Japan Report GE-GLOSS-XVIII

Hironori Hayashibara

Japan Meteorological Agency

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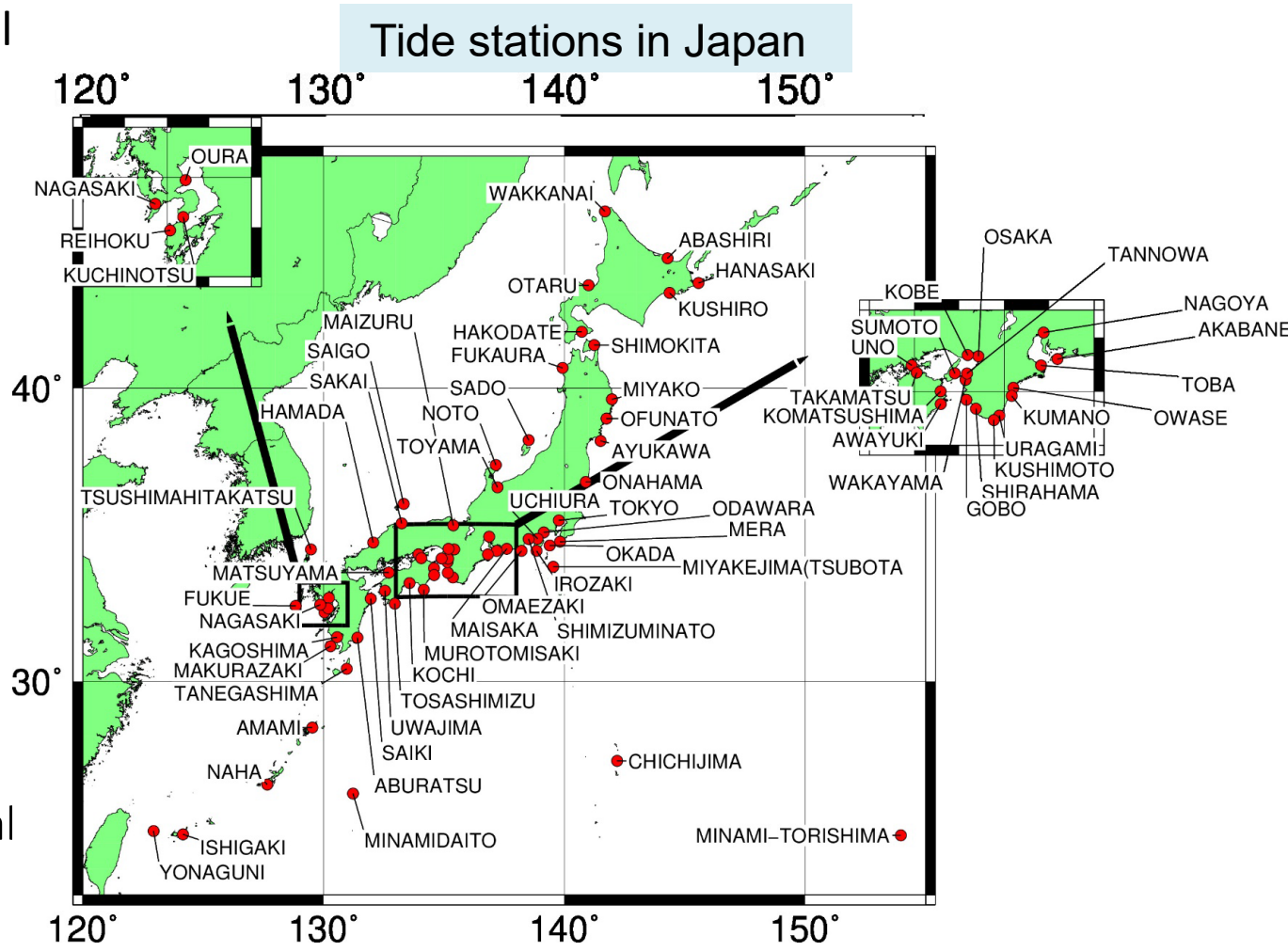
Sea Level Observation Network in Japan

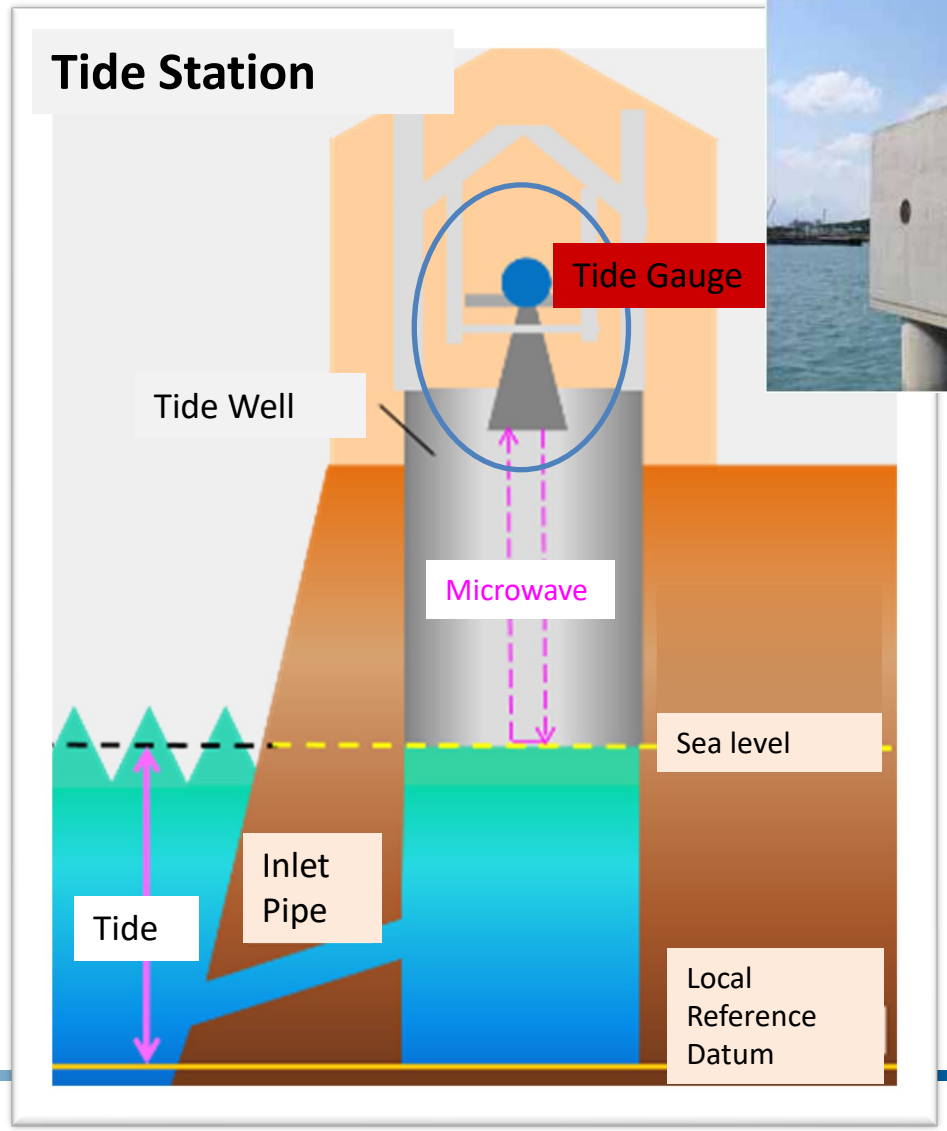
- Tide stations are operated by several national and local governmental organizations Japan including
  - the Japan Meteorological Agency (JMA)
  - the Japan Coast Guard (JCG)
  - the Geospatial Information Authority of Japan (GSI)
  - the Ports and Harbors Bureau (PHB)
  - the Water and Disaster Management Bureau (WDMB) of the Ministry of Land, Infrastructure, Transport and Tourism (MLIT).
- Data from 189 stations are sent to JMA in real time and published on its website .

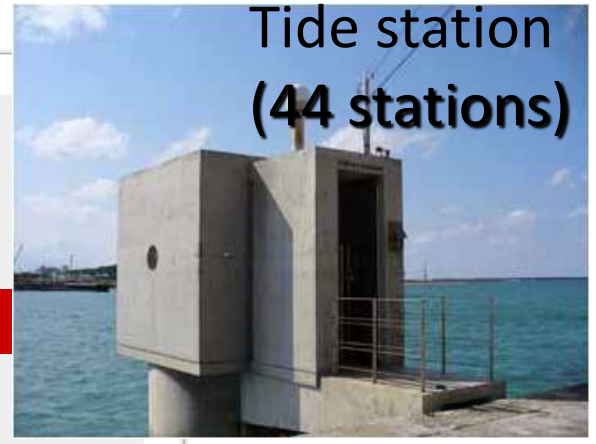


Instruments of Tidal observation : Tide station

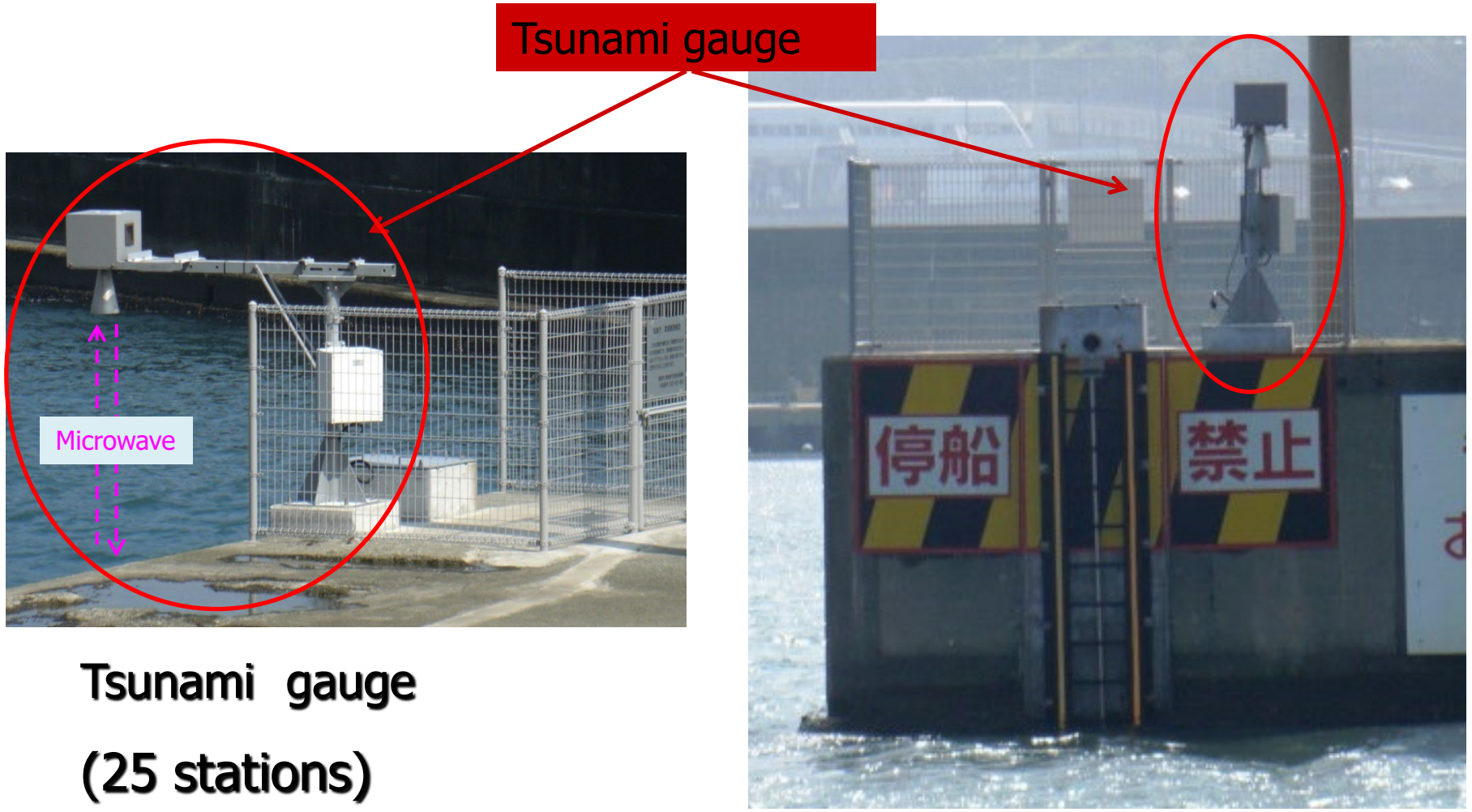
Main facility for measurements of the tide in JMA

- A tide station is equipped with a well into which seawater is run through the inlet pipe (aqueduct) so that the height of the water surface in the well is regarded as the sea level.
- The sea level is measured by the microwave gauge above the well.
- This structure allows noises from open water to be excluded.





Other Instruments : Tsunami gauge



Tsunami gauge

(25 stations)

Microwave gauge in the Open Air

Other Instruments : Huge Tsunami gauge

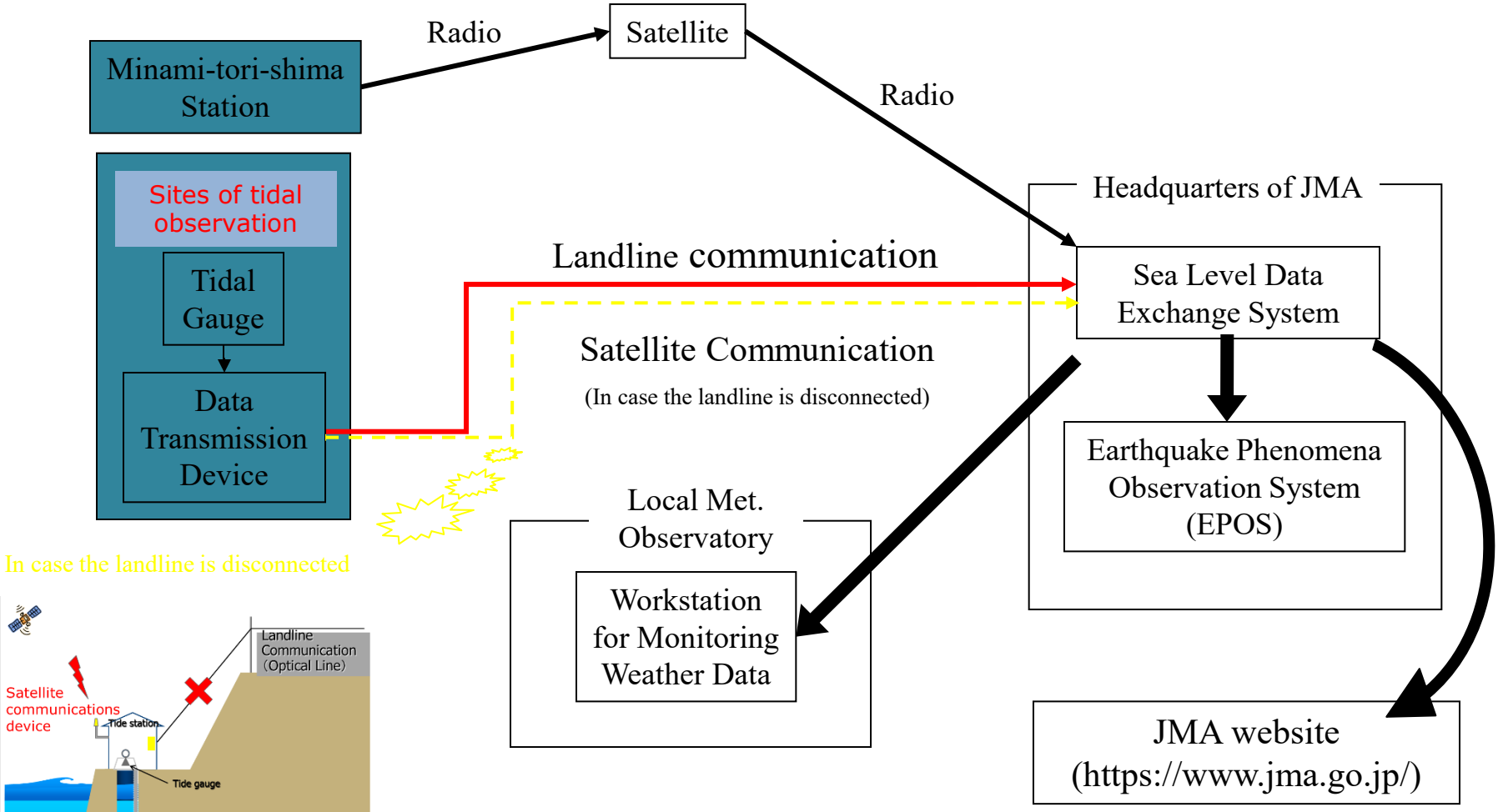
Tide gauge

Huge Tsunami gauge
using pressure sensor

Tsunami gauge

Huge Tsunami gauge

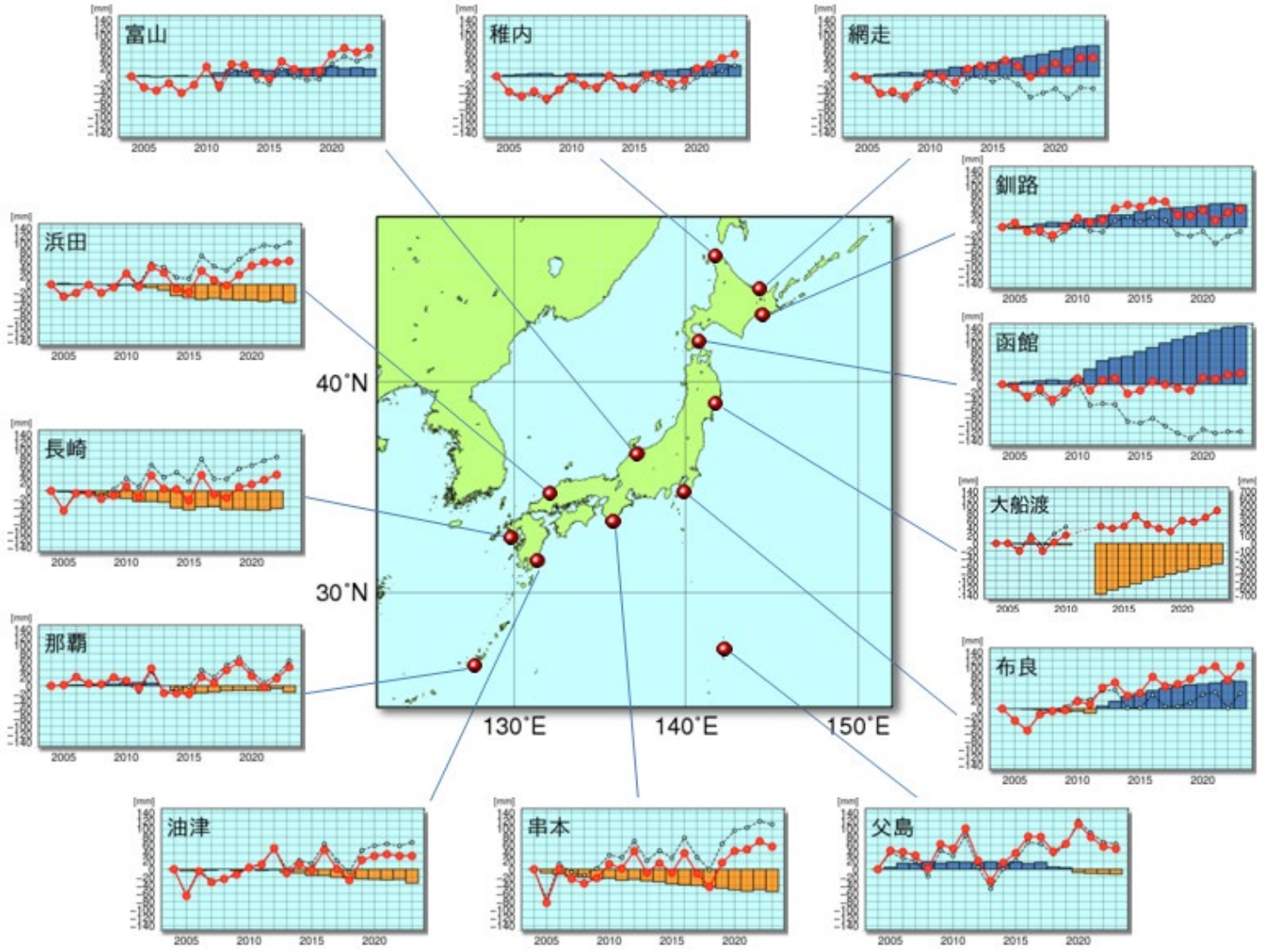
Data Collection



An overview of the GPS Technology in the Network

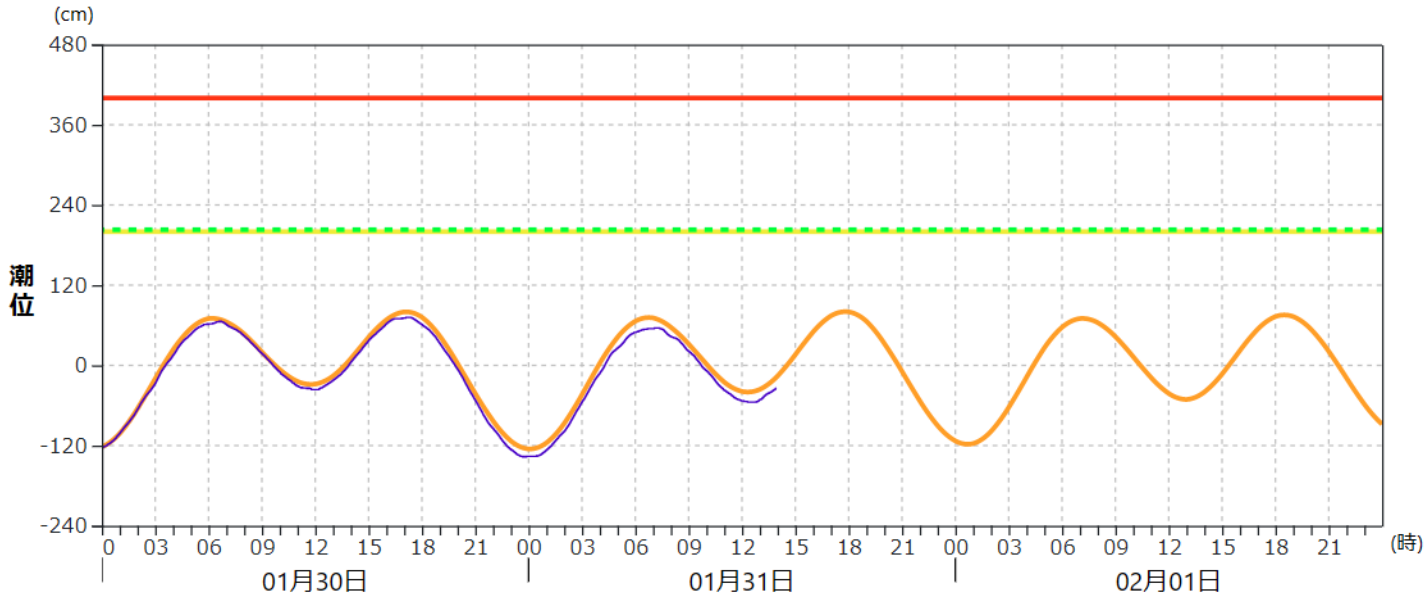
- The Geospatial Information Authority of Japan (GSI) monitors crustal movement in real-time through GEONET, a network of about 1,200 GNSS-based stations across Japan. GPS systems are also operated at most Japanese GLOSS Core Network (GCN) stations, except for Minamitorishima and Syowa, to support GSI.
- The collected data is sent to the Japan Meteorological Agency (JMA) for sea level corrections, with updated sea level variations published annually ~~in March~~ at: JMA Sea Level Data (in Japanese).

Location	Station code
Abashiri	AS
Aburatsu	AB
Chichijima	CC
Hakodate	HK
Hamada	HA
Kushimoto	KS
Kushiro	KR
Mera	MR
MinamiToriShima	MC
Nagasaki	NS
Naha	NH
Ofunato	OF
Toyama	TY
Wakkanai	WN
Syowa	



An overview of Data Availability

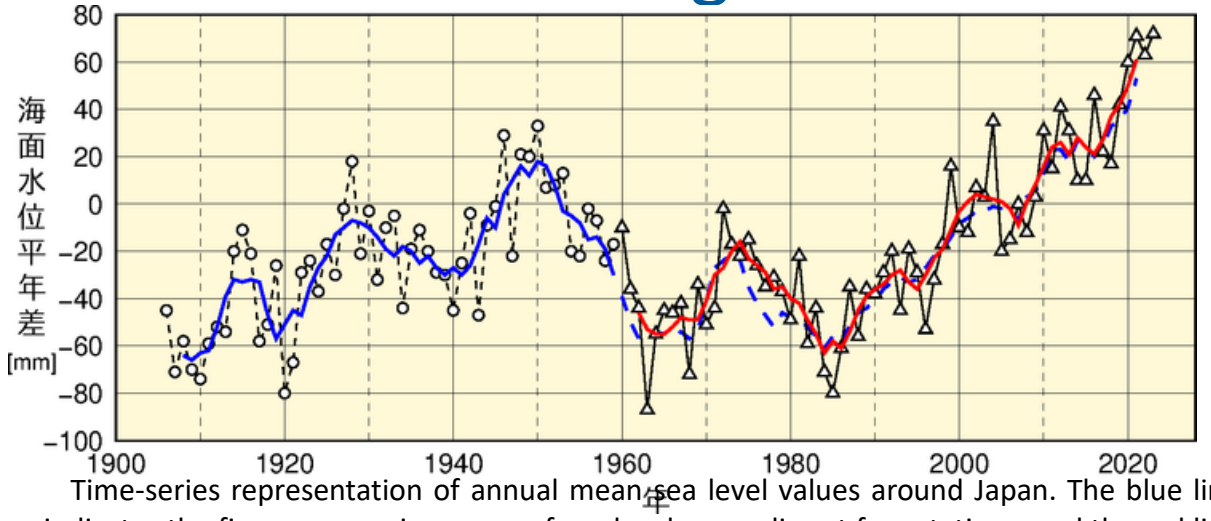
- Near-real-time tide data (updated every five minutes) from 189 tide stations, except Minamitorishima, is available on the Japan Meteorological Agency (JMA) website:
  JMA Tide Data (in Japanese).
- The site also allows monitoring of sea level variations due to storm surges, tsunamis, and other factors.



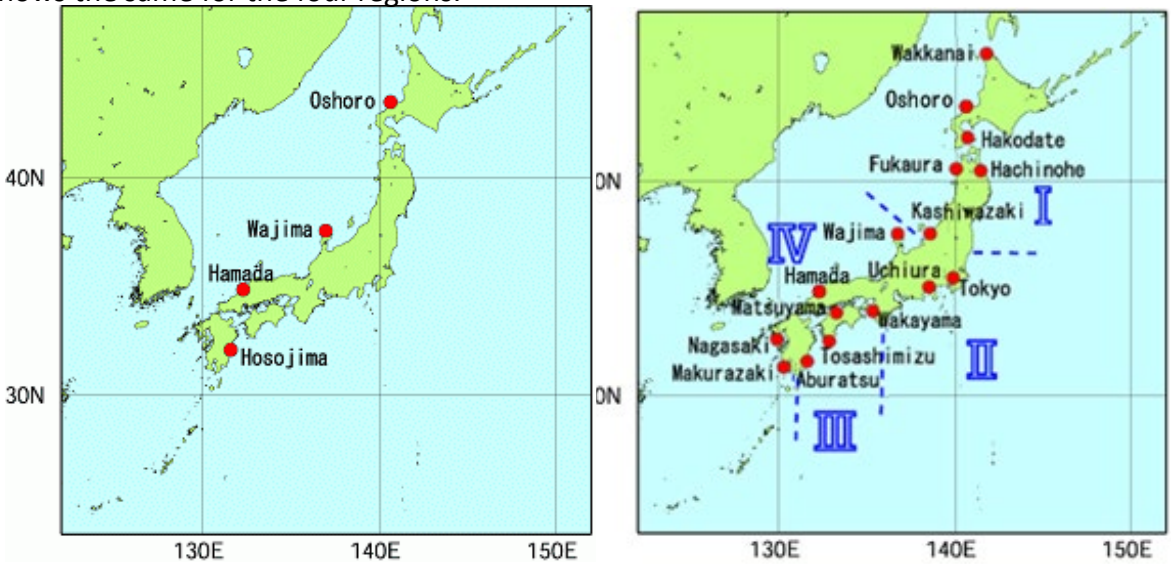
Tokyo sea level observations for January 30 – 31 1, 2025.
Dark blue line: observation data
Orange line: astronomical tides
Red and yellow lines: criteria for storm surge warnings and advisories, respectively
Dotted green line: maximum observed sea levels

Monitoring of Long-Term Sea Level Change

- The Japan Meteorological Agency (JMA) monitors long-term sea level changes using annually updated tide gauge data.
- Sea levels have been observed for over 100 years at multiple stations in Japan.
- Data from 1906 to 1959 used 4 stations, while 16 stations were used from 1960 onward for better coverage.
- Key trends:
  - Sea levels peaked around 1950 with 20-year cycles until the 1990s.
  - Since the 1990s, sea levels have been rising with 10-year fluctuations.
- These trends help understand climate change impacts on sea levels.



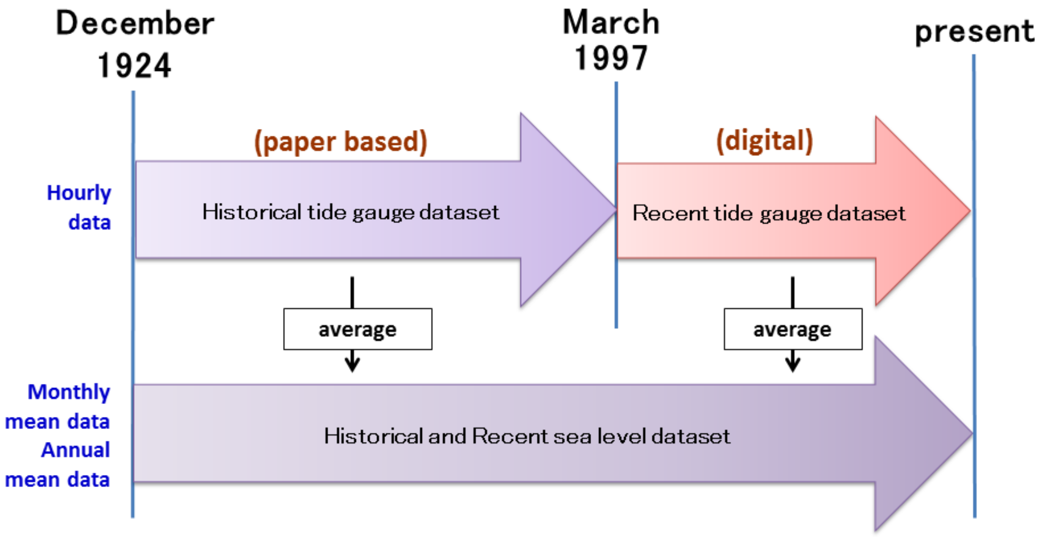
Time-series representation of annual mean sea level values around Japan. The blue line indicates the five-year running mean of sea level anomalies at four stations, and the red line shows the same for the four regions.

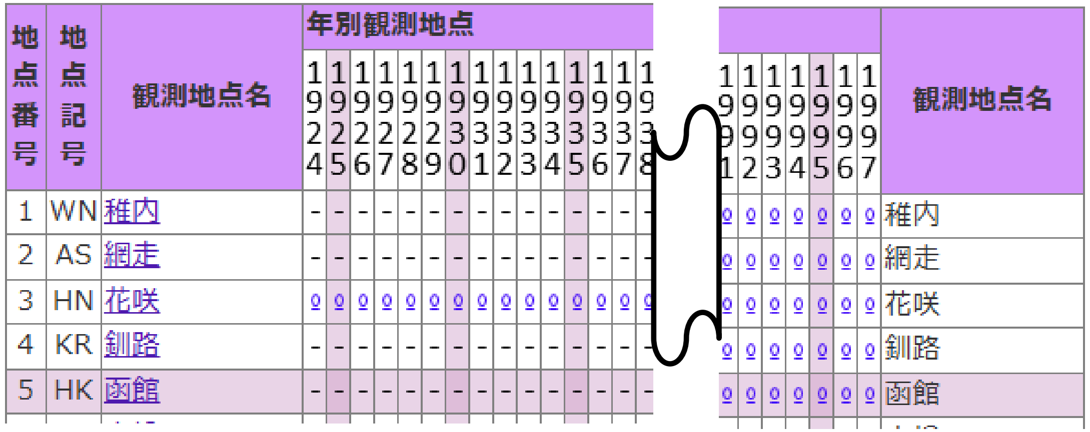


Location of tide stations

JMA's Historical Tide Gauge Dataset

- JMA published a historic tide gauge dataset online in March 2017. The data includes means starting in December 1924.
- The hourly data was converted from paper records, and outliers were identified and corrected. The monthly and annual means are the averages of the reanalyzed hourly data.

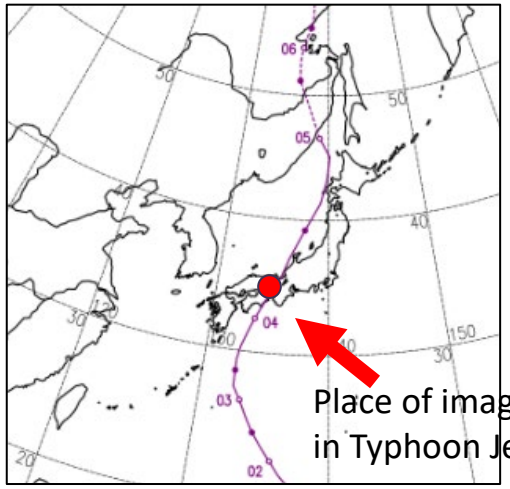


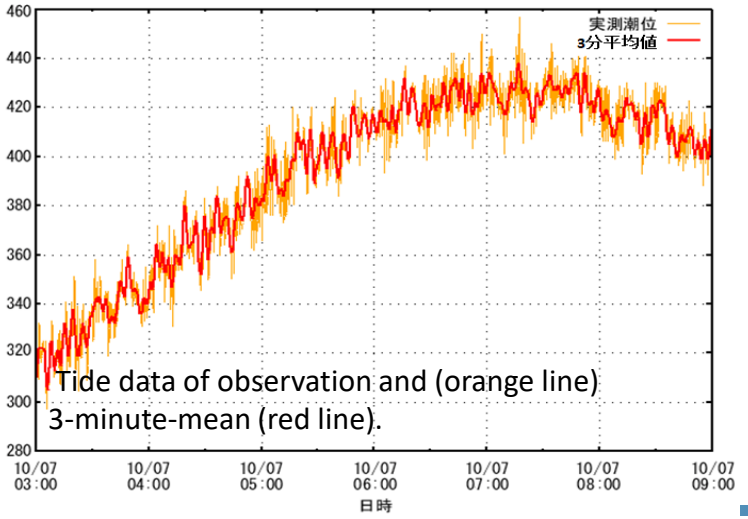


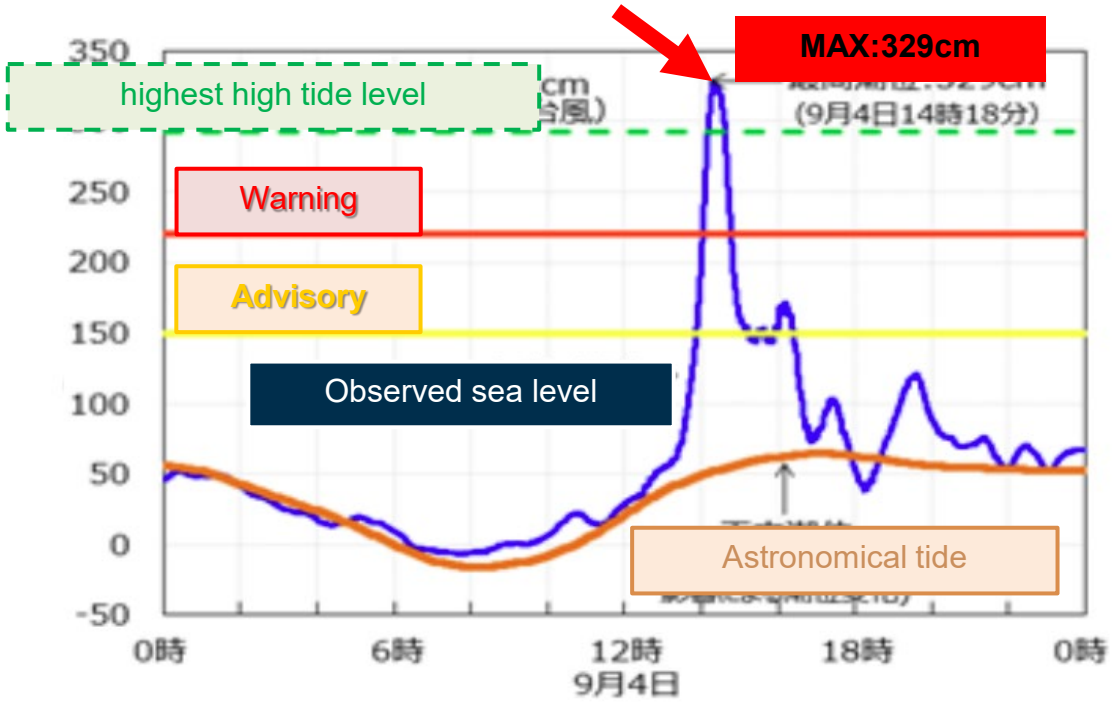
地点番号	地点記号	観測地点名	1924	1925	1926	1927	1928	1929	1930	1931	1932	1933	1934	1935	1936	1937	1938	1991	1992	1993	1994	1995	1996	1997	観測地点名
1	WN	稚内	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	○	○	○	○	○	○	○	稚内
2	AS	網走	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	○	○	○	○	○	○	○	網走
3	HN	花咲	○	○	○	○	○	○	○	○	○	○	○	○	○	○	○	○	○	○	○	○	○	○	花咲
4	KR	釧路	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	○	○	○	○	○	○	○	釧路
5	HK	函館	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	○	○	○	○	○	○	○	函館

Three-minute mean of tide level

Storm surge damage from Tropical Cyclone Jebi (T1821)
(These images were provided by Kobe City)
Left: Cars washed away. Right: Inundated road.







- Thank you for listening.