

Activity report of NIPR

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M. Nakamoto⁴ and K. Shibata⁴

1: National Institute of Polar Research & SOKENDAI

2: The 56th Japanese Antarctic Research Expedition

3: The 57th Japanese Antarctic Research Expedition

4: The 58th Japanese Antarctic Research Expedition



NiPR
National Institute of Polar Research



国立極地研究所
大学共同利用機関法人 情報・システム研究機構

Japanese Antarctic Research Expedition (JARE)

- National Institute of Polar Research (NIPR) manages Japanese Antarctic Research Expedition (JARE). JARE continues many observations in the East Antarctica around Syowa Station which is the main base for JARE' activities.



IN SYOWA STATION

JARE

J
A
R
E

Winter team

from end of Nov. to end of Mar. + 1yr (about 16 months)

(Nov. 27, 2013 -- Mar. 17, **2015** in the case of JARE55)

Fremantle, Australia - (Syowa Station) - Sydney, Australia

24 persons (JARE55)

Leader, Researcher(9), Engineer(10), Doctor(1), Cook(1), FA(1)

Affair (1)

28 (JARE51), 30 (JARE52), 31 (JARE53), **30 (JARE54)**

Summer team

from end of Nov. to end of Mar. (about 4 months)

(Nov. 27, 2013 -- Mar. 17, **2014** in the case of JARE55)

Fremantle, Australia - (Syowa Station) - Sydney, Australia

39 persons (JARE55)

Government employees

※ Japanese government pays their travel expenses.

Observer team

Same as Summer team

13 persons (JARE55)

Journalist, teacher, engineer, Pilot (helicopter), Foreigner

※ Observers have to pay own travel expenses.

Nongovernment employees

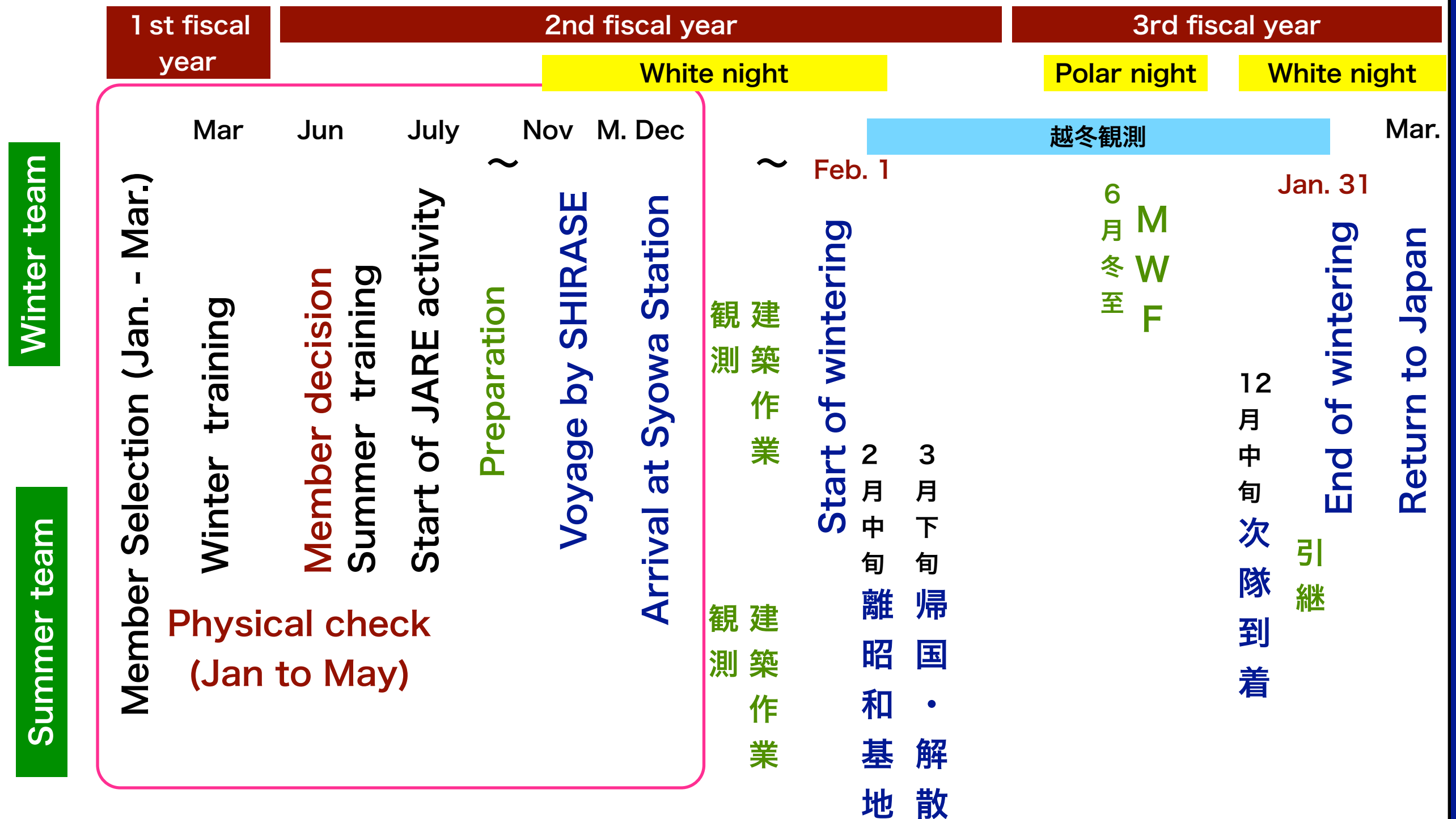


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Schedule of JARE

JARE (Japan Antarctic Research Expedition)



All supplies (for observation and life)
are loaded on Shirase in Mid. of Oct.

Supplies will return to
Japan in Mid. of Apr.

Access to Syowa Station

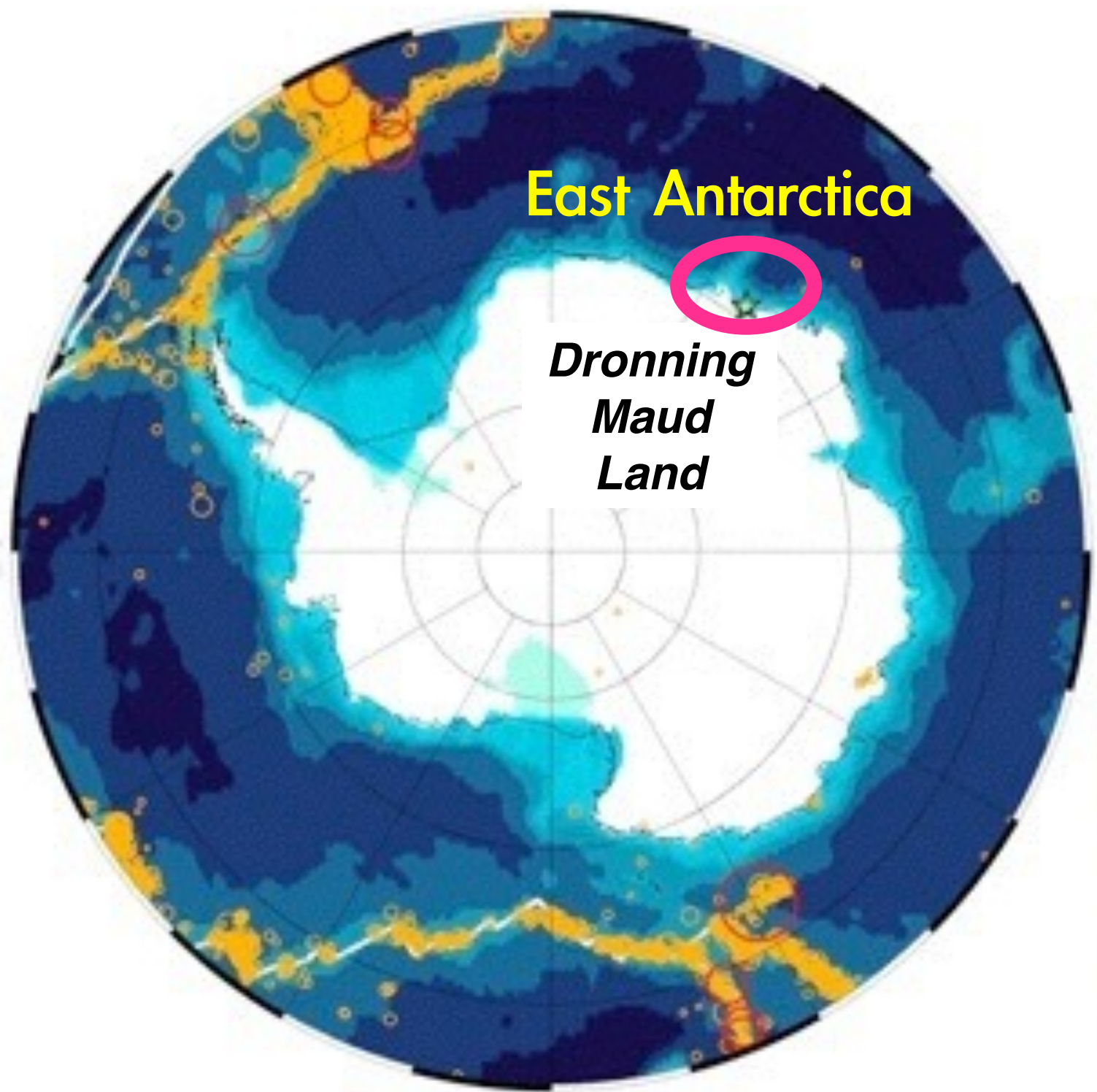
Ice Breaker “ SHIRASE ”
operated by **Japan Maritime Self-Defense Force (JMSDF)**.
About 170 crews go aboard Shirase.



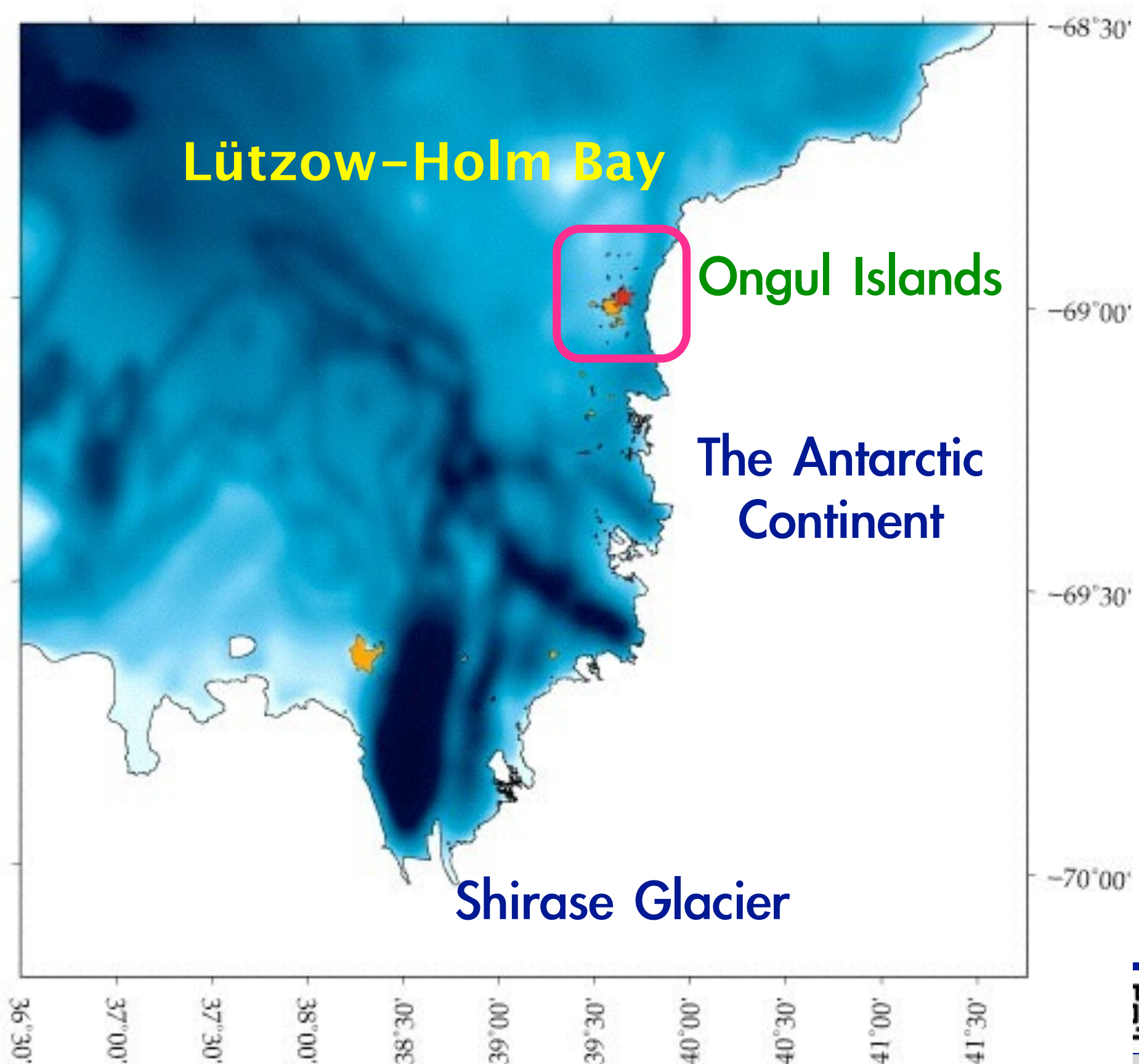
Access to Syowa Station



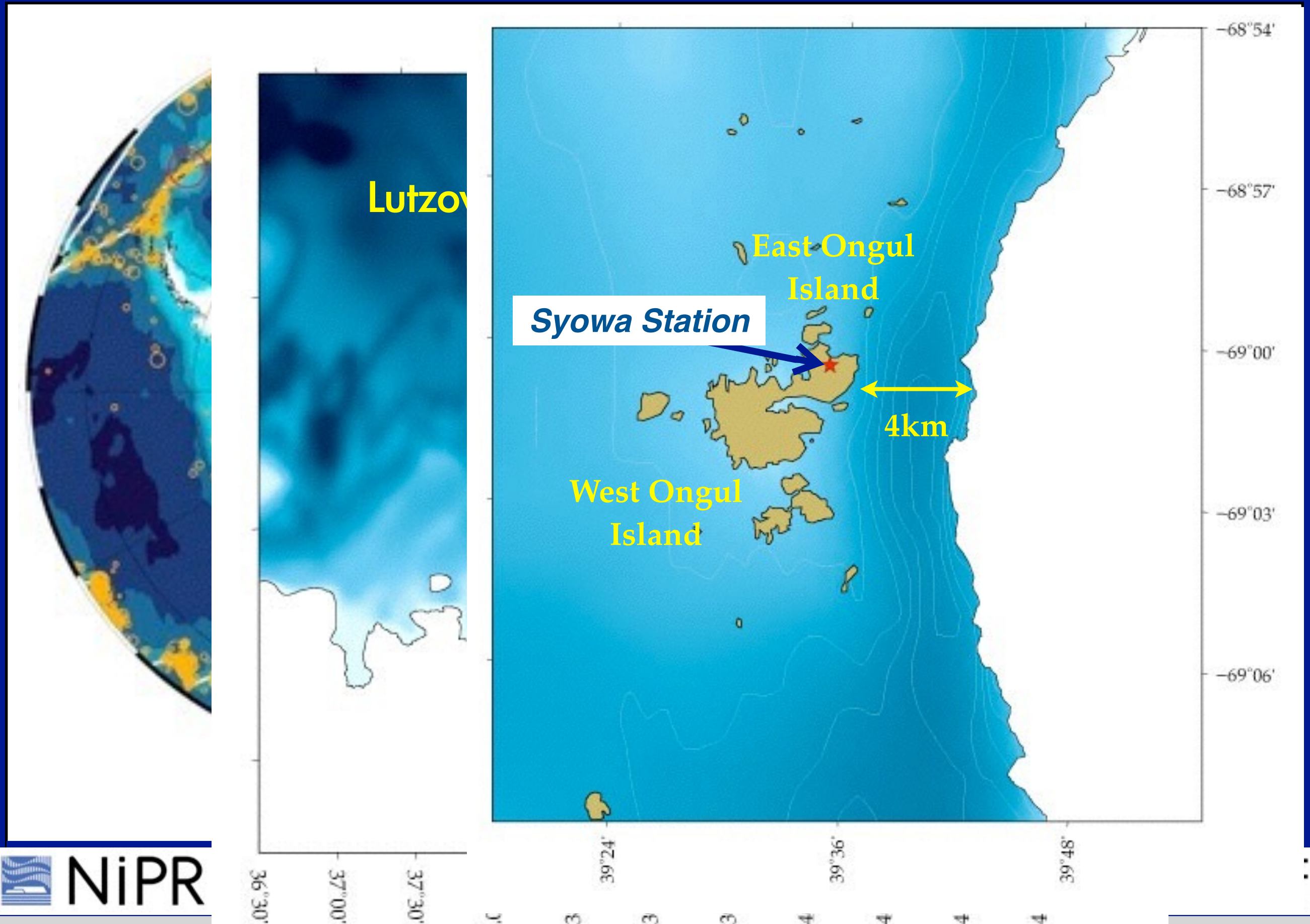
Location of Syowa Station



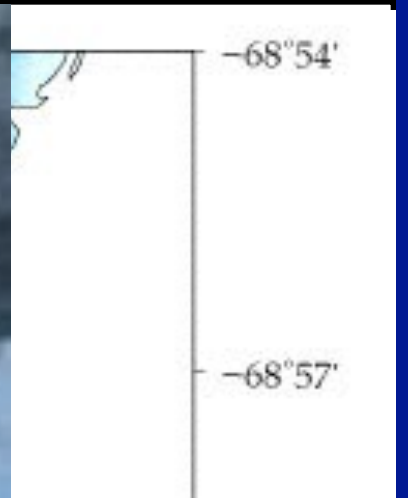
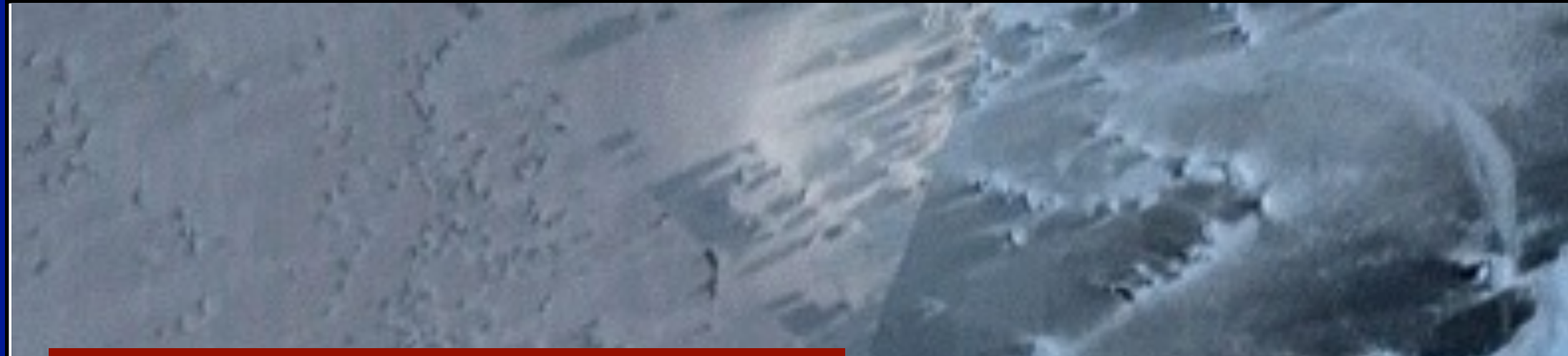
Location of Syowa Station



Location of Syowa Station



Location of Syowa Station



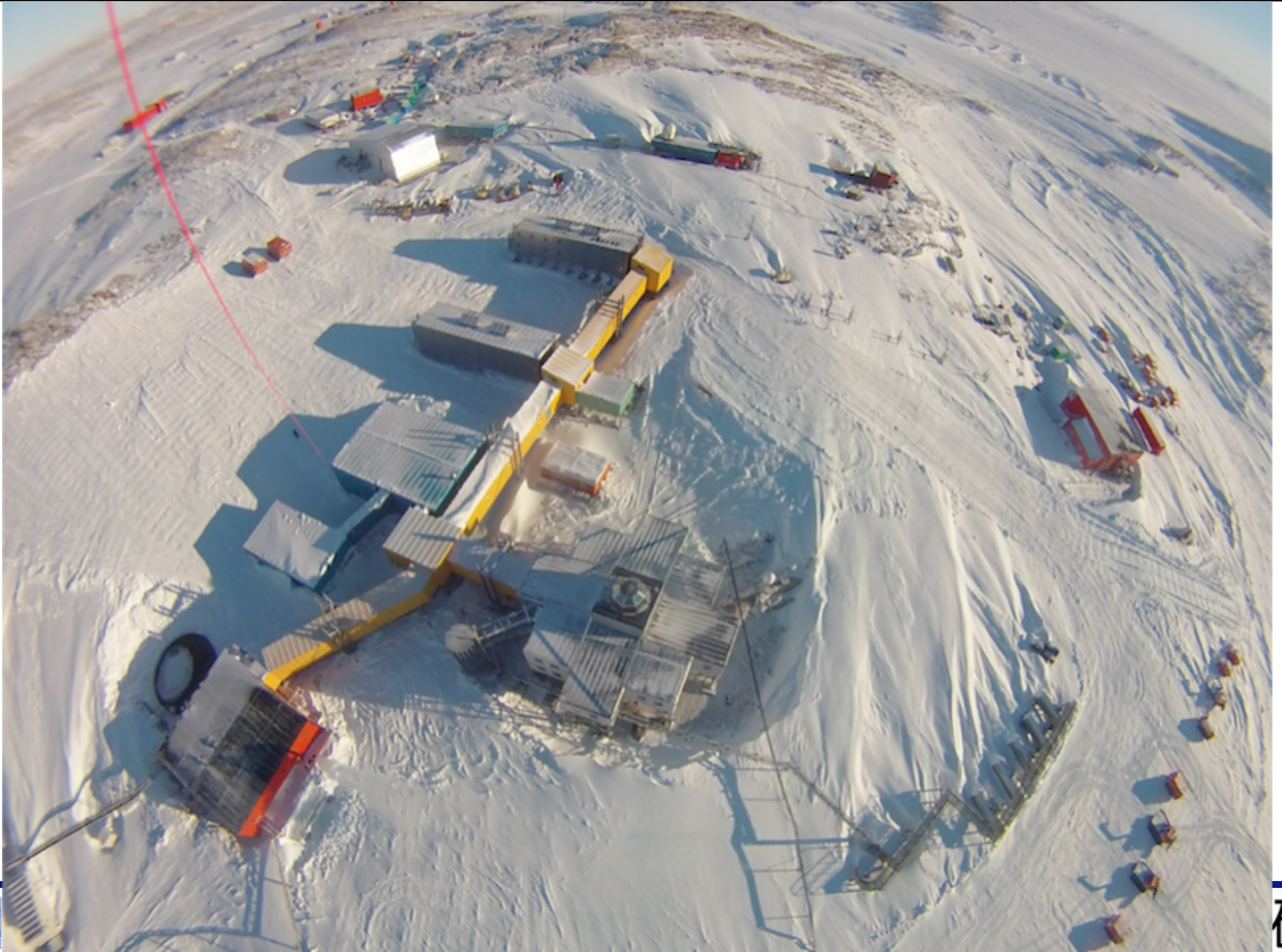
Syowa Station, E



4.38 km

撮影日: 2006/2/14

Syowa Station in winter



Sea

Syowa Station, East Ongul Island

Sea

**Bare rock
(Base rock with little sediment layer)**

Sea

- **300kVA diesel cogeneration system
(Electricity, fresh water, public bath, heating...)**
- **About 70 buildings**
- **Always-on internet connection by INTELSAT
(speed: < 3Mbps)**

Geodetic measurements at Syowa Station, East Antarctica

Three space geodetic observations with VLBI, GNSS and DORIS have been carried out since the 1990s. We have also conducted repetitive absolute gravity measurements with FG-5 and temporal gravity change measurements with three serial superconducting gravimeters (SG) since early 1990s. For monitoring ocean tides and sea level, tidal observation with bottom pressure gauges has been continuing since 1976.



DORIS



Met.

① DORIS

Snow accumu.

⑥ CR

② VLBI

Seis.

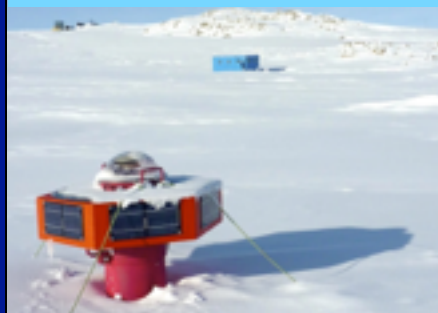
③ IGS-SYOG

④ Gravity

Corner-cube Reflector

⑥ CR

**⑤ Tide gauge/
GPS buoy**



**VLBI
11-m antenna**



IGS-SYOG



**Gravity
measurements
with SG & FG5**



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Monument name	Offset vector (m)		
	dx	dy	dz
GPS IGS (SYOG)	0	0	0
VLBI	13.714	-120.574	-24.362
DORIS tower (SYOB)	-291.082	15.929	-85.889
DORIS pillar (SYPB)	-298.055	23.376	-89.987
Absolute Gravimetry (IAGBN(A))	28.448	-71.868	-17.129
Bench Mark 1040 (tide gauge tie point)	-416.634	563.293	-14.029

(after Shibuya et al. 2005)

VLBI IERS DOMES Number 66006S004

【History】

- 1989 : 11-m S/X-band antenna & Radome was constructed.
- 1990 : First VLBI measurement succeeded between Kashima, Tidbinbilla and Syowa.
- 1997 : K4 system and Hydrogen maser were installed.
- 1998 : Regular VLBI measurements started.
- 1999 : Participation in OHIG session
- 2004 : Replacing K4 with K5 system.
- 2020 : VLBI antenna will be demolished.



DORIS

Local tie is performed in 1995, 1999, 2009, (2010), and 2011.

Local tie is planned in 2017/2018 austral season.



VLBI

対重力・SG

CR

CR



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VLBI



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VLBI

対重力・SG

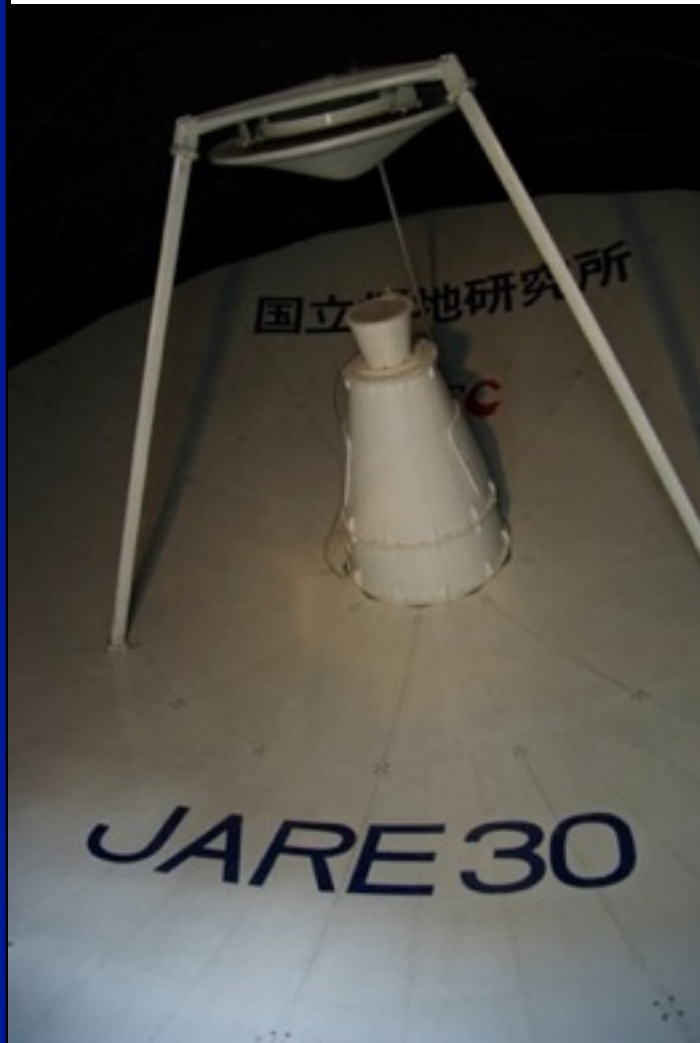
CR

CR

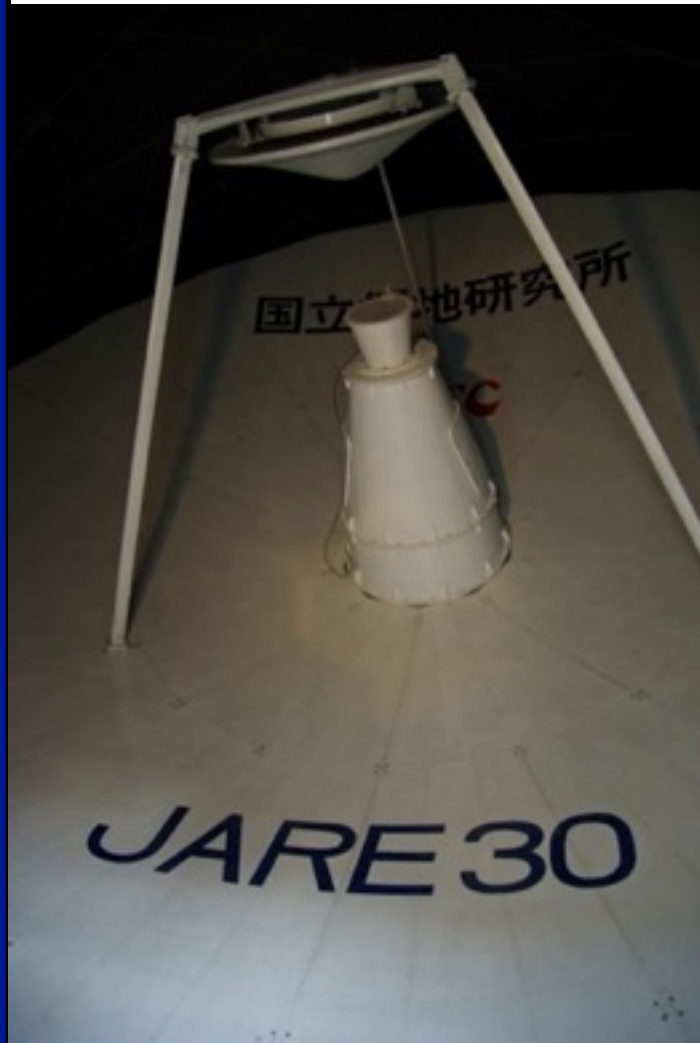


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VLBI Station at Syowa



VLBI Station at Syowa



VLBI system

Antenna : 11-m S/X-band Cassegrain antenna
 Manufacturer: NEC
 IF: 100—520 MHz?
 Frequency standard : Anritsu Hydrogen Maser (2) , GPS
 Recording system : K5, 128Mbps
 Co-location : GPS(IGS)、DORIS

VLBI data transfer



Feb. Departure from Syowa
 Apr. Arrival in Japan

GSI Correlator

AOV
 Internet

Internet

OHIG

Bonn Correlator



OHIG

Internet



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VLBI experiments during 2015 - 2017

実験名	観測開始時刻(UT)	観測終了時刻(UT)	Scan	Participation sites	備考
OHIG94	2015/02/04 18:00:00 UT	2015/2/5 17:57:30 UT	118回	7局 Hb, Ht, Ke, Kk, Oh, Ww, Yg -Ft -Sy	※ 1, 2
OHIG95	2015/2/10 17:30:00 UT	2015/2/11 17:24:40 UT	125回	8局 Sy, Hb, Ht, Ke, Kk, Oh, Ww, Yg -Ft	
OHIG96	2015/2/11 18:00:00 UT	2015/2/12 17:57:40 UT	124回	8局 Sy, Hb, Ht, Ke, Kk, Oh, Ww, Yg -Ft	※ 3
AOV02	2015/4/30 19:00:00 UT	2015/5/1 18:37:30 UT	114回	9局 Sy, Hb, Is, Ke, Kv, Ts, Vm, Ww, Yg	※4
OHIG97	2015/11/11 18:00:00 UT	2015/11/12 17:45:36 UT	135回	8局 Sy, Ft, Ho,Ht,Ke,Kk,Ww,Yg -Oh	
OHIG98	2015/11/17 17:30:00 UT	2015/11/18 17:24:48 UT	150回	8局 Sy, Ft,Hb,Ht,Ke,Kk,Ww,Yg -Oh	※1
OHIG99	2015/11/18 18:00:00 UT	2015/11/19 17:52:02 UT	140回	9局 Sy, Ft,Hb,Ht,Ke,Kk,Oh,Ww,Yg	
AOV07	2016/2/2 17:30:00 UT	2016/2/3 17:29:44 UT	150回	8局 Ho,K1,Ke,Kg,Km,Ts,Ur,Yg -Hb -Ww -Sy	Cancelled
OHG100	2016/2/9 17:30:00 UT	2016/2/10 17:24:40 UT	125回	6局 Sy, Hb,Kk,Oh,Ww,Yg -Ht -Ke	※ 2
OHG101	2016/2/10 18:00:00 UT	2016/2/11 17:57:40 UT	124回	7局 Sy, Hb,Ke,Kk,Oh,Ww,Yg -Ht	
OHG102	2016/2/17 19:00:00 UT	2016/2/18 18:37:30 UT	114回	8局 Sy, Ft,Hb,Ke,Kk,Oh,Ww,Yg -Ht	※ 4

OHG103	2016/11/8 17:30:00 UT	2016/11/9 17:29:37 UT	122回	7局 Sy, Ft, Hb, Ht, Ke, Kk, Yg -Oh -Ww	
OHG104	2016/11/9 18:00:00 UT	2016/11/10 17:39:49 UT	138回	7局 Sy, Ft, Hb, Ht, Ke, Kk, Yg -Oh -Ww	
OHG105	2016/11/16 18:00:00 UT	2016/11/17 17:58:40 UT	123回	7局 Sy, Ft, Hb, Ht, Ke, Kk, Yg -Oh -Ww	
AOV13	2017/1/16 16:30:00 UT	2016/2/3 16:02:29 UT	158回	10局 Sy,Hb,K1,Ke,Kg,Km,Kv,Ur,Vm,Yg -Sh -Ww	※ 1,2
OHG106	2017/2/14 17:30:00 UT	2017/2/15 17:28:32 UT	150回	9局 Sy, Ft, Hb, Ht, Ke, Kk, Oh, Ww, Yg	
OHG107	2017/2/15 18:00:00 UT	2017/2/16 17:56:55 UT	146回	9局 Sy, Ft, Hb, Ht, Ke, Kk, Oh, Ww, Yg	
OHG108	2017/2/22 17:30:00 UT	2017/2/23 17:20:06 UT	147回	9局 Sy, Ft, Hb, Ht, Ke, Kk, Oh, Ww, Yg	



Site condition: Very low seismicity

Earthquakes
around the
Antarctica from
1950

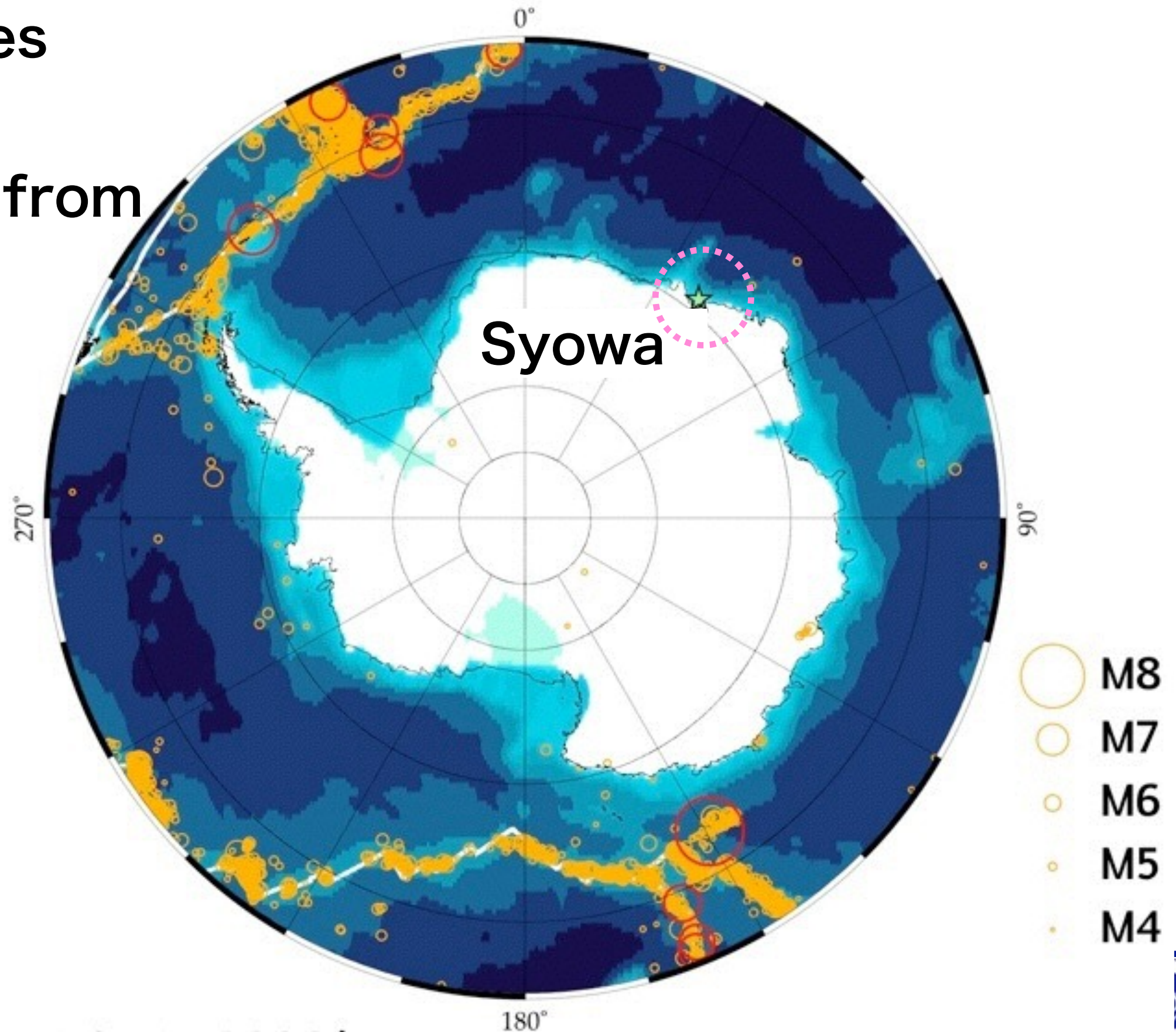
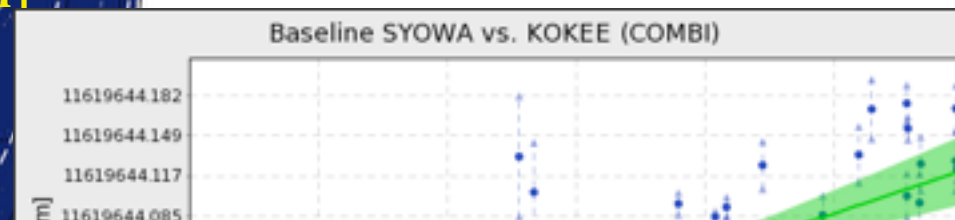
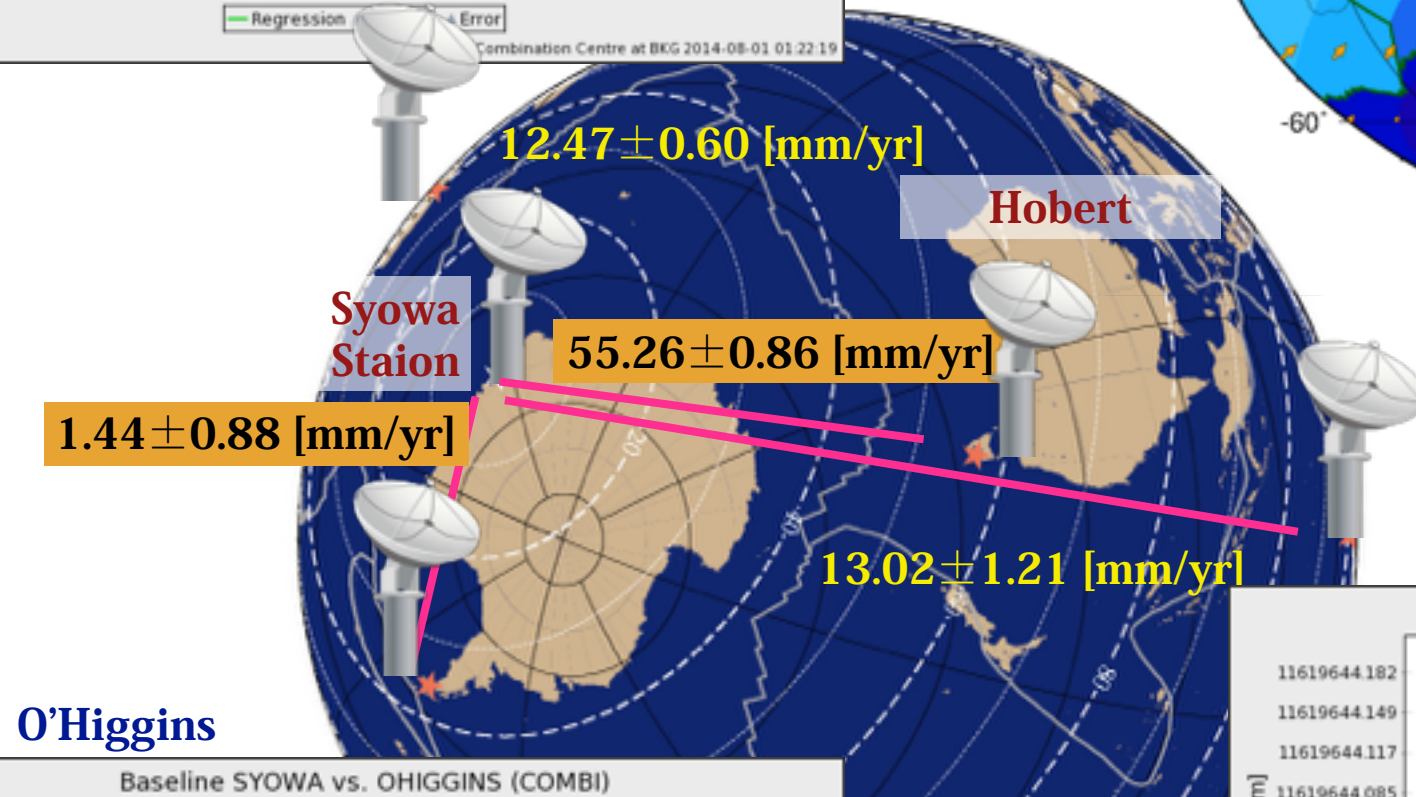
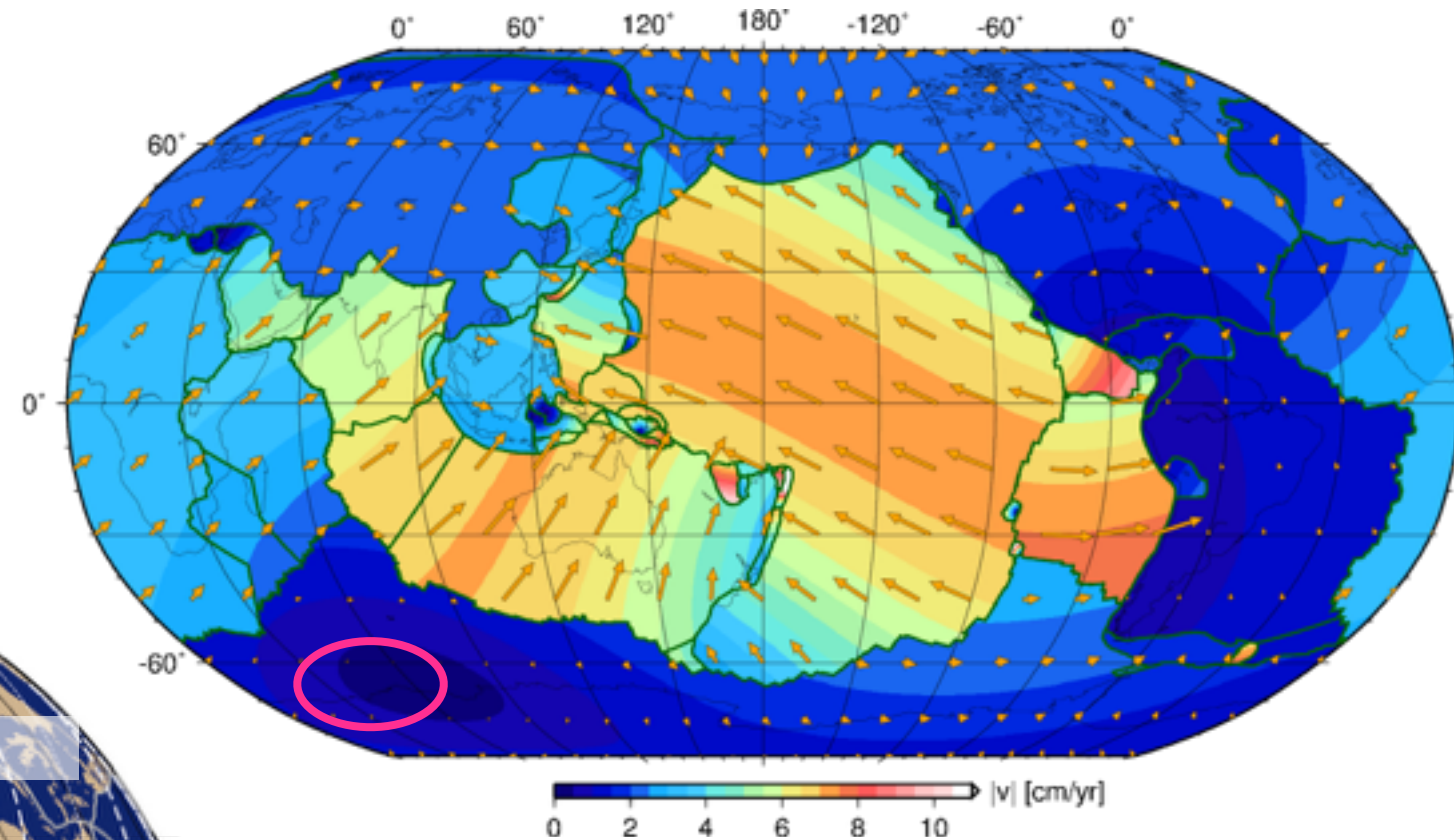
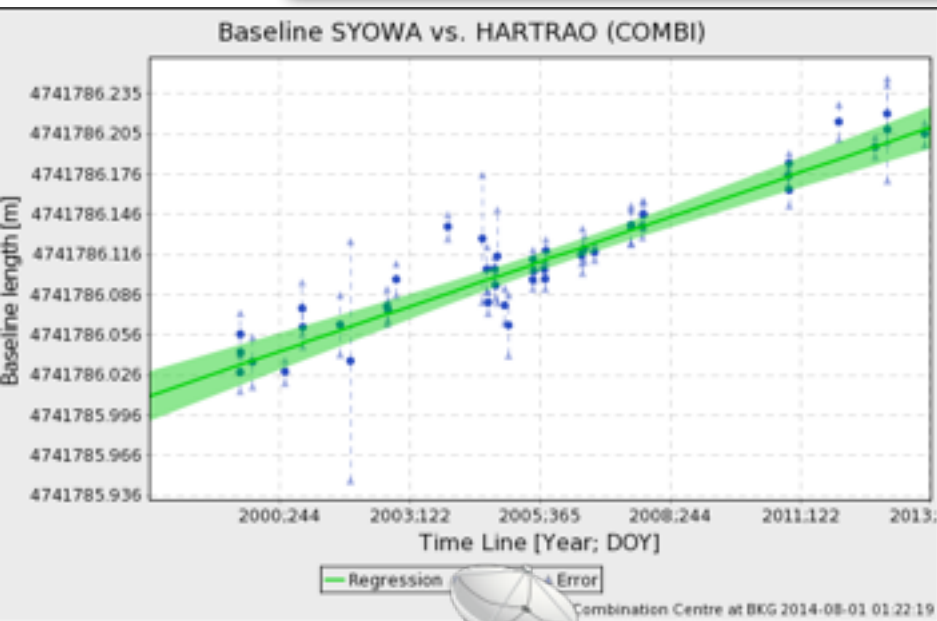
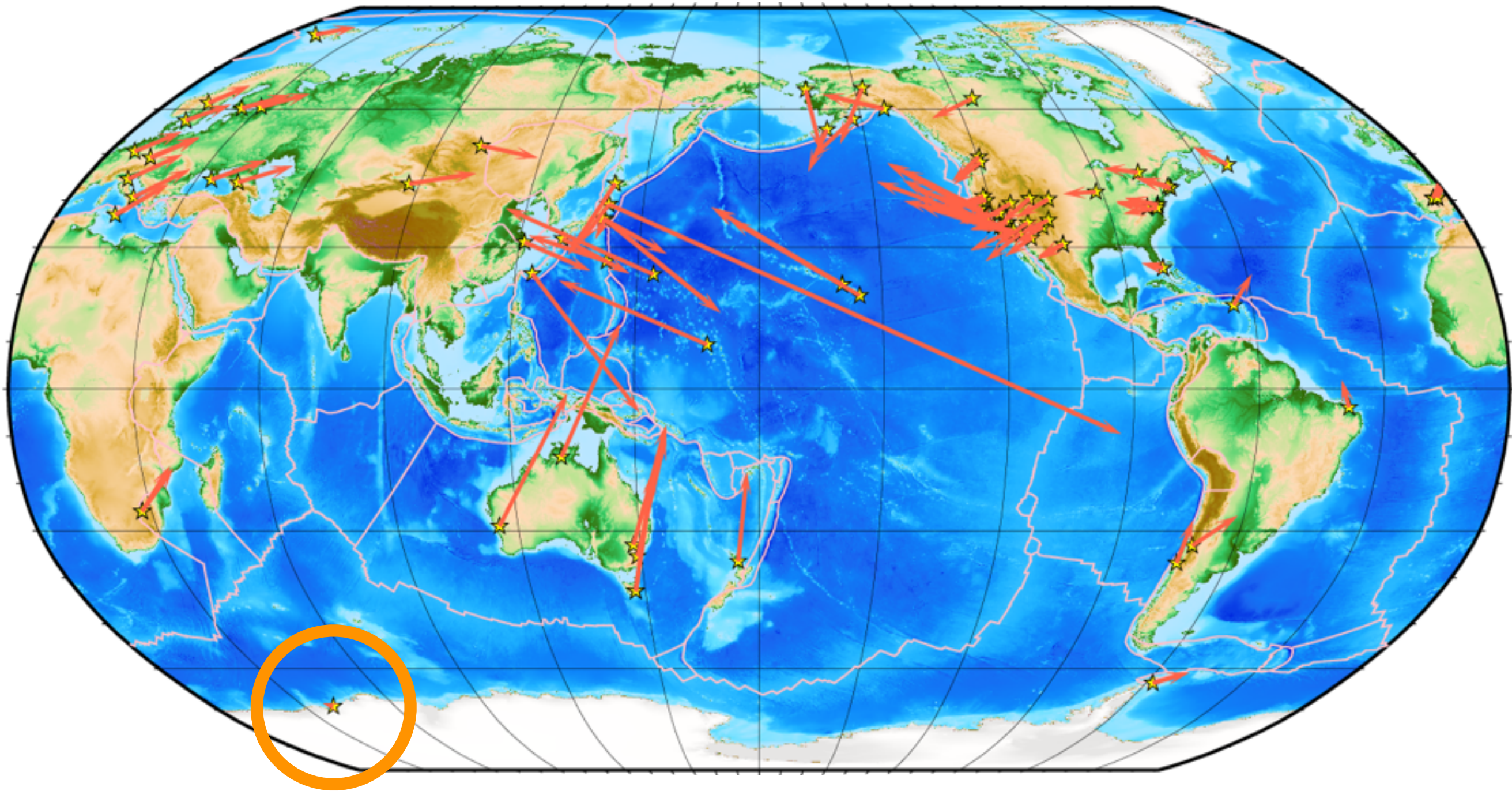


Plate motion estimated by VLBI & GNSS



X(m)	Y(m)	Z(m)	σ_x (m)	σ_y (m)	σ_z (m)
V_x (m/y)	V_y (m/y)	V_z (m/y)	σ_{V_x} (m/y)	σ_{V_y} (m/y)	σ_{V_z} (m/y)
1766194.160	1460410.914	-5932273.310	0.00039	0.00037	0.00069
0.0051	-0.0006	-0.0002	0.00010	0.00008	0.00017

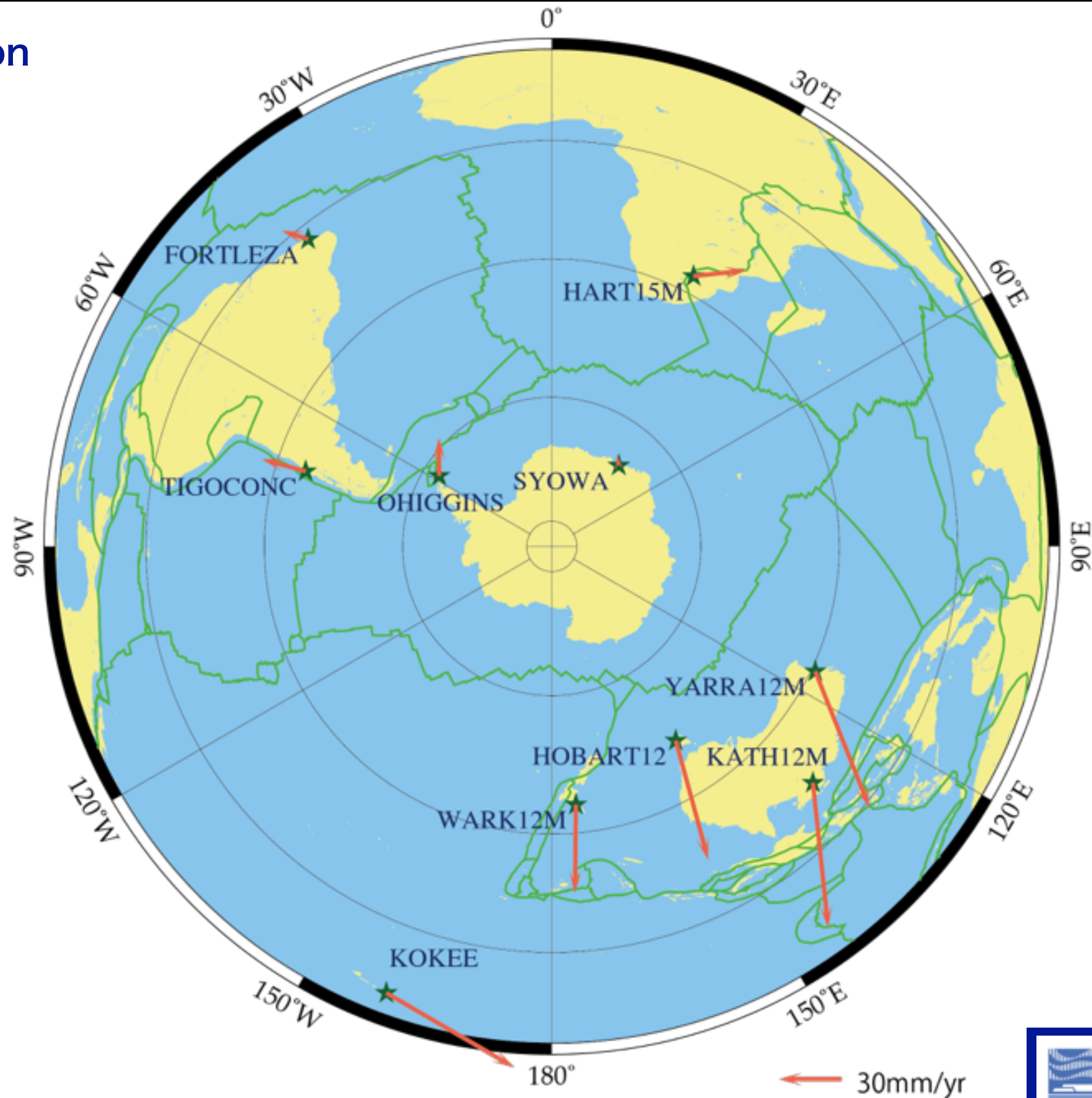
Plate motion estimated by VLBI & GNSS



Syowa Station is a station with smallest velocity vector.

Crustal movements measured by VLBI

OHIG Session



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A photograph of a seal sitting on a flat, white ice surface. The seal is looking directly at the camera with a neutral expression. Above the seal's head is a large yellow thought bubble with a black outline. Inside the bubble, the text "We plan to participate AOV sessions in the future" is written in blue. Two smaller yellow circles lead from the bubble down to the seal's head. The background shows a vast, flat expanse of ice under a pale sky, with some distant, low mountains visible on the horizon.

**We plan to participate AOV
sessions in the future**

**K. Doi and Y. Aoyama will go to Syowa Station in
2017/2018 austral summer.**