Status Report of GSI

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国土地理院

- Four stationary VLBI antennas

  - Japanese Domestic sessions scheduled, observed, and correlated by GSI

  - Three stations terminated an operation by 2015

  - **Tsukuba 32-m antenna was dismantled in 2017.**

- **Ishioka 13-m antenna**

  - in operation since 2015

Shintotsukawa 3.8-m

Ishioka 13-m

Tsukuba 32-m

Aira 10-m

Chichijima 10-m

Tsukuba 32-m antenna

Diameter	32 m
Frequency Range	S/X/K
SEFD (S/X)	400 Jy / 300 Jy
Slew Rate	3 deg/s
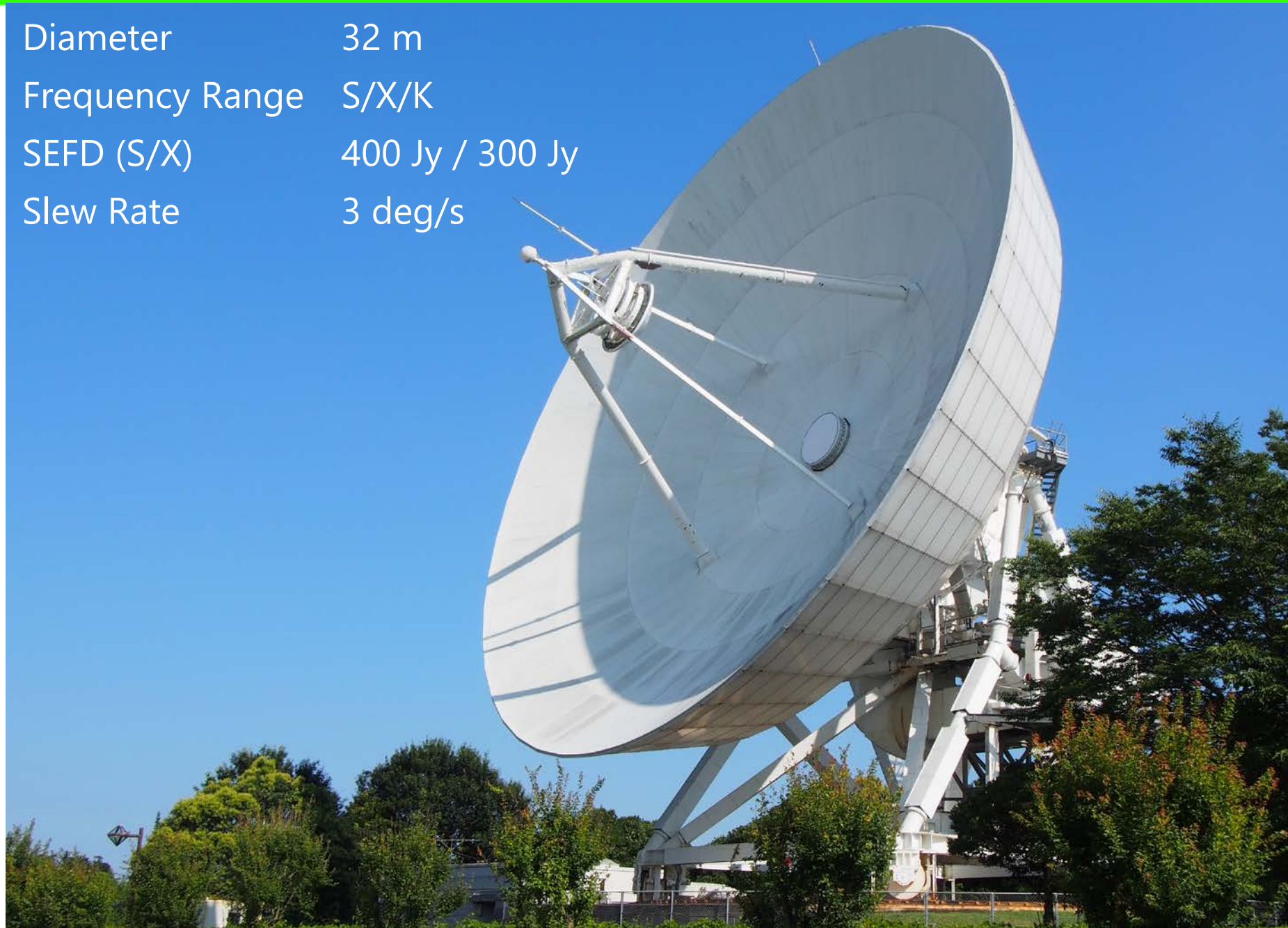
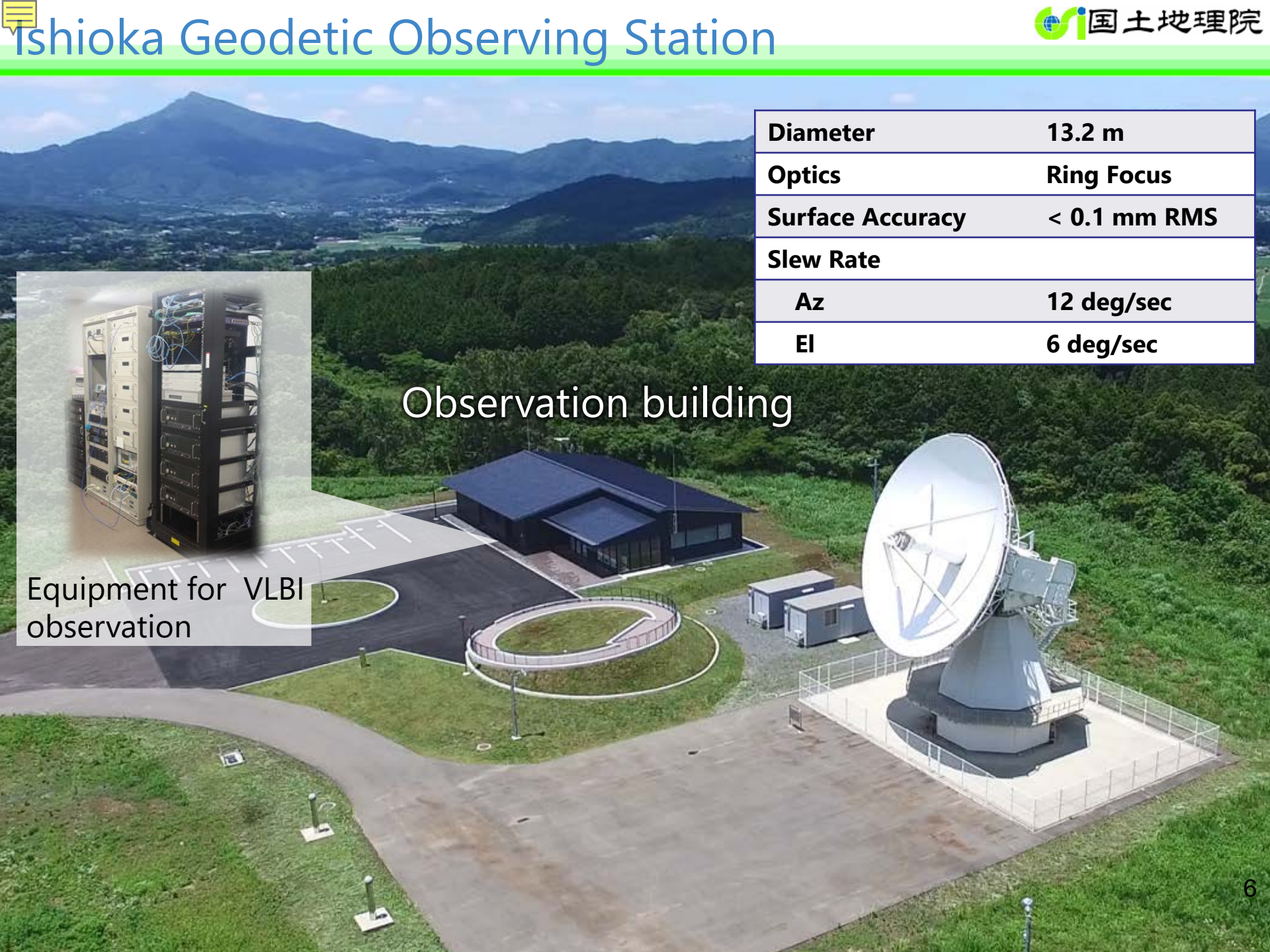- Tsukuba 32-m antenna participated in more than 2,600 sessions for 18 years.

- Date: Jan. – Mar. 2017

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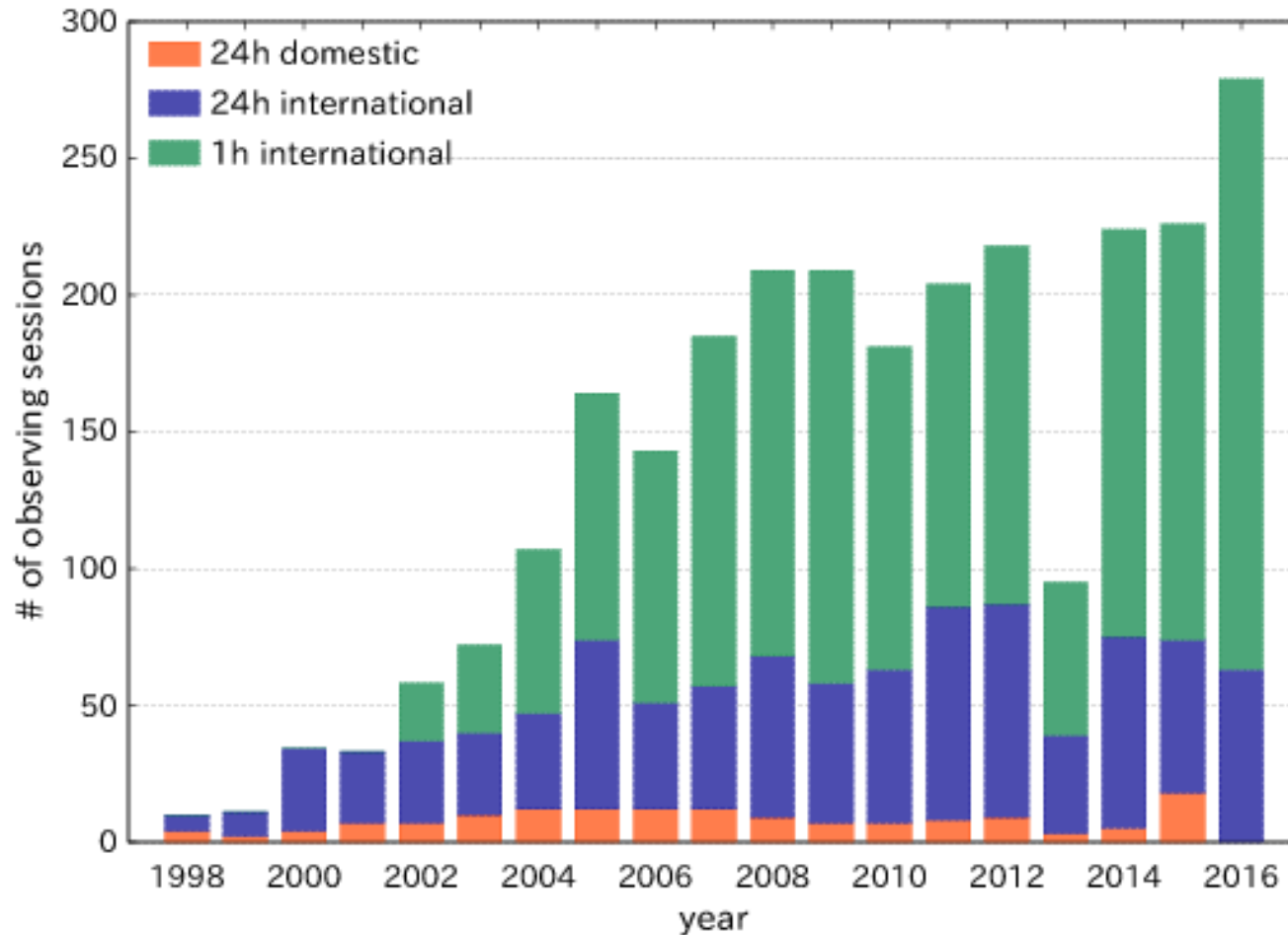
Diameter	13.2 m
Optics	Ring Focus
Surface Accuracy	< 0.1 mm RMS
Slew Rate	
Az	12 deg/sec
El	6 deg/sec

Observation building

Equipment for VLBI observation

Gravity measurement facility

GNSS observation stations

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Ishioka

Tsukuba (GSI)

Kobe

Tokyo

Kashima

8

Ishioka Operation Timeline
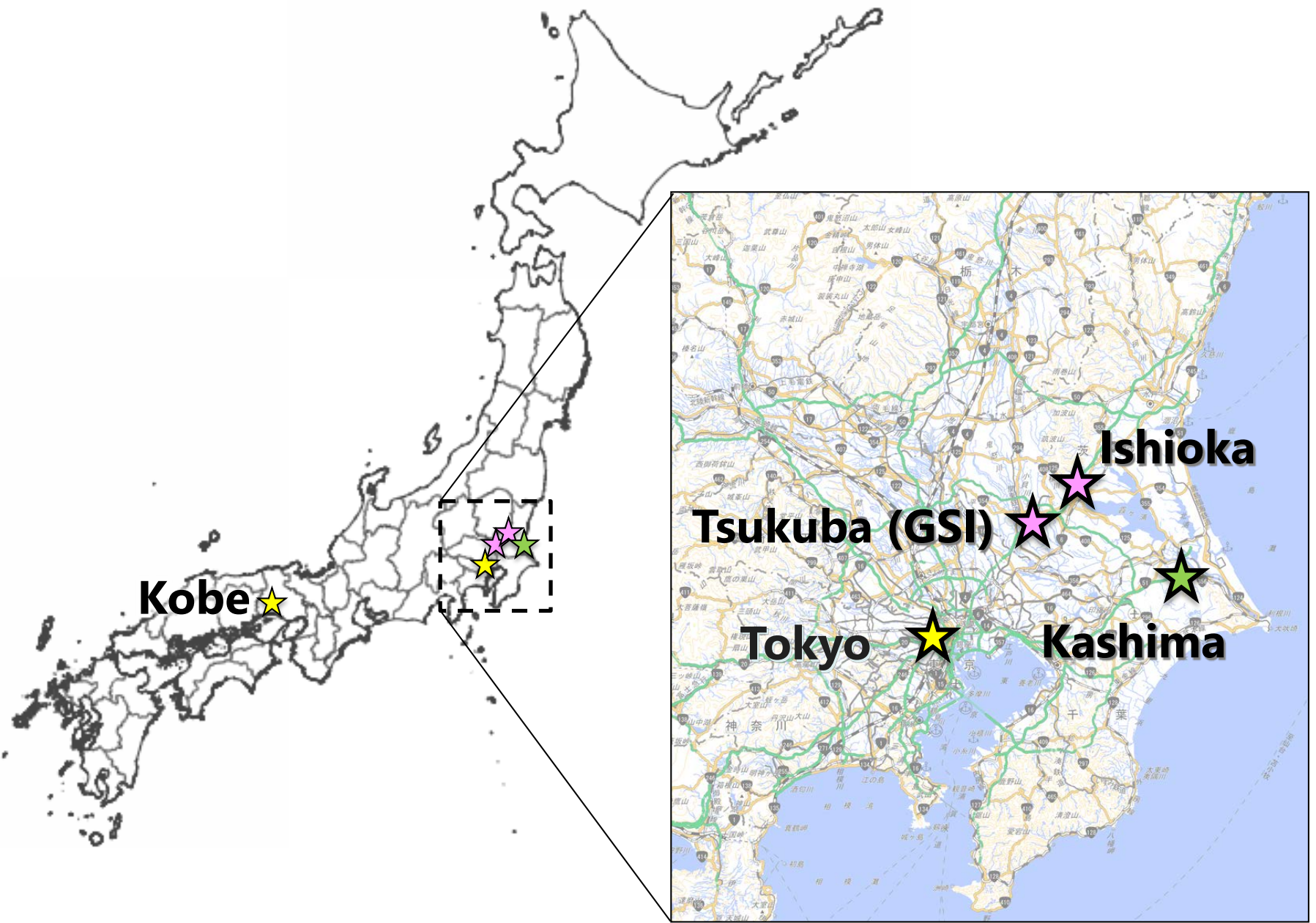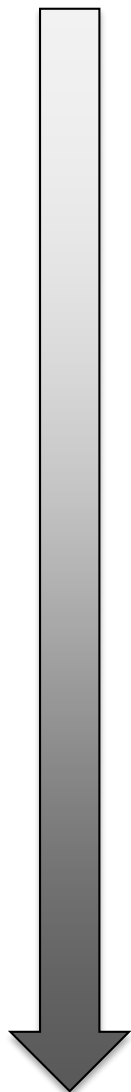
Year	Month	Topic	Operation
2014	Mar	Antenna Complete	Initial test
2015	Feb	Operation Start	Broadband test S/X / Broadband test S/X
2016	Feb	Building Complete	Interruption S/X Broadband
	Aug Sep	VGOS Trials	
2017	Jan	Regular Intensive Session Start	S/X
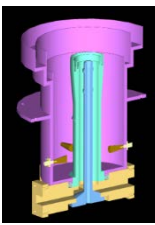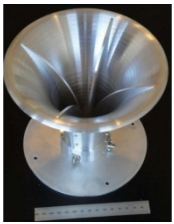
Legacy S/X-band observations compared with GNSS.

The GNSS data are adapted for the comparison by adding the tie vectors in both sites.
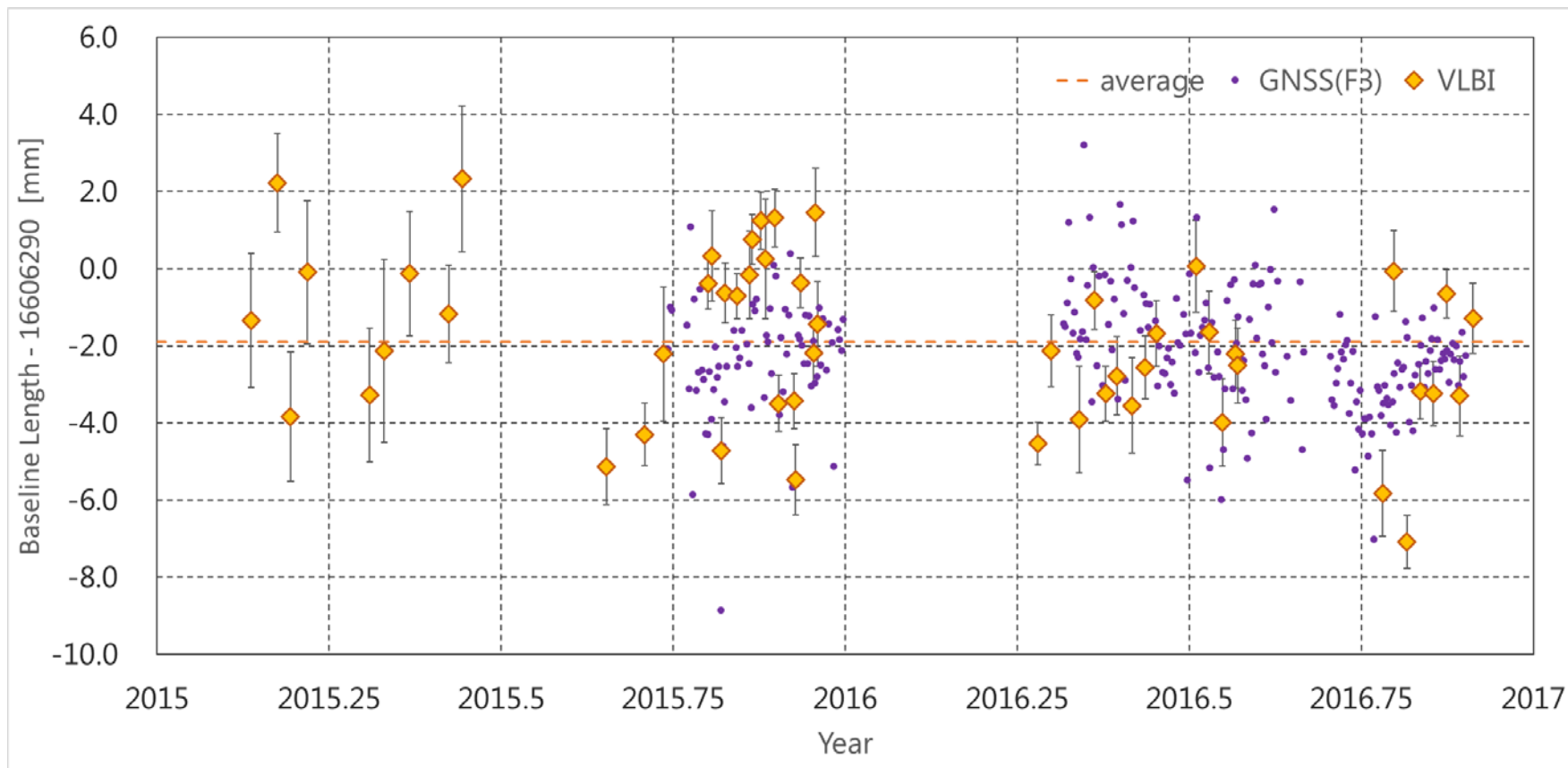
→ VLBI results are consistent with GNSS results.

	S/X		Broadband	
Feed	Tri-band		QRFH **NEW**	
Converter	Down Converter	**Up-down Converter** **NEW**		
Sampler	ADS3000+	**K6/iDAS** **NEW**	ADS3000+	**K6/iDAS** **NEW**
Recorder	K5VSI		K5VSI	

11

Date	Experiment	Frontend	Backend	Mode	Fringe
Aug. 6, 2016	BB Test with Kashima	QRFH	ADS3000+	8 Msps x 16 ch	Yes
Aug 9, 2016	BB test with Hobart, NICT	QRFH	GALAV(NICT)	2 Gsps x 4 bands	Yes
Aug. 11, 2016	Trial VGT003	QRFH	ADS3000+	64 Msps x 8 ch x 2 pol x (3) band	Failed
Aug. 18, 2016	Mixed Fringe with Tsukuba	QRFH	ADS3000+	64 Msps x 16 ch	Yes
Aug. 23, 2016	BB with Compact Antenna	QRFH	GALAV(NICT)	2 Gsps x 4 bands	Yes
Aug. 30, 2016	Trial VGT004	QRFH	ADS3000+	64 Msps x 8 ch x 2 pol x (3) band	Yes
Sep. 20, 2016	Trial VGP001	QRFH	ADS3000+	64 Msps x 8 ch x 2 pol x 4 band	Yes

We confirmed the broadband equipment worked well.

- 2017

  - Continue legacy S/X-band observations

    R1, R4, AOV, T2, APSG and Intensives

  - Broadband experiments as well

    Ishioka will participate in CONT17 as a VGOS station

- Near future (2018~)

  - Ishioka will basically continue S/X, but number of VGOS sessions will increase gradually.

  → **Taking over the 18-year history of Tsukuba**

  → **Transit to VGOS keeping pace with overseas stations**

- Involved in almost all AOV sessions so far
- Also assigned as scheduler and correlator

DATE	Stations	Sked.	Corr.
2015/03/21	AiHb**Is**K1KeKgKmSh**Ts**WwYg –Ur	UTAS	SHAO
04/30	Hb**Is**KeKvSy**Ts**VmWwYg	**GSI**	**GSI**
05/17	HbHo**Is**KeKmT6**Ts**WwYg -K1KgPaVm	UTAS	**GSI**
08/26	**Is**KeKvSh**Ts**Yg –HbKbWw	SHAO	SHAO
09/26	**Is**KbKeKg**Ts**VmWwYg -HoK1Ur	**GSI**	**GSI**
12/16	Hb**Is**KbKeKmKv**Ts**UrWwYg –Sh	SHAO	SHAO
2016/02/02	HoK1KeKgKm**Ts**UrYg –HbSyWw	**GSI**	**GSI**
03/16	HbKbKeKv**Ts**UrVmWwYg	UTAS	SHAO
05/11	Hb**Is**K1KmKv**Ts**UrWw –KeKgYg	**GSI**	**GSI**
07/27	Ho**Is**K1KeKgKmPaShT6**Ts**UrWwYg –Hb	SHAO	SHAO
09/20	HbK1KeKgKmKvSh**Ts**UrVmWwYg	UTAS	**GSI**
10/12	HbK1KeKgSh**Ts**UrVmWwYg –Is	SHAO	SHAO
2017/01/16	HbK1KeKgKmKvSyUrVmYg –ShWw	**GSI**	**GSI**
03/21	HbKeKmKvShUrVmWwYg	UTAS	SHAO
04/11	Hb**Is**KeKmKvShUrVmWwYg	**GSI**	**GSI**
06/20	Hb**Is**KbKeKmKvShT6UrWwYg	SHAO	SHAO

Ishioka will be involved in AOV sessions,

- as **legacy** station

  → keeping connection to VGOS stations

- as **VGOS** station

  If you will participate in CONT17 as VGOS station, would you like to carry out a broadband experiment with us?

Summary

- Tsukuba 32-m antenna was dismantled this year.

- Ishioka station has performed international observations since 2015 and takes over the role of Tsukuba station.

- Ishioka station succeeded in the international VGOS experiments with two stations in the AOV region (Kashima and Hobart) last year.

- GSI will be involved in the AOV sessions as both legacy and VGOS station.

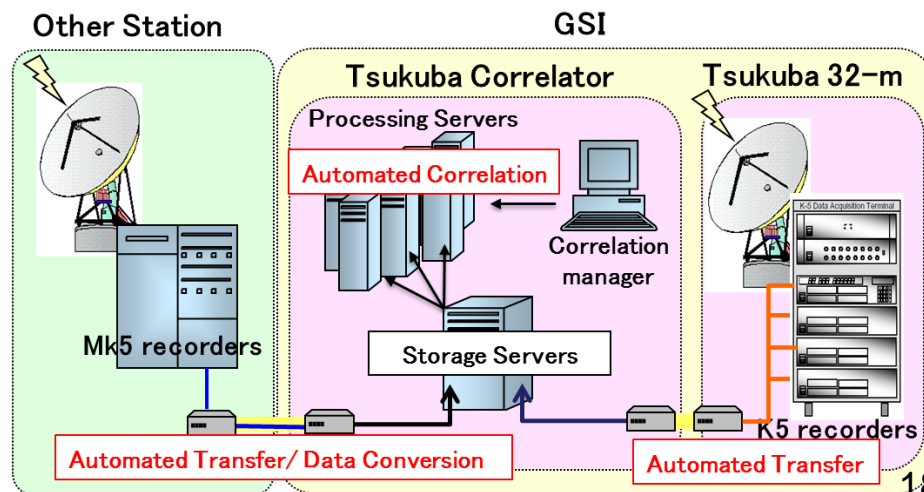Thank you so much for your kind attention.

Tsukuba Correlator (1998~) and Analysis Center (2009~)

- Using
  - 66 servers, >500 TB storage
  - 10 Gbps network (Maximum)
  - K5 software Correlator (NICT)
  - Well Automated System
  - C5++ for automation analysis
  - Calc/Solve for final products

- Processing
  - INT2s in every weekend
  - JADE (Japanese domestic sessions)
  - Some AOV sessions

Other Station   GSI

Tsukuba Correlator   Tsukuba 32-m

Processing Servers

Automated Correlation

Correlation manager

Mk5 recorders

Storage Servers

K5 recorders

Automated Transfer/ Data Conversion   Automated Transfer

18

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- Four stationary VLBI antennas
  - Japanese Domestic sessions
  - scheduled, observed, and correlated by GSI
- Construction of Ishioka antenna (2014)
- Operations of regional antennas were terminated (2015).
  - Shintotsukawa (Dec. 2013)
 - Aira and Chichijima (Mar. 2015)

Shintotsukawa 3.8-m

837 km

Tsukuba 32-m

996 km

Aira 10-m

1,020 km

1,239 km

Chichijima 10-m

GSI's telescopes

- **Until March 2015**

Tsukuba 32-m + Three Regional Telescopes

- **From April 2015**

Tsukuba 32-m + Ishioka 13-m

	Tsukuba	Ishioka
Diameter	32 m	13 m
Slew rate	3 deg/s	12 deg/s
Frequency	2, 8 GHz	2-14 GHz
Optics	Cassegrain	Ring Focus
SEFD(S/X)	360/320 Jy	1700/1300 Jy
Operation	1998-	2014-
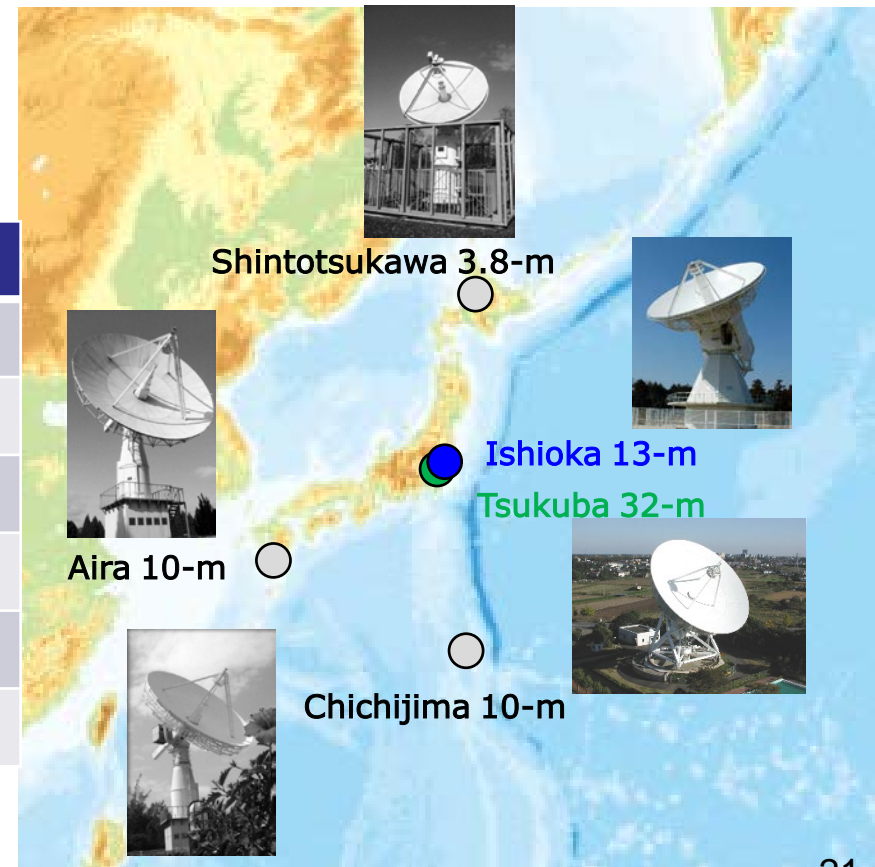
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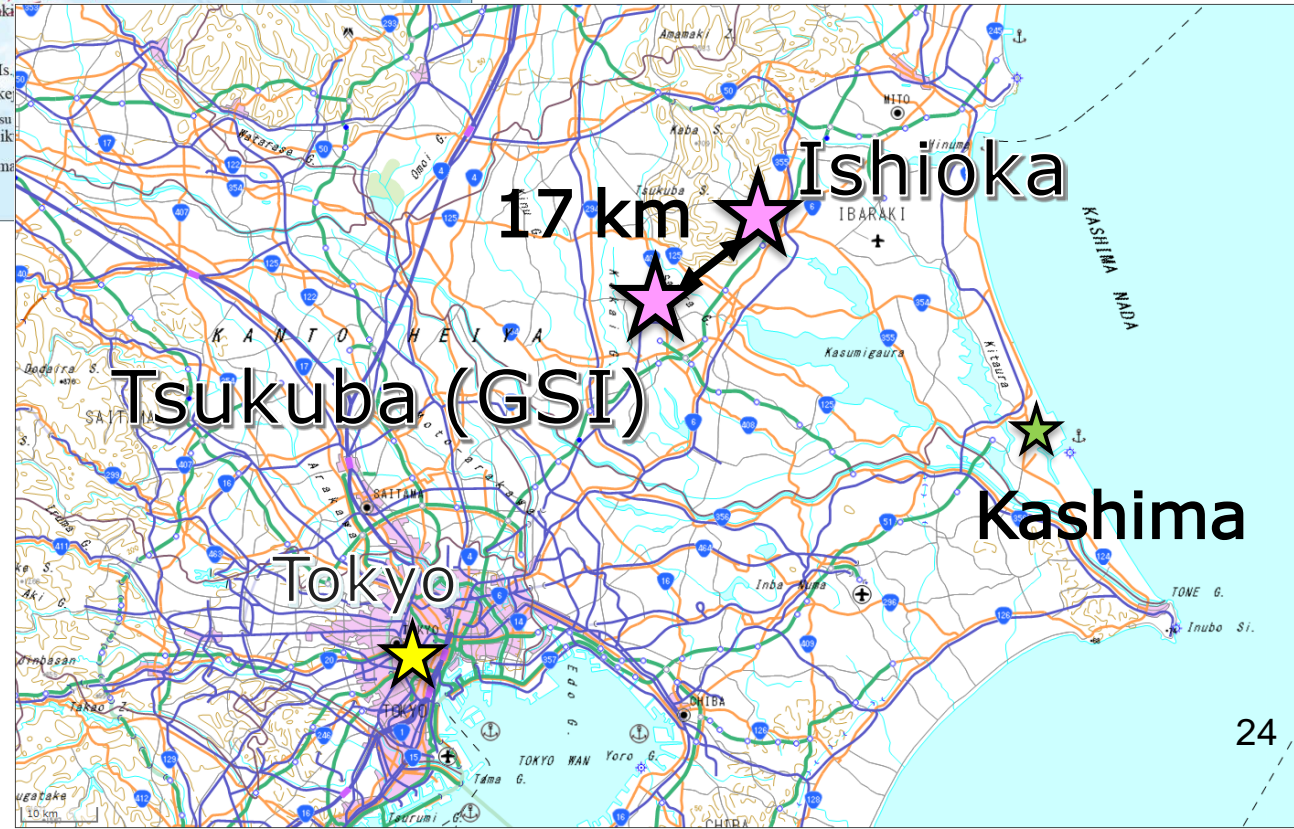
Aira 10-m

Chichijima 10-m

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    scheduled, observed, and

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  - Three stations terminated

    operation by 2015

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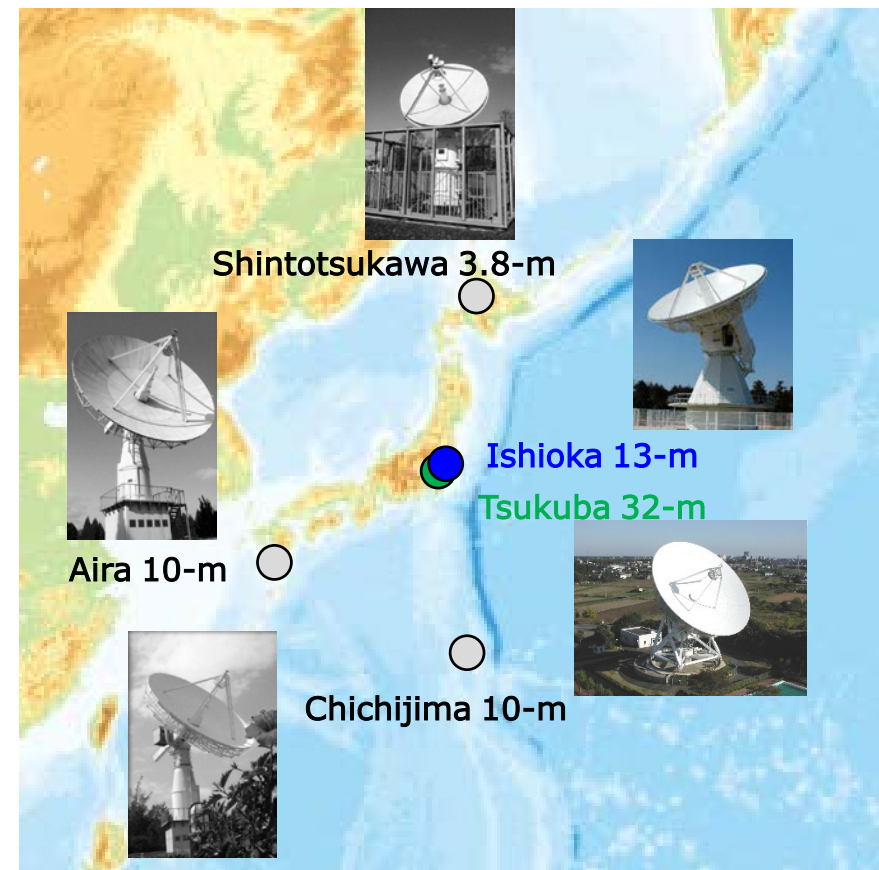
- November 28 – December 12

- Three different station networks

  – The difference of the network coordinate

  – The difference of the data rete

Kobe

Kyoto

Tokyo

17 km

Ishioka

Tsukuba (GSI)

Kashima

Tokyo
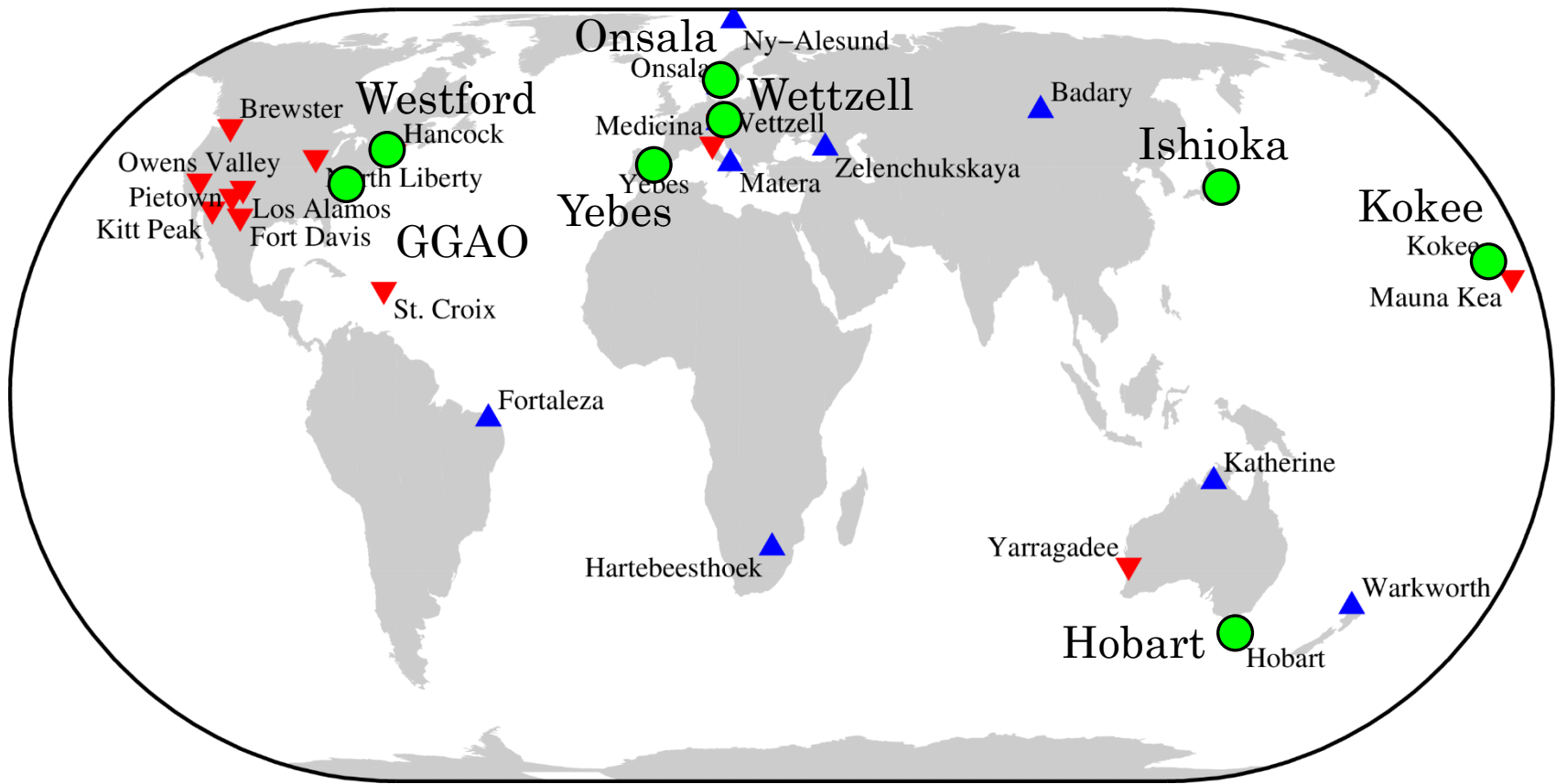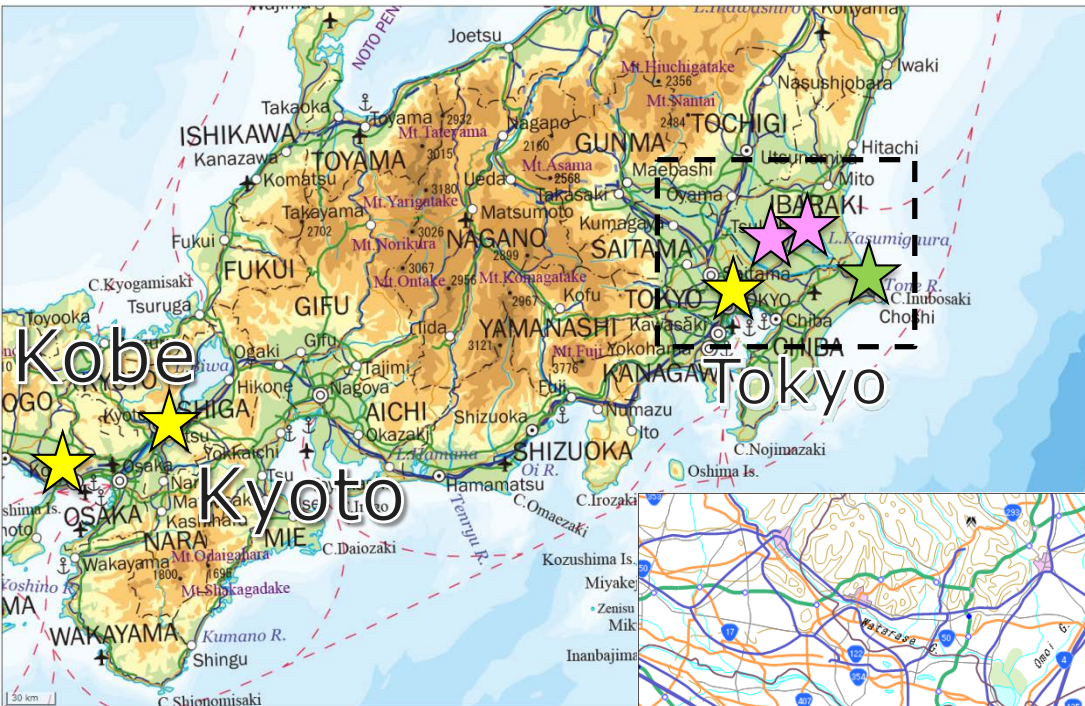
Up-down Converter for Ishioka

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UDC

RF (VH)

IF (VH)

Ref 10 MHz

Control Unit
2nd LO=
13.696 x2 GHz (USB)
15.232 x2 GHz (LSB)

Conversion Unit 1
1st LO =15.44-26.416 GHz
(synthesizer)
BPF=28.428-29.428 GHz

Conversion Unit 2

Conversion Unit 3

Conversion Unit 4

2nd LO= 27.4 GHz (USB)
2nd LO= 30.4 GHz (LSB)

IF

USB

LSB

BPF(28.4-29.4 GHz)

RF

1st LO= 28.4 − f GHz

1 GHz   2 GHz   f   14 GHz   Frequency