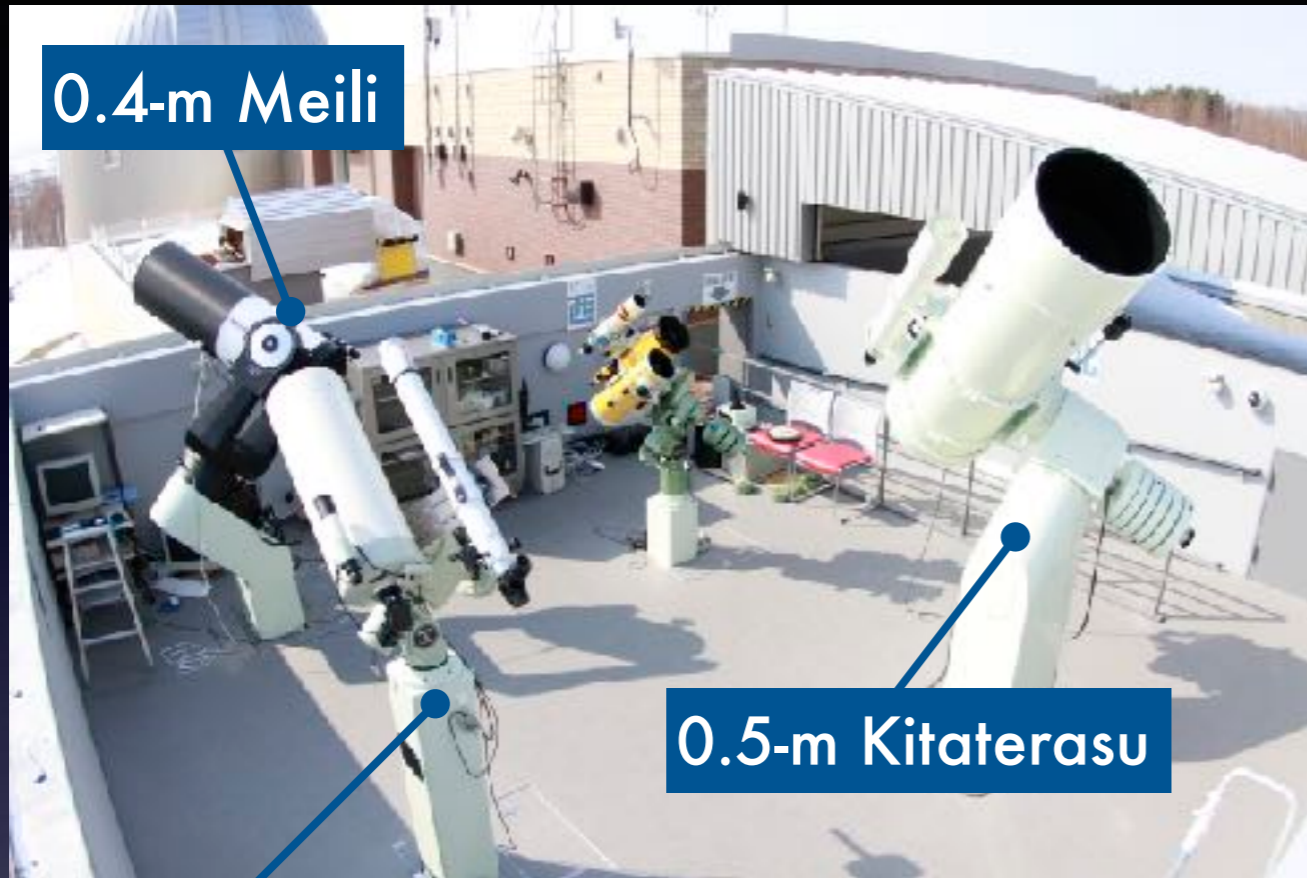
Credit: Falchi et al., Sci. Adv., Jakob Grothe/NPS contractor, Matthew Price/CIRES

1-2 Location of Nayoro Observatory

Hokkaido Island from ISS



1-3 Telescopes at Nayoro Observatory

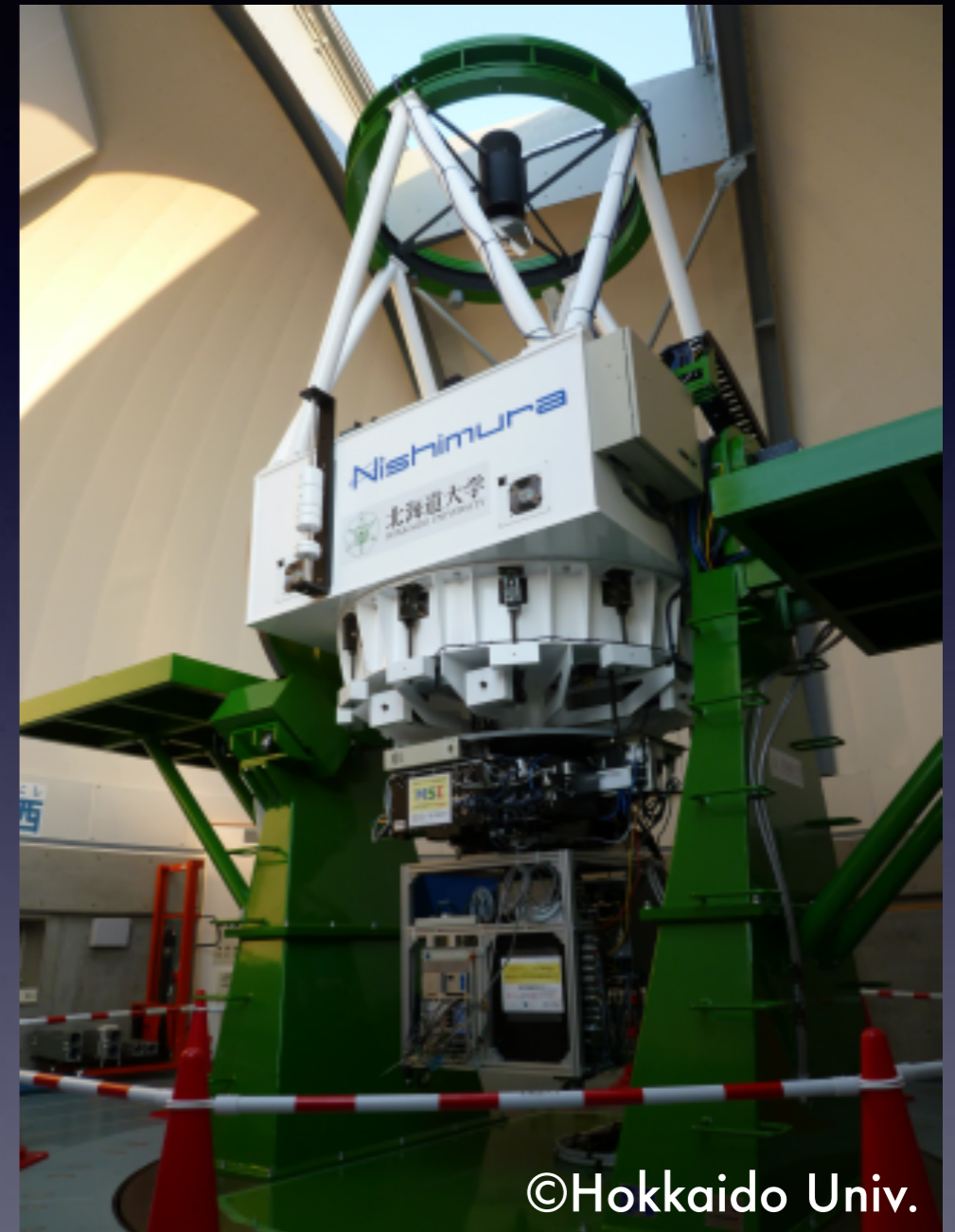
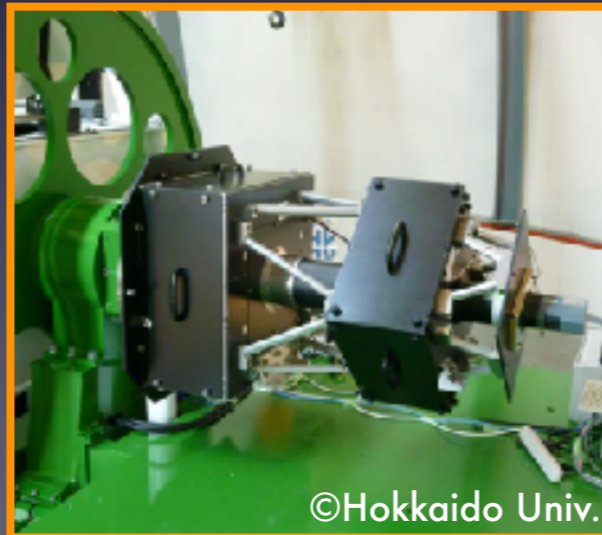


▶ Chura, Meili and Pirka all mean "beautiful" in Okinawan, Chinese and Ainu languages, respectively.

1-3 Telescopes at Nayoro Observatory

◆Pirka telescope of Hokkaido University

- Diameter: 1,600 mm ($f=19,238$ mm F12)
- Optics: Ritchey–Chretien system
- Foci: Cassegrain, Nasmyth x2
- Mounting: Alt-Azimuth
- Instruments: MSI, NaCS, NICE, Eyepiece



- Use for: Scientific observation, Star viewing, etc.
- Can be used also as an open facility system (~30,000 yen/hour)

1-3 Telescopes at Nayoro Observatory

◆Chura telescope (美ら望遠鏡)

- Diameter: 400 mm (f=4,000 mm F10)
- Optics: Ritchey–Chretien system
- Focus: Cassegrain
- Mounting: TAKAHASHI EM-500
- CCD: SBIG STL-1001E (1k x 1k pixel)
- FOV: 21'.2 x 21'.2 (1".2/pixel)
- Filters: Johnson RVB
- Use for: Asteroid search project, Taking beautiful images, etc.



1-3 Telescopes at Nayoro Observatory

◆ Meili telescope (美麗望遠鏡)

- Diameter: 406.4 mm (f=4,064 mm F10)
- Optics: MEADE ACF system
- Focus: Cassegrain
- Mounting: MEADE LX200
- CCD: SBIG STL-1001E (1k x 1k pixel)
- FOV: 20'.9 x 20'.9 (1".2/pixel)
- Filters: IDAS RGB
- Use for: SN survey, Taking beautiful images, etc.

M31N 2008-12a

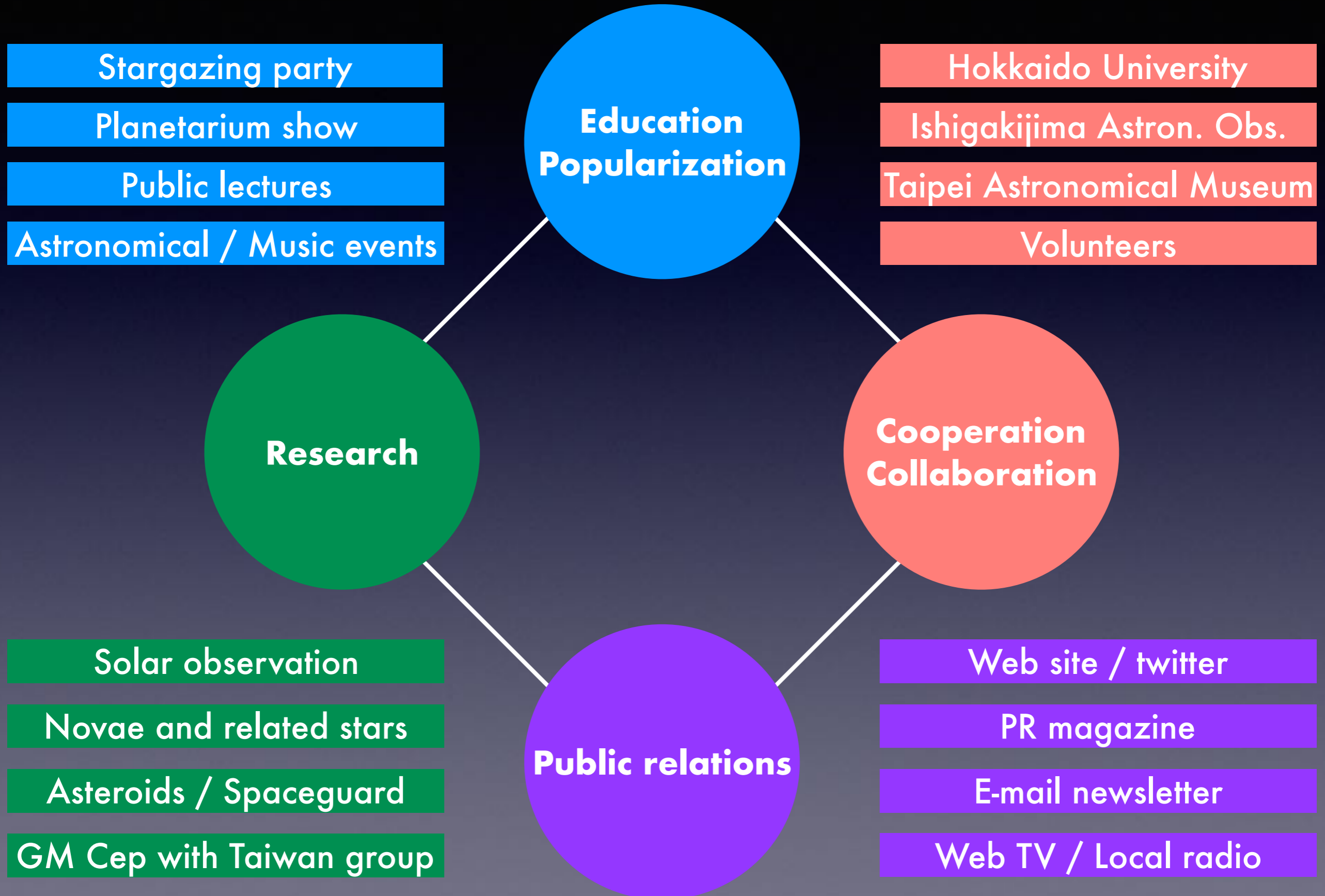
Naito, Watanabe et al. 2015, ATel 9891

V1655 Sco

CBAT TOCP (PNV J17381927-3725077) report



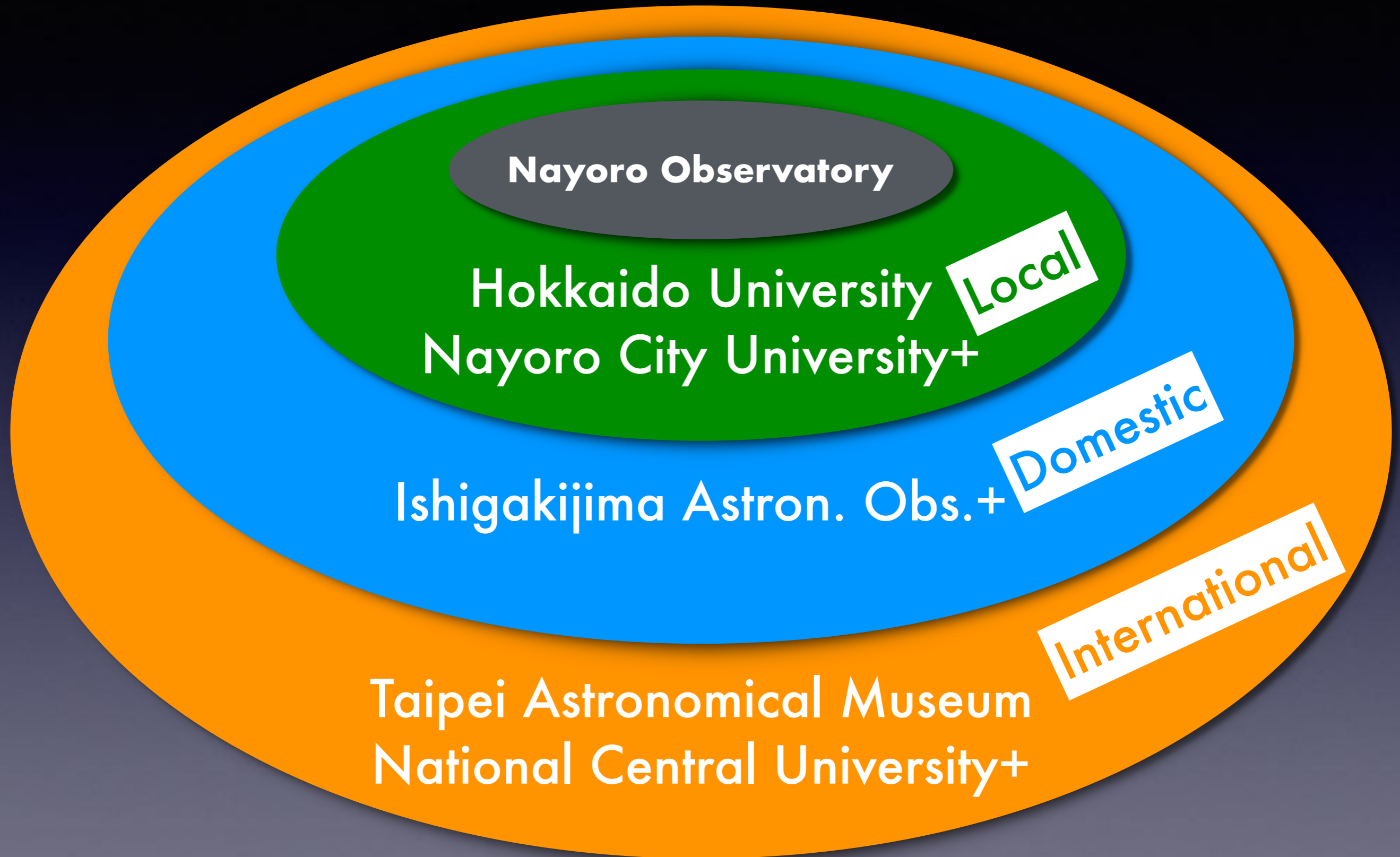
1-4 Activities of Nayoro Observatory



Outline

1. Introduction of Nayoro Observatory
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2-1 Our Collaboration at Every Level



2-2 History of Nayoro Observatory

《Before Nayoro Observatory Era》

1973 Dec Private Kihara observatory was founded
(Mr. Kihara was a H.S. teacher)

1992 Sep Nayoro City started the operation as *public*
Kihara observatory

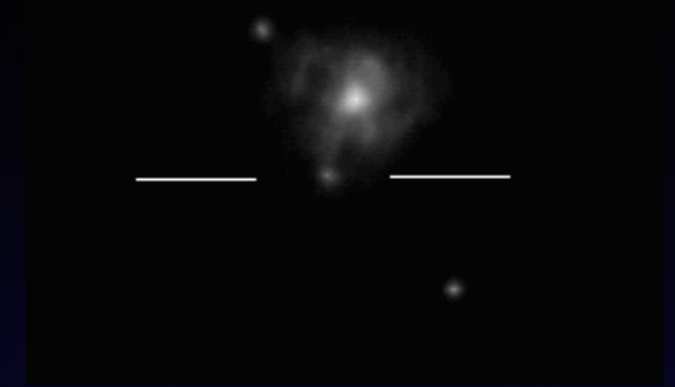
1993 Apr Mr. Sano was disposed at the observatory as a specialist staff

1997 Dec Mr. Sano discovered SN 1997ef (to be identified as the first hypernova)

2002 Started joint research with Hokkaido University

2005 Oct New Nayoro Observatory project was launched

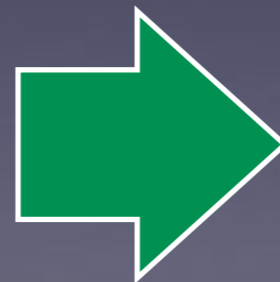
2005 Dec Concluded an agreement on cooperation with Hokkaido University



Supernova 1997ef



Kihara Observatory
(~4,000 visitors/year)



Nayoro Observatory
(~12,000 visitors/year)

2-2 History of Nayoro Observatory

《After Nayoro Observatory Era》

2010 Apr Nayoro Observatory was opened

2011 Apr The 1.6-m Pirka telescope (of Hokkaido Univ.) started to be used

2011 Oct Asteroid search project was started

2014 Feb Concluded an exchange agreement with Ishigakijima Astronomical Observatory (IAO), National Astronomical Observatory of Japan (NAOJ)

2015 Jul Concluded an agreement on education and research with Taipei Astronomical Museum (TAM)

2016 Mar MPC Observatory Code (= Q33) was given

2016 Jun Joined the Asia-Pacific Asteroid Observation Network (APAON)

2017 Jul at present, attend the APRIM 2017 in Taipei



Signing ceremony at Ishigaki



Our honorary director (Mr. Yamada) with TAM members

2-3 Collaboration with Hokkaido Univ.

1.6-m Pirka telescope



◎ Location: $44^{\circ} 22' 25''$ N, $142^{\circ} 28' 58''$ E

◎ Altitude: 161 m

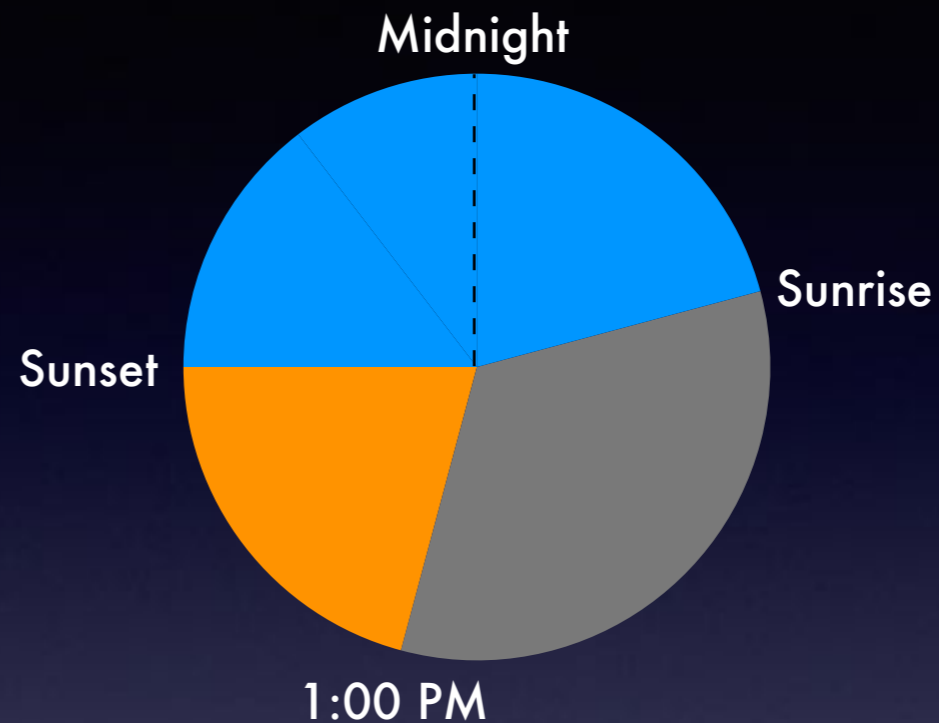
◎ Instruments:

- ▶ MSI (Optical imager)
- ▶ NaCS (Low Spectrograph)
- ▶ NICE (Near-IR Echelle Spectrograph)

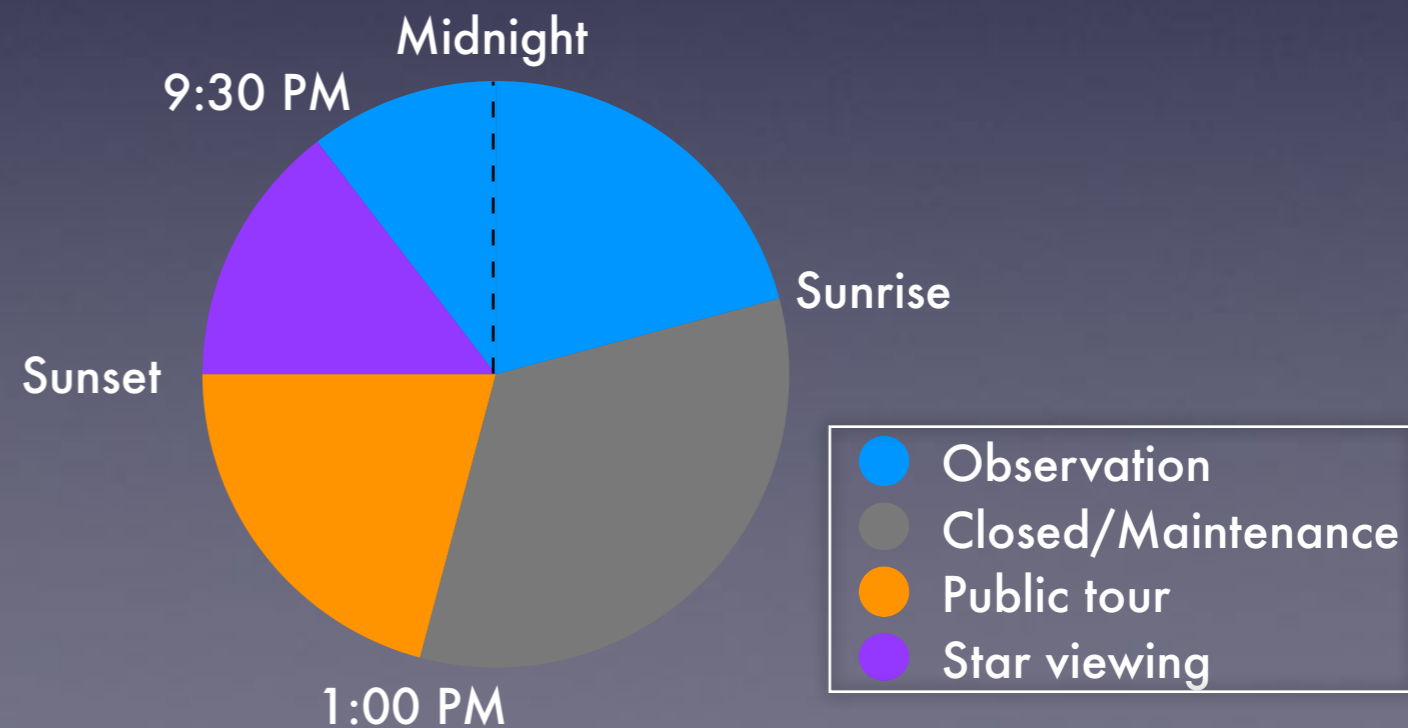
◎ Research fields:

- ▶ Planetary atmospheres
- ▶ Novae & related stars
- ▶ Comets & minor planets, etc.

Tuesday - Thursday



Friday - Sunday



2-3 Collaboration with Hokkaido Univ.

Public Lectures by Members of Hokkaido Univ.



Venus (by Mr. Imai)



Exoplanets (by Prof. Kuramoto)



Itokawa & Ryugu (by Prof. Yurimoto)



Itokawa & Ryugu (by Dr. Tachibana)

2-4 Collaboration with Nayoro City Univ.

Moon Viewing Event by College Students



2015.09.20-17

2-5 Collaboration with IAO

To Know the Difference Between Ishigaki and Nayoro



2-5 Collaboration with IAO

Joint Music Event: Local Folk Song Band from Ishigaki



2016.02.14

2-5 Collaboration with IAO

“Stamp Rally”: Let’s Visit Both of the Observatories



国立天文台 石垣島天文台

北緯 24度37分 東経 124度14分



石垣島天文台は、自然科学研究機構国立天文台、石垣市、石垣市教育委員会、NPO法人八重山星の会、沖縄県立石垣青少年の家、琉球大学の6者の連携によって運営される新しいタイプの天文台です。九州・沖縄では最大の口径 105cm の光学・赤外線反射式望遠鏡、「むりかぶし望遠鏡」を備え、太陽系天体や恒星天体の観測研究、および天文学の広報普及をおこなっています。2006年4月1日より施設公開、天体観望会など一般への公開もおこなっています。



北海道名寄市★

★沖縄県石垣市

みなみじょうじ座

石垣島天文台となよろ市立天文台

2014年2月16日、沖縄県石垣市の国立天文台 石垣島天文台となよろ市立天文台が交流協定を結びました。両天文台の運営には、学術研究機関や地元自治体、市民団体も参加するなどユニークな天文台として知られており、雪と星のまつり、南の島の星まつり、という市民が星と親しむイベントをするなど多くの共通点を持っています。

日本列島の北と南に直線距離で約 3,300km、緯度で 20 度以上も遠く離れているという、両地域特性を生かしながら相互理解に努めつつ、共に連携し地域の文化や観光物産の交流など友好活動を進めます。



なよろ市立天文台 きたすばる

北緯 44度22分 東経 142度28分



なよろ市立天文台では晴天時、「50cm 反射望遠鏡」や国内最大級の口径を誇る北海道大学所有の「1.6m 反射望遠鏡 (愛称: ビリカ望遠鏡)」を利用しての観望を行っています。また、「50cm 反射望遠鏡」では昼間の空でも明るい 1 等星など限定的ですが、観望することができます。併設されているプラネタリウムでは、美しい映像と音響でお空や宇宙についての理解を深めていただけます。また、この天文台の特色は他では類を見ない「星と音楽」のコラボレーションです。

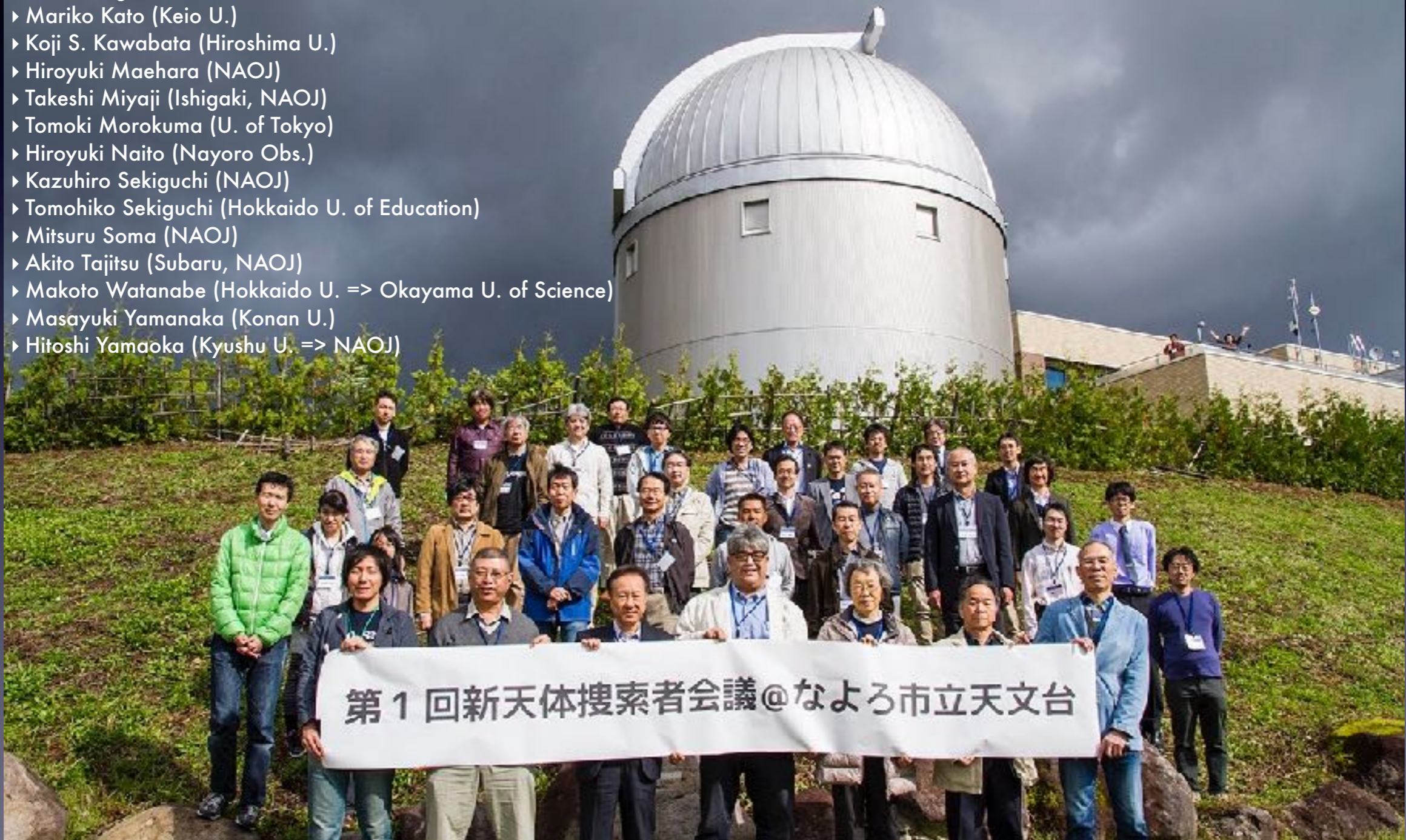
2-6 Collaboration with Amateur Astronomers

Stella Nova 2015 – Searching for New Stellar Objects

Invited speakers

- ▶ Arai Akira (Kyoto Sangyo U.)
- ▶ Koichi Itagaki
- ▶ Mariko Kato (Keio U.)
- ▶ Koji S. Kawabata (Hiroshima U.)
- ▶ Hiroyuki Maehara (NAOJ)
- ▶ Takeshi Miyaji (Ishigaki, NAOJ)
- ▶ Tomoki Morokuma (U. of Tokyo)
- ▶ Hiroyuki Naito (Nayoro Obs.)
- ▶ Kazuhiro Sekiguchi (NAOJ)
- ▶ Tomohiko Sekiguchi (Hokkaido U. of Education)
- ▶ Mitsuru Soma (NAOJ)
- ▶ Akito Tajitsu (Subaru, NAOJ)
- ▶ Makoto Watanabe (Hokkaido U. => Okayama U. of Science)
- ▶ Masayuki Yamanaka (Konan U.)
- ▶ Hitoshi Yamaoka (Kyushu U. => NAOJ)

October 2-4, 2015



- ▶ To promote collaboration between professional and amateur astronomers.
- ▶ A total of 53 participants joined the meeting.


2-7 Collaboration with TAM

Live Stream Images of Solar Eclipse on March 9, 2016

Partial Solar Eclipse 2016 March 9

Nayoro Observatory (Japan)

Partial solar eclipse (Nayoro Observatory) LSTREAM

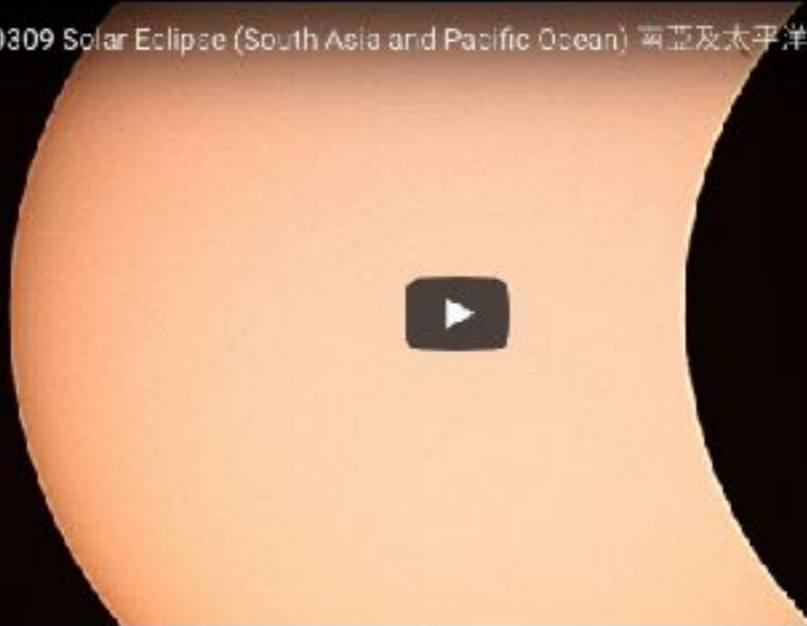


2012年5月21日の部分日食

	Time		Azimuth	Altitude
	JST	IST		
Sunrise	5:51:08	4:51:08		
Start	10:44:04	9:44:04	161.6	39.5
Maximum (eclipse magnitude: 0.114)	11:21:07	10:21:07	173.5	41.1
End	11:58:07	10:58:07	185.8	41.1
Sunset	17:30:16	16:30:16		

Taipei Astronomical Museum (Taiwan)

20160309 Solar Eclipse (South Asia and Pacific Ocean) 南亞及太平洋地... 🔔 📄



	Time		Azimuth	Altitude
	JST	IST		
Sunrise	7:07:22	6:07:22		
Start	9:19:38	8:19:38	110.2	28.0
Maximum (eclipse magnitude: 0.309)	10:14:55	9:14:55	119.5	39.4
End	11:15:18	10:15:18	134.2	50.4
Sunset	19:01:59	18:01:59		

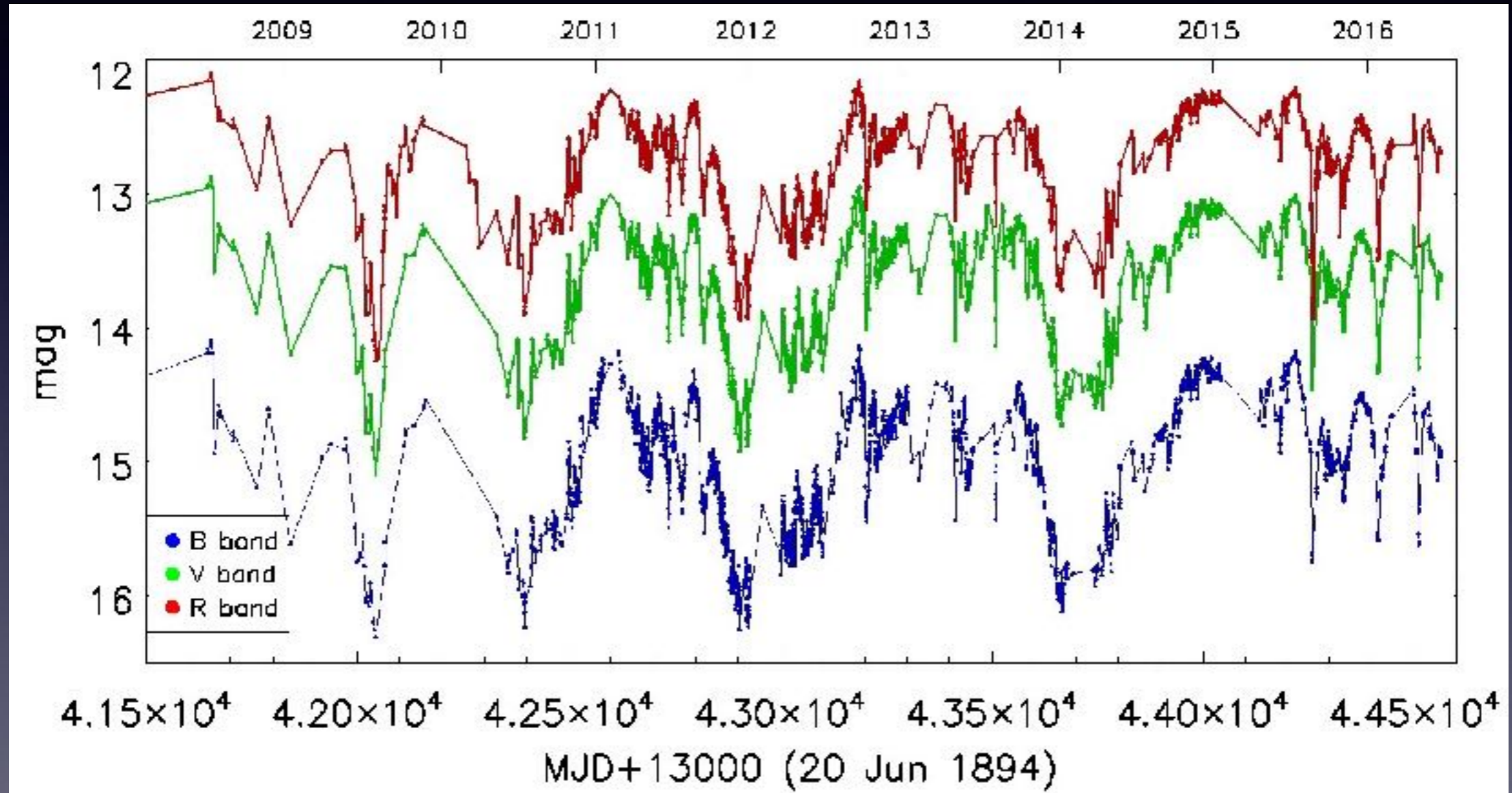
Mail : kitasubaru@nayoro-star.jp

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2-8 Collaboration with Taiwan Group

Joint Observation for GM Cephei

GM Cep is a UX Ori type variable star which seems to be a young star with a proto-planetary disk, showing light variation of ~ 1 -2-mag irregularly.



Light curve of GM Cep (by Po-Chieh Huang)

Photometry (B,V,R): 109 nights
Polarization: 48 nights

Visit P2-21 poster for details

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Summary

Nayoro Observatory is a public observatory located in Nayoro, Hokkaido, Japan, which is operated by Nayoro City. Due to collaboration with educational and research institutions at every level, we are successfully developing various activities so as to achieve over 10,000 visitors a year.

Local level: A key collaboration is with **Hokkaido University**. We are sharing machine time of the 1.6-m Pirka telescope for star gazing parties and scientific observations. Visitors can enjoy viewing stars through the Pirka telescope with high priority at every weekend night.

Domestic level: In the collaboration with **Ishigakijima Astronomical Observatory**, the long distance apart between Ishigaki and Nayoro gives us advantages to perform location-dependent observations and to hold cross-cultural events.

International level: Collaboration with **Taipei Astronomical Museum** and **the Taiwan group** produced many results on both education and research. We are continuously developing international activities in the future.

Thank you