

Brief history of SLR observation at **Shimosato** Hydrographic Observatory

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ILRS Virtual Tour

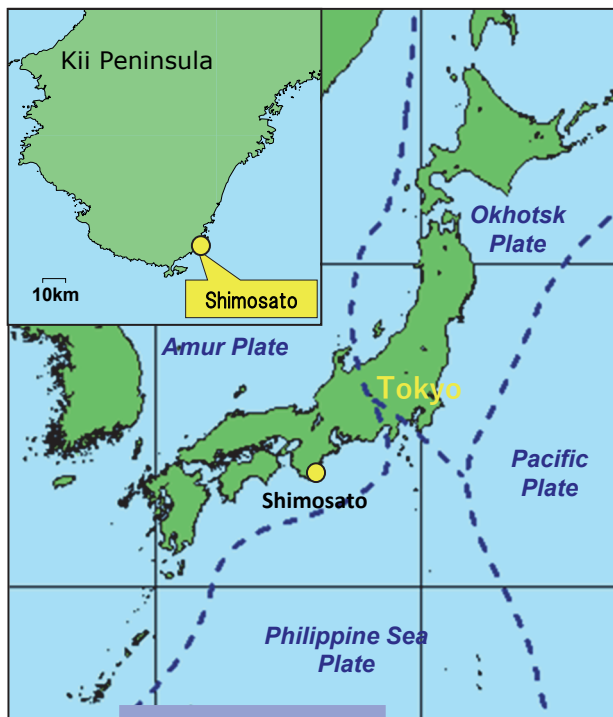
Simosato? Shimosato?

Simosato : only for the ILRS site name

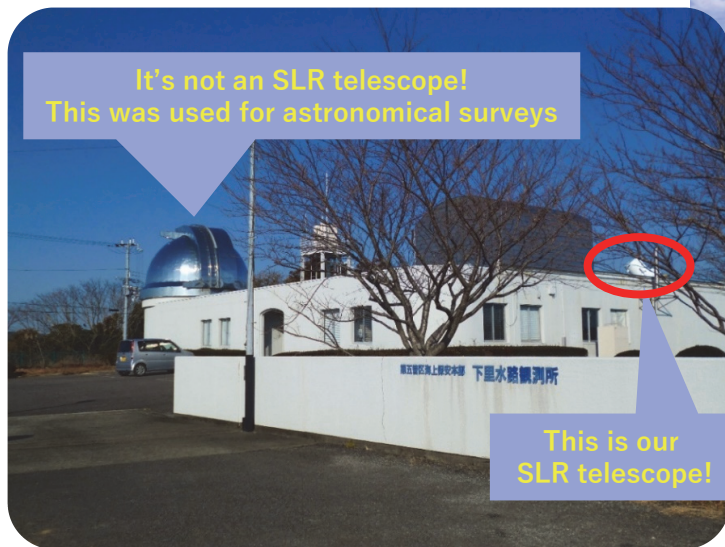
Shimosato : for others (e.g., observatory, address, organization, ...)



Shimosato Hydrographic Observatory (SHO), the 5th Regional Coast Guard Headquarters



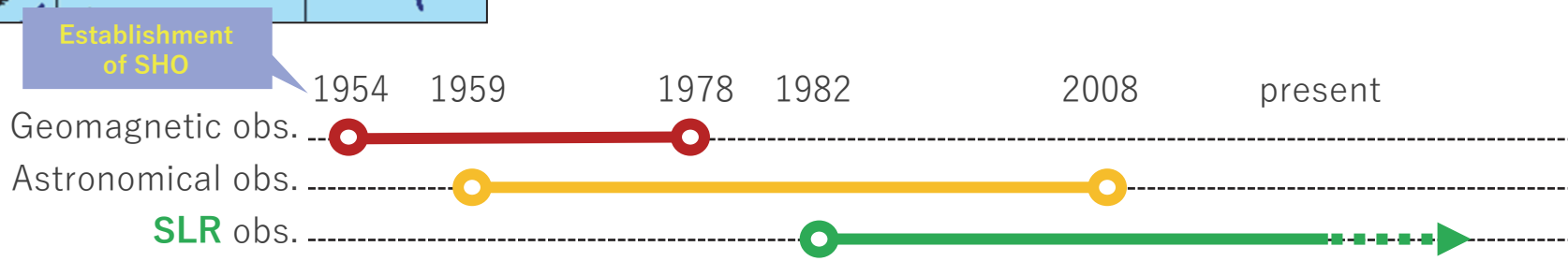
SHO is located on the hill near the sea



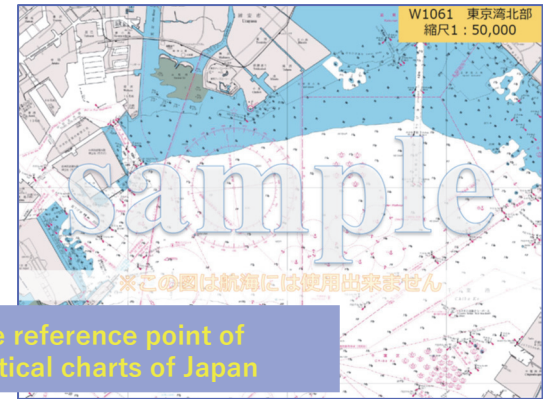
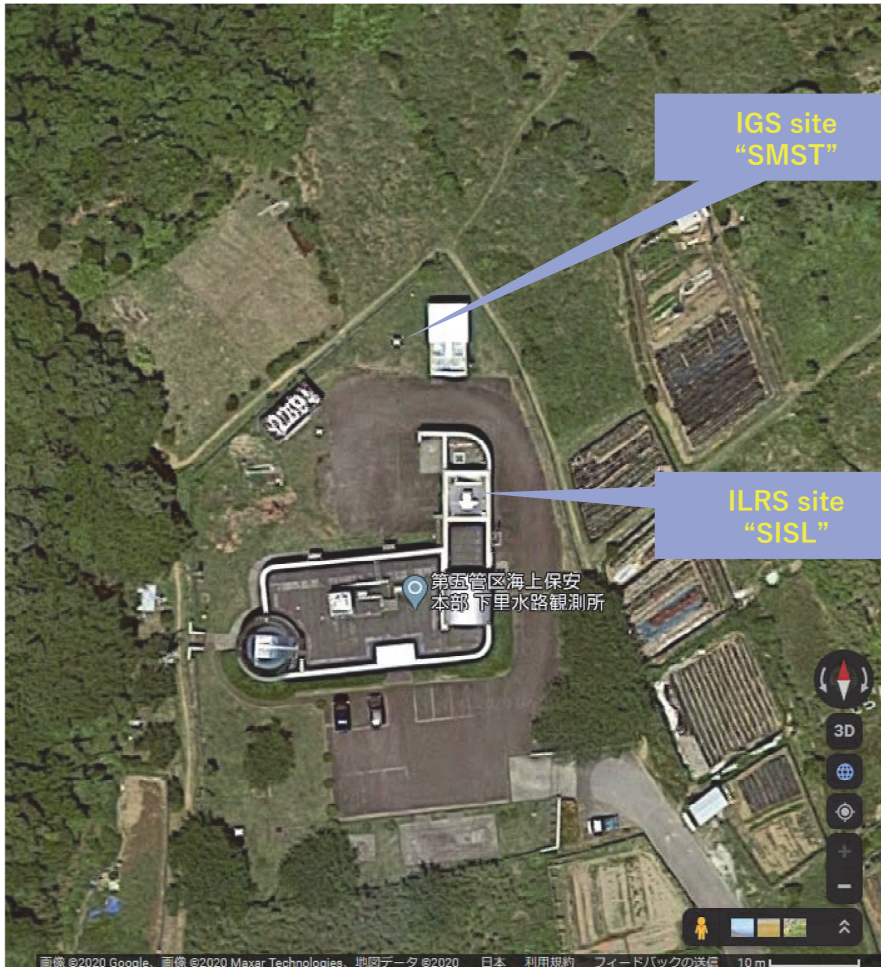
It's not an SLR telescope!
This was used for astronomical surveys

This is our
SLR telescope!

Latitude (°N)	33.578
Longitude (°E)	135.937
Ellipsoidal height (m)	101.6



Shimosato is the reference of the Japanese nautical charts



The reference point of nautical charts of Japan



1982-2007



2007-present

SLR was originally introduced to establish the new ECEF Japanese Geodetic Datum



The geodetic datum in Japan was first determined in the end of 19th Century. (called “**Tokyo Datum**”)

In 1970s, the new Japanese geodetic system was planned to be established:

- (1) to be aligned to the ECEF global reference frame,
- (2) for the utilization of space geodetic technique such as GPS,
- (3) for positioning of remote islands.

Geographical Survey Institute(*) and Japan Coast Guard collaborated to establish the new Japanese Geodetic Datum.

(* now Geospatial Information Authority of Japan)

- 1970s Tokyo Astronomical Observatory started SLR at Dodaira
- 1982 Mar. JCG started stationary SLR observation at Simosato
- 1986 Launch of Japanese geodetic satellite AJISAI
- 1987-'01 JCG's SLR campaign observations were performed in remote area
- 1990s CRL (now NICT) started SLR at Koganei
- 2004 NASDA (now JAXA) started SLR at Tanegashima



AJISAI (launched on Aug. 13, 1986)



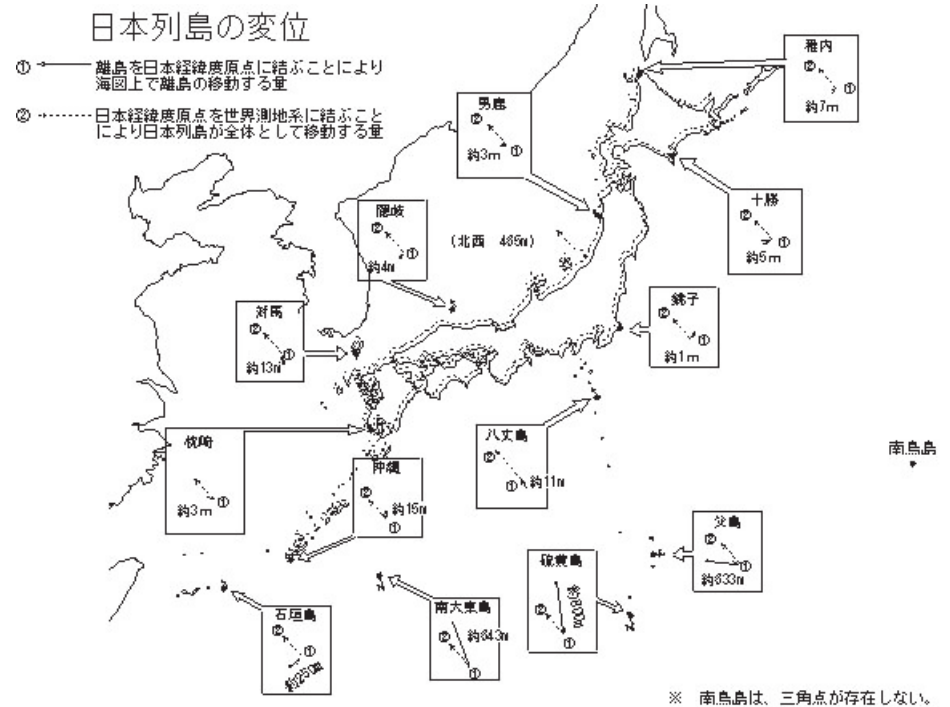
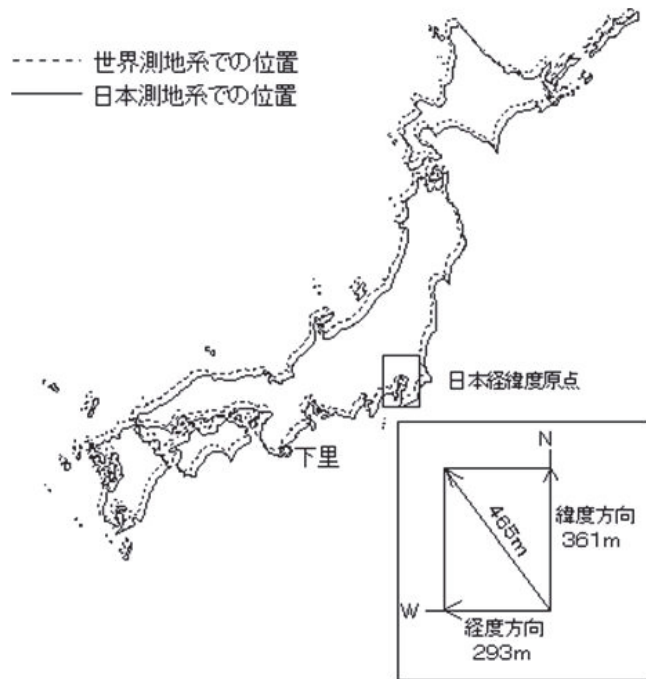
SLR Telescope (1982-2007)



Control & monitor devices

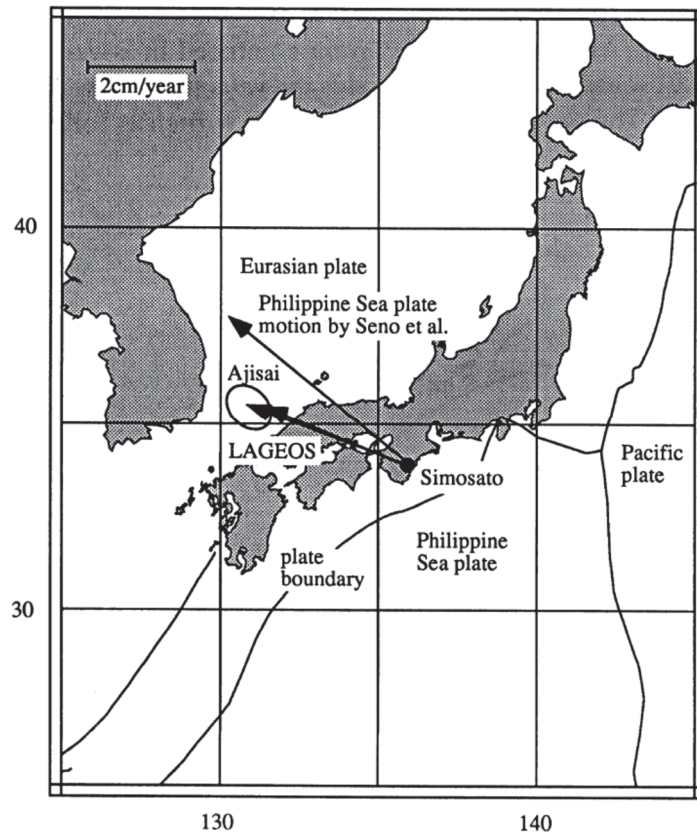
Positional offset of approx. 465 m
b/w the global ref. and Tokyo Datum

Corrected errors (distortion)
- Remote islands: 200-600 m (Astronomical obs.)
- Main islands: up to 15 m



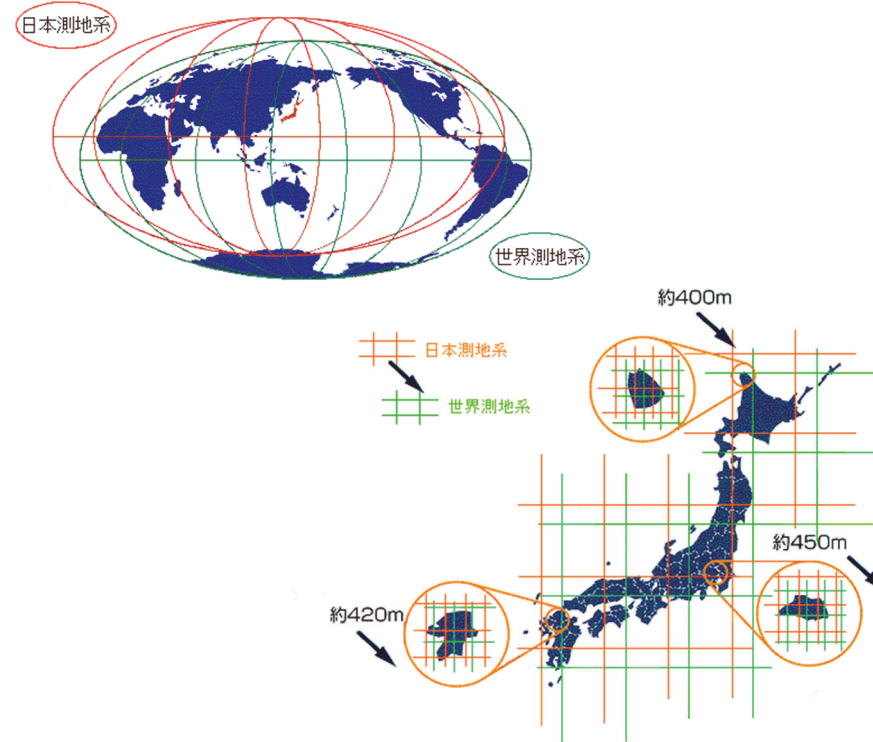
291 deg., 32mm/yr (Sengoku, 1998)

Using the ranging data to “AJISAI” in 1986-1994



<2002>

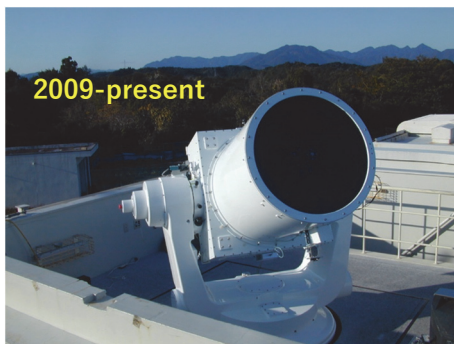
Implementation of global reference frame (2002)
(collaboration of GSI and JCG) in the domestic law



from GSI's web page (<https://www.gsi.go.jp/LAW/G2000-g2000.htm>)

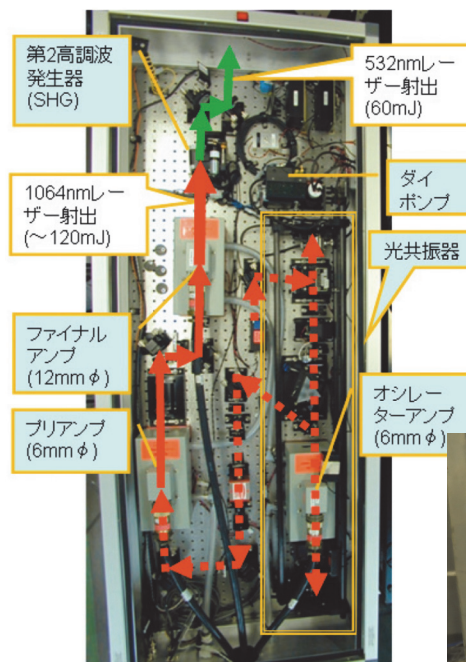


1982-2007

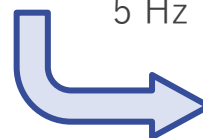


2009-present

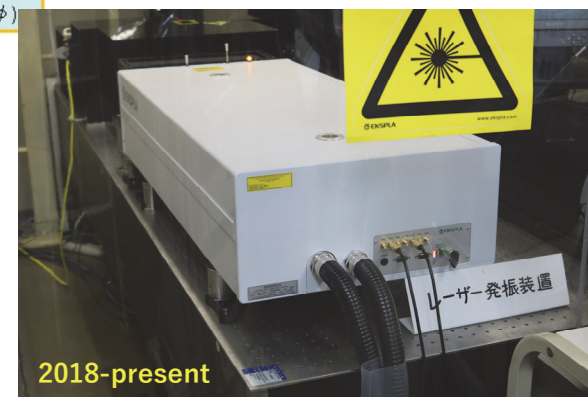
2007-2018



5 Hz



← Laser oscillator



2018-present

10 Hz - 1kHz



GNSS data

Yellow dots

30 sec. GPS data since Apr. 1, 2004

Analytical procedure

Solved with RTKLIB v2.4.2 (Takasu, 2013)

Daily solution of PPP-static mode

Offsets due to antenna/radome updates (**yellow broken lines**) were corrected using the 15-days averages.

SLR data

Black circles

LAGEOS-1 and LAGEOS-2

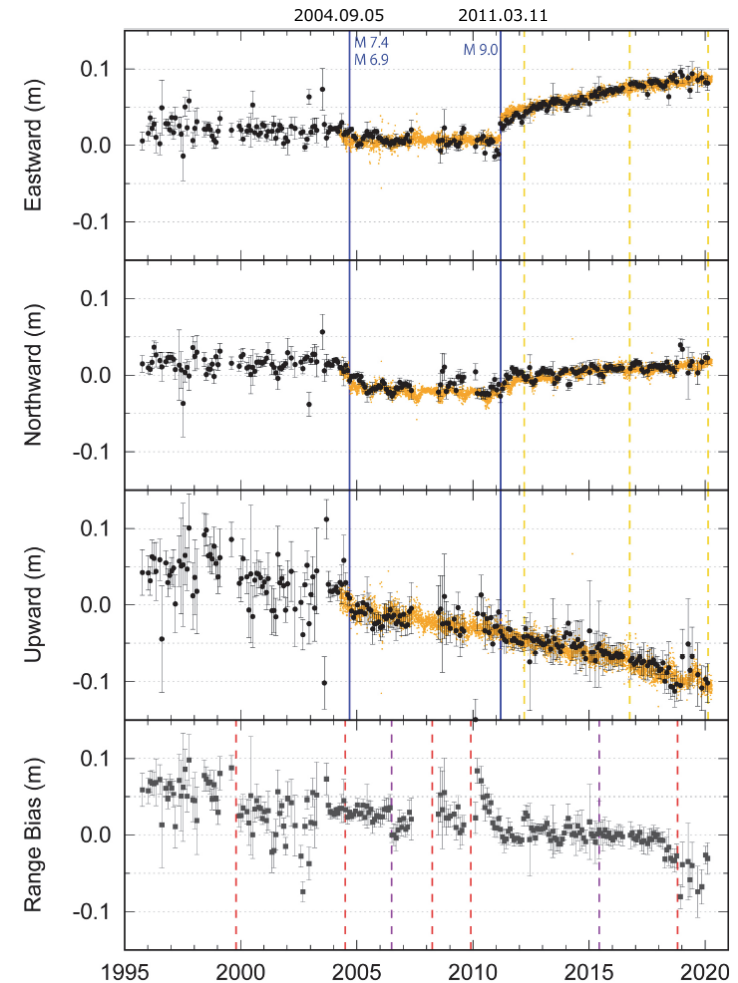
Analytical procedure

Solved with C5++ (Otsubo et al., 2016 EPS)

Monthly solution with simultaneous estimation of range bias, earth center, and orbit elements.

- Error bars: 1σ
- Red lines: Updates of SLR observation system
- Purple lines: Updates of calibration target

- Estimated positions were aligned to the local ENU coordinates.
- Only the velocity of ITRF2014 was corrected.
- Thus, we can find the co- and post-seismic displacements in the time series.



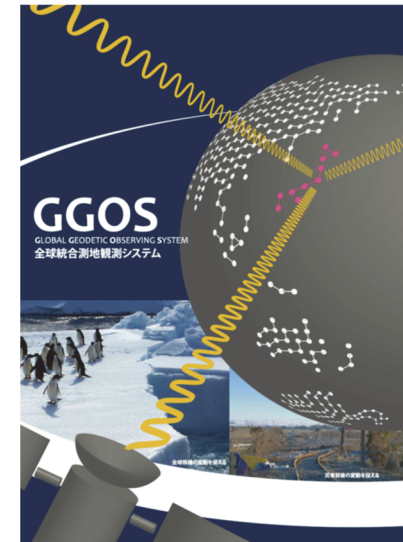
Local-tie survey planed next week (11/8-11/17)



Locations of the local-tie survey points

JCG will carry out the **local-tie survey** for ITRF 2020 in collaboration with the **GSI**, who has skills and expertise in surveying.

An outcome of *the GGOS Japan*



**Thank you for your attention,
and please enjoy visiting our SLR station!**

