JMA's Ocean Data/Products

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Seventh WMO International Workshop on Monsoons (IWM-7)
ONLINE TRAINING WORKSHOP ON
SUBSEASONAL TO SEASONAL (S2S) PREDICTION OF MONSOONS
1-12 NOVEMBER 2021

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- Ocean products of JMA
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Purpose of the ocean products

- Maritime safety
  - Prevention of marine distress
  - Search and rescue ships and aircrafts in distress
- Economical ship routing
- Fishery service
  - Monitoring and predicting ocean conditions such as extreme southward intrusion of the Oyashio cold water, large meander of the Kuroshio path
  - Prediction of fishing area
- Input for Marine pollutants prediction
  - Drift of spilled oils, Tsunami debris
  - Advection and diffusion of pollutants
- Input for Atmospheric Numerical Weather Prediction
- Climate Monitoring and Weather Forecast

Ocean products of JMA

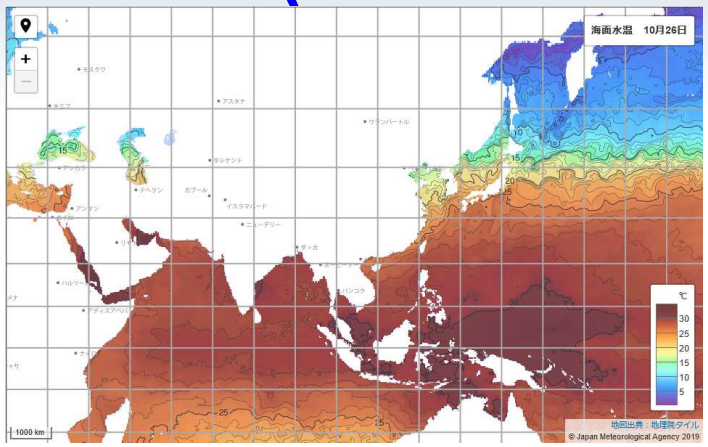
- Internet
  (JMA website)
  - Sea surface temperature (SST) (analysis, forecast, normal)
  - Ocean current at 50m depth (analysis, forecast)
  - Subsurface temperature（50,100,200,400m depth） (analysis, forecast, normal)
  - Sea Ice concentration (analysis, forecast)

(NEAR-GOOS)
  - SST (Objective analysis called MGDSST, HIMSST, COBE-SST)
  - Subsurface temperatures and Surface Currents (Assim. analysis by MOVE/MRI.COM)
  - Sea Surface Height (SSH) anomalies (Objective analysis)
  - Sea Ice concentration (analysis)
- Radio fax （JMH)
  - SST and Ocean current (analysis)
  - Sea Ice (analysis, forecast)

*1 MGDSST: Merged satellite and in-situ data Global Daily Sea Surface Temperature
*2 HIMSST: High resolution Merged satellite and in-situ data Sea Surface Temperature
*3 COBE-SST: Centennial in-situ Observation-Based Estimates of variability of SST and marine meteorological variables
*4 MOVE/MRI.COM: Meteorological Research Institute Multivariate Ocean Variational Estimation system / Meteorological Research Institute Community Ocean Model

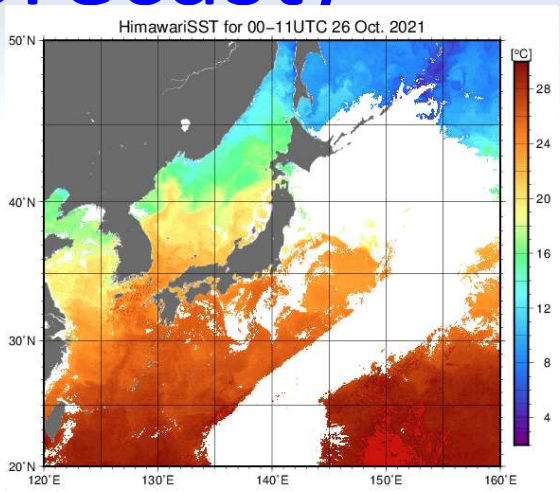
Ocean products on JMA website (realtime and forecast)

Japanese only



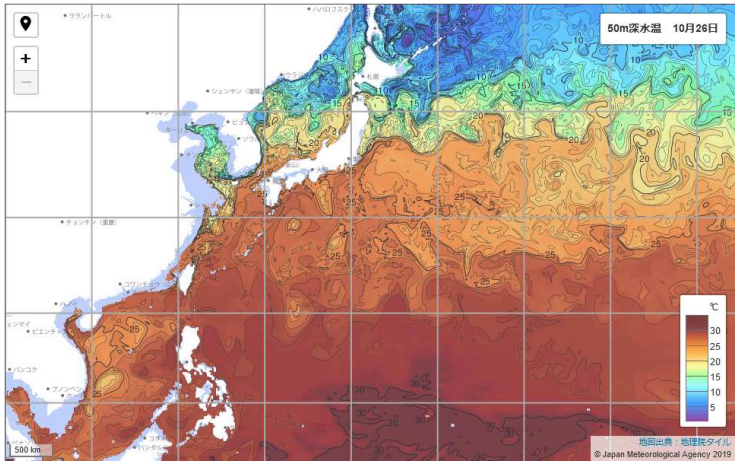
SST (by objective analysis)

https://www.data.jma.go.jp/kaikyou/kaikyou/tile/jp/index_sst.html



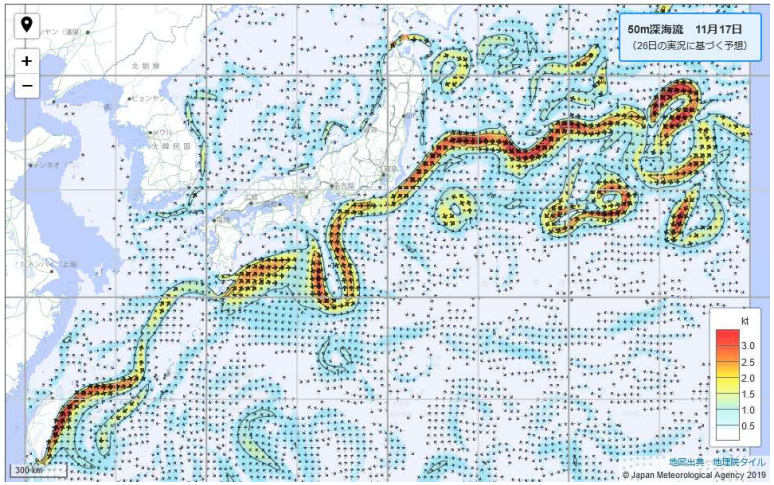
SST (composite map of Himawari)

https://www.data.jma.go.jp/kaiyou/data/db/kaikyo/daily/himawarisst.html



Sea water temperatures at 50m (by model)

https://www.data.jma.go.jp/kaikyou/kaikyou/tile/jp/index_subsanl.html

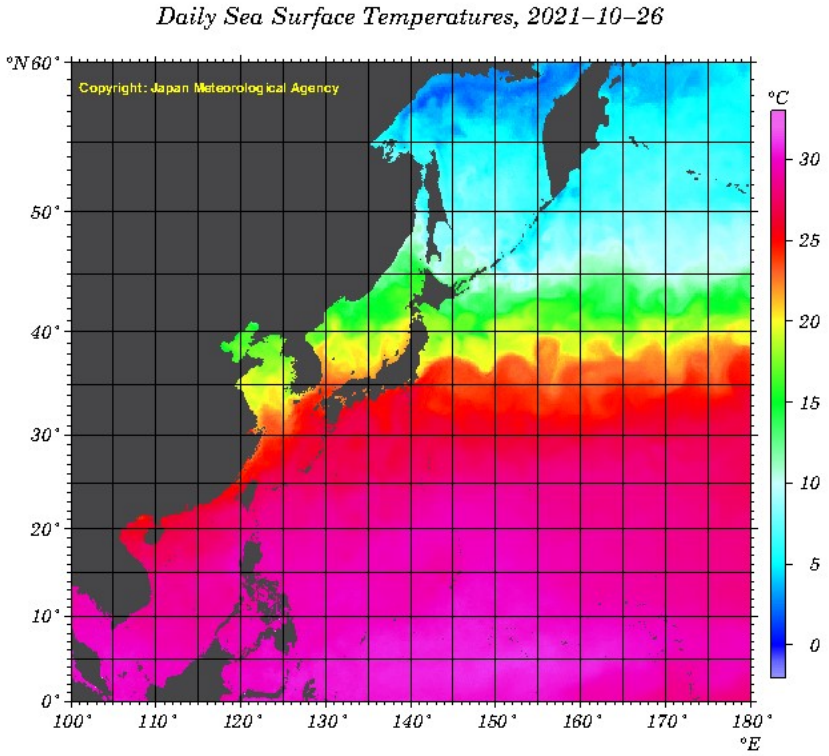


Current at 50m depth (by model)

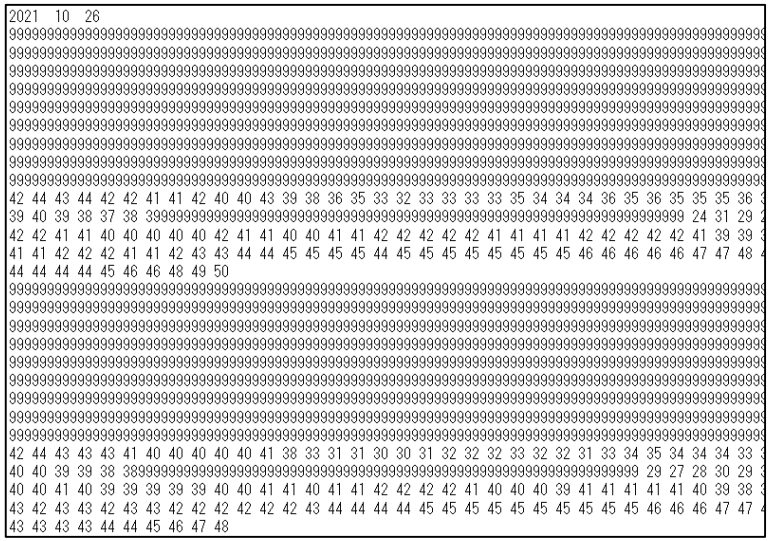
https://www.data.jma.go.jp/kaikyou/kaikyou/tile/jp/index_subsfct.html

Ocean products on NEAR-GOOS (near-realtime and past data)

English page



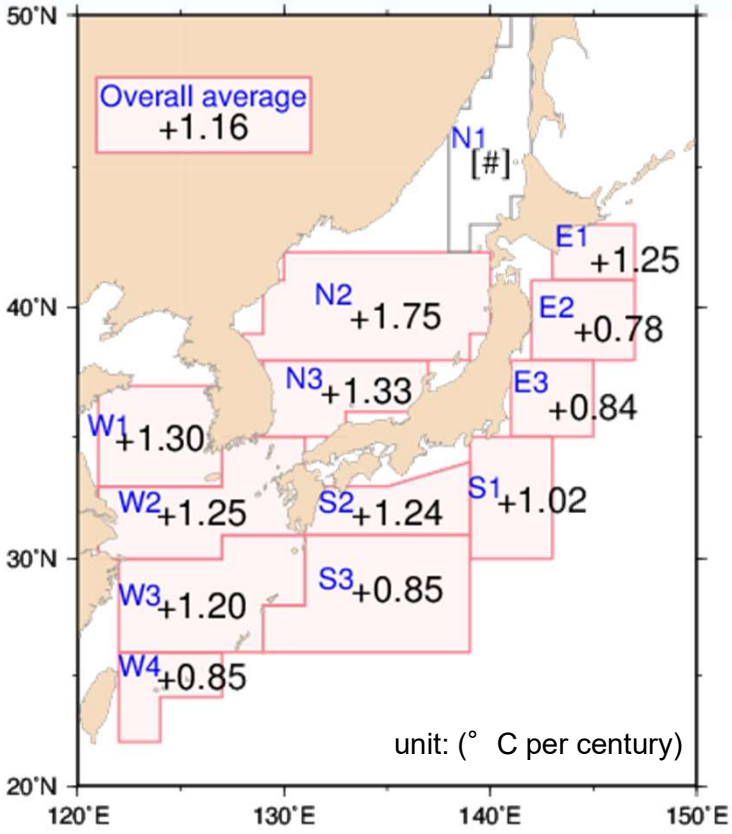
SST (by objective analysis)



Text data

Ocean products on JMA website (historical data)

English page



Trends of annual mean SSTs around Japan from 1900 to 2020

SST anomaly(deg-C SAKISHIMA)

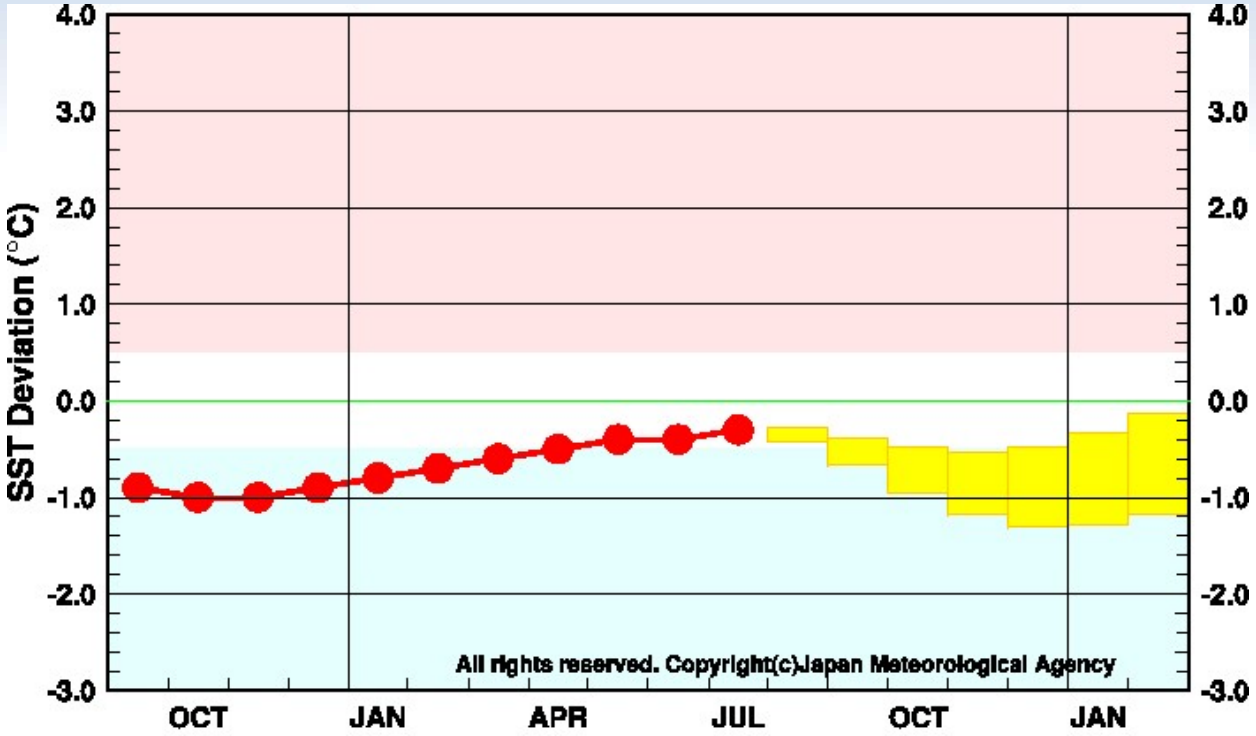
######,	Annual,	Winter,	Spring,	Summer,	Autumn
Normal,	26.21,	23.39,	26.46,	29.02,	25.98
Slope ,	0.85,	0.93,	0.67,	0.78,	1.20
95%lim,	0.20,	0.36,	0.26,	0.22,	0.27

Year	,Annual,	Winter,	Spring,	Summer,	Autumn
1900	,NoData,	NoData,	NoData,	NoData,	NoData
1901	, -1.92,	NoData,	-1.24,	-1.92,	-2.09
1902	, -0.13,	NoData,	-0.34,	0.13,	NoData
1903	, 0.47,	NoData,	0.79,	0.25,	NoData
1904	,NoData,	NoData,	NoData,	NoData,	NoData
1905	,NoData,	NoData,	NoData,	NoData,	NoData
1906	,NoData,	NoData,	NoData,	NoData,	NoData
1907	,NoData,	NoData,	NoData,	NoData,	NoData
1908	, -0.68,	NoData,	NoData,	-0.59,	-0.67
1909	,NoData,	NoData,	NoData,	NoData,	NoData
1910	, -0.62,	NoData,	NoData,	-0.33,	-1.27
1911	, -0.83,	-0.10,	-0.65,	-1.04,	-1.51
1912	, -0.57,	-0.33,	-0.58,	-0.13,	-1.25
1913	, -0.30,	-0.13,	0.11,	-0.46,	-0.72
1914	, -0.70,	-0.57,	-0.65,	-0.98,	-0.60
1915	, 0.22,	-0.10,	0.03,	0.38,	0.58
1916	, -0.30,	0.09,	0.43,	-0.61,	-1.10

Text data

https://www.data.jma.go.jp/kaiyou/english/long_term_sst_japan/sea_surface_temperature_around_japan.html

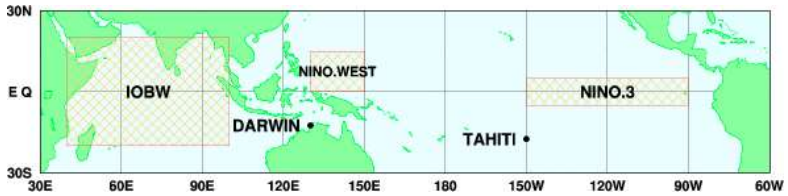
El Niño related products on Tokyo Climate Center website on the JMA website



Five-month running mean of the SST deviation for NINO.3

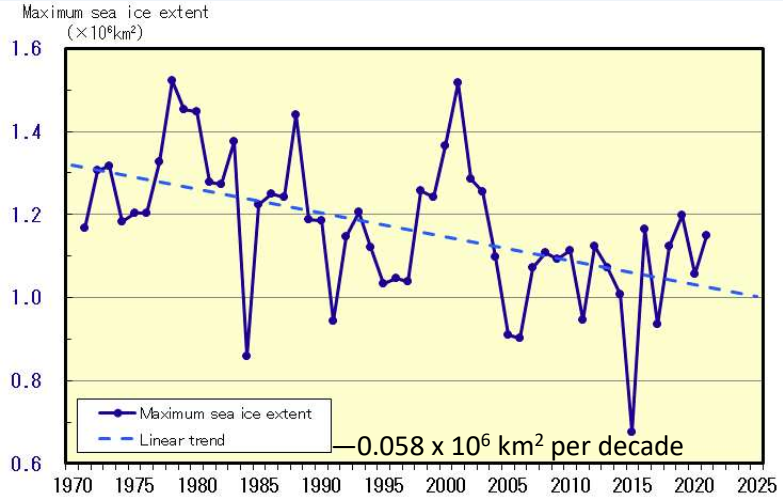
Red dots indicate observed values, and yellow boxes indicate predictions.

Each box denotes the range where the value will be included with the probability of 70%.

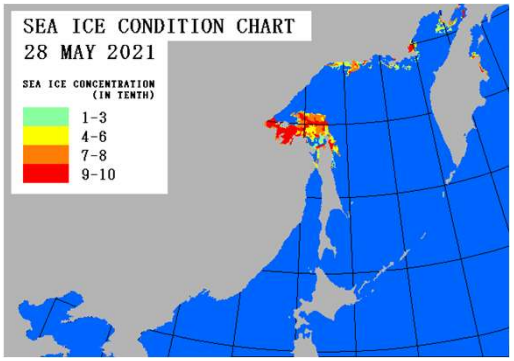


https://www.data.jma.go.jp/tcc/tcc/products/elnino/

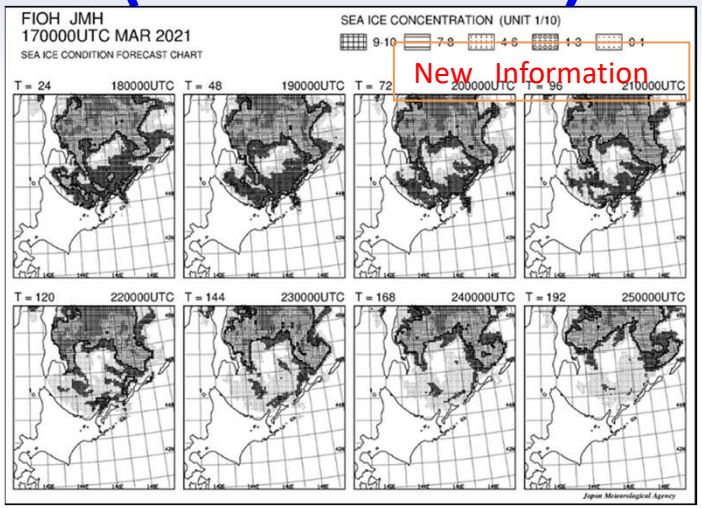
Sea ice products on JMA website , NEAR-GOOS and JMH (radio fax)



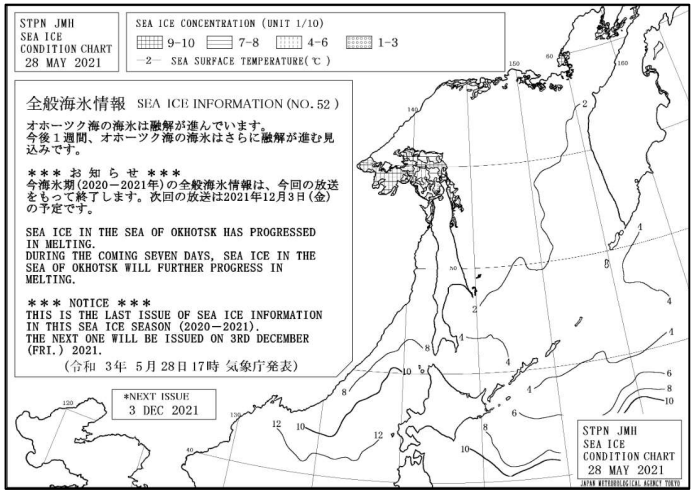
Time-series of maximum sea ice extents in the Sea of Okhotsk from 1971
https://www.data.jma.go.jp/kaiyou/english/seaice_okhotsk/series_okhotsk_e.html



Sea Ice Condition Chart (NEAR-GOOS)



Sea ice forecast charts (JMH))



Sea ice charts (JMH)

< JMH broadcast schedule >
https://www.jma-net.go.jp/common/177jmh/JMH-ENG.pdf

List of Ocean Products (SST analysis)

	MGDSST	HIMSST	SST by Himawari	COBE-SST
Resolution	0.25 deg	0.1 deg	0.02 deg	1 deg
Frequency	daily	daily	2 times per day	monthly
Period	From 1982/1/1	From 2015/10/1	From 2015/10/1	From 1890/1
Operation	From 2004/4	From 2016/11	From 2016/5	
Area	global	Weatern North Pacific	Around Japan 20N-50N, 120E-160E	global
Obs. Data	In situ-data NOAA, Metop-A, AMSR2, Windsat	In situ-data NOAA, Metop-A, AMSR2, Windsat, Himawari8	Himawari8	In situ-data
Analysis method	Optimal interpolation method	Optimal interpolation method	Composite of Himawari8 for 12 hours	Optimal interpolation method

List of Ocean Products (Sea Ice Analysis)

	Sea Ice Condition Chart			Global Sea Ice Concentration Analysis
Resolution	~ 2km	~ 2km	0.25 deg	0.25 deg
Frequency	2 times/ 1week (immediate analysis) 5-day (reanalysis)	Daily	Daily	Daily
Area	Sea of Okhotsk	Sea of Okhotsk	global	global
Obs. Data	Himawari, NOAA, Metop, Terra, Aqua, SuomiNPP, GCOM-W, GCOM-C, visual obs.	Himawari, NOAA, Metop, GCOM-W	DMSP	DMSP, GCOM-W
Analysis method	Manual analysis	Machine Learning (LookUp Table)	NASA Team algorithm	NASA Team algorithm

The JMA ocean forecasting system

operation until 2020/10/28

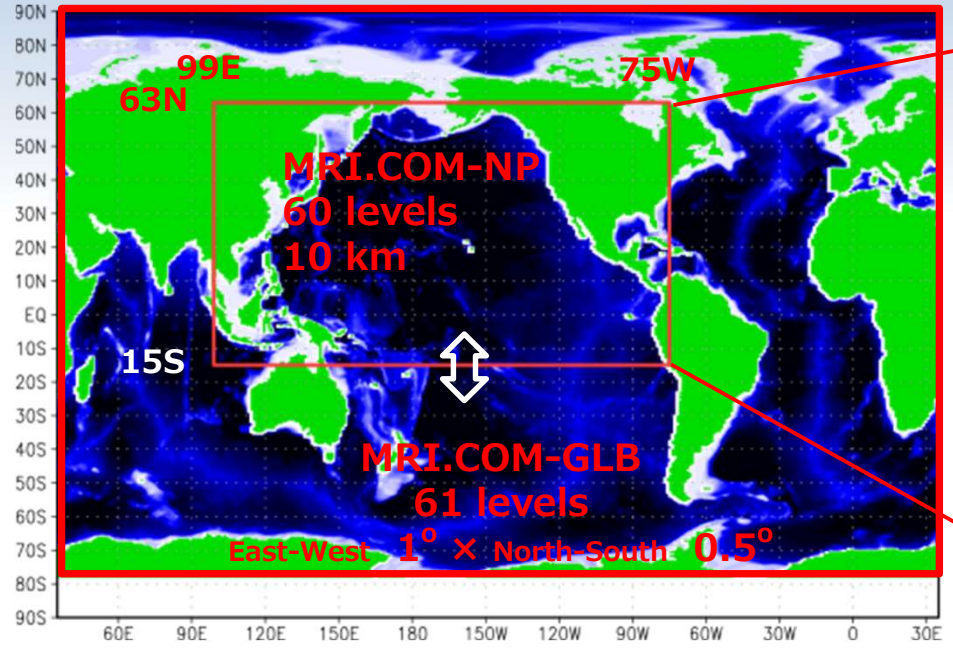
Under operation since 2020/10/28

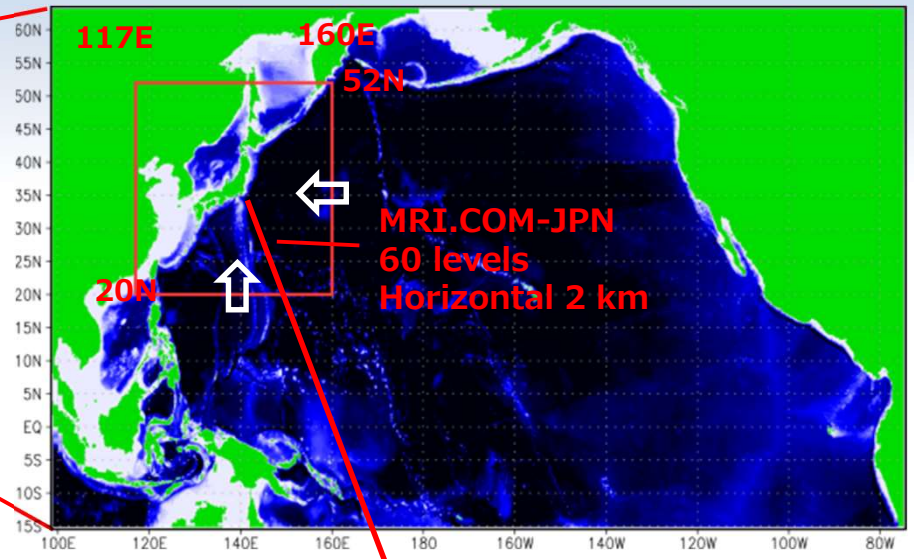
System	MOVE/MRI.COM-WNP 3DVAR	NPR-4DVAR	MRI.COM-JPN
Grid size	10km	10km	2km
Region	Western north Pacific	North Pacific	Seas around Japan
Tidal Process/ River water/Sea Ice	-	-	Yes
Forcing data	JRA55, GEPS	JRA55	GSM
Initialization /Assimilation	3DVAR assimilation	4DVAR assimilation	"NPR-4DVAR" is used as initial condition of JPN.
Forecast period	45 day	-	11 day
Target phenomena	Kuroshio, Oyashio, mesoscale eddies	Kuroshio, Oyashio, mesoscale eddies (improve short period variation)	Anomalous sea level rise event along the coast, coastal waves, upwelling, sub-meso scale eddies, streamer and Sea Ice

By Hirose et al. (2019) (https://doi.org/10.1007/s10236-019-01306-x)

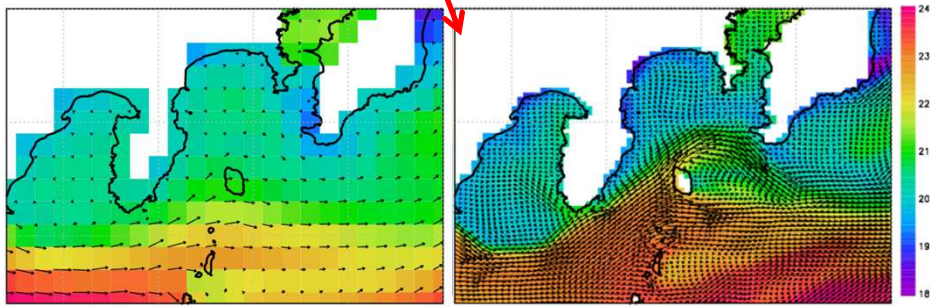
*JRA55:Japanese 55-year reanalysis,
*GEPS: Global Ensemble Prediction System
*GSM: Global Spectral Model

MOVE/MRI.COM-JPN





WNP JPN



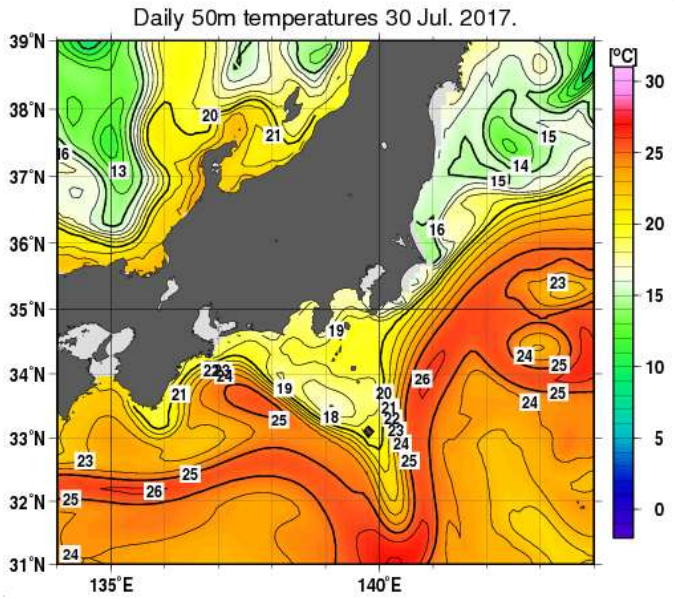
Model	MRI.COM-GLB	MRI.COM-NP	MRI.COM-JPN
Horizontal resolution	1°x 0.5° Long. Lat.	10 km	2 km
Region	Global	North Pacific	Seas around Japan
Tide	Yes		
Forecast period	30 days		11 days

- MRI.COM-JPN, JMA's new OFS provides more realistic ocean analyses/forecasts compared with the previous OFS (MRI.COM-WNP).

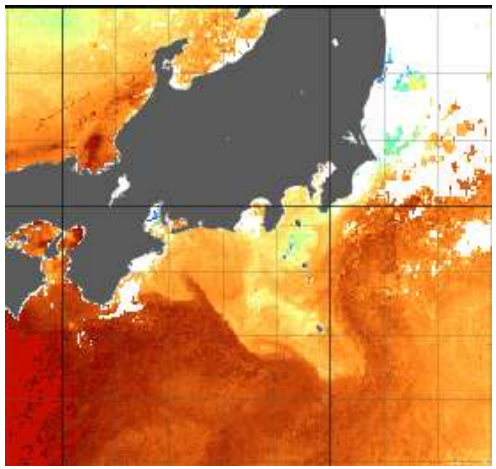
Validation of assimilation analysis

2017/07/30 Cold water within the Kuroshio

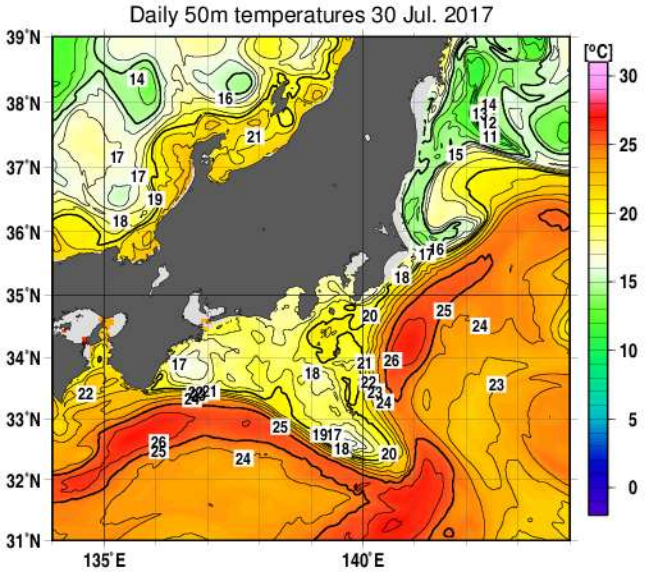
WNP-3DVAR（T 50m）



SST by Himawari 8
（nighttime）



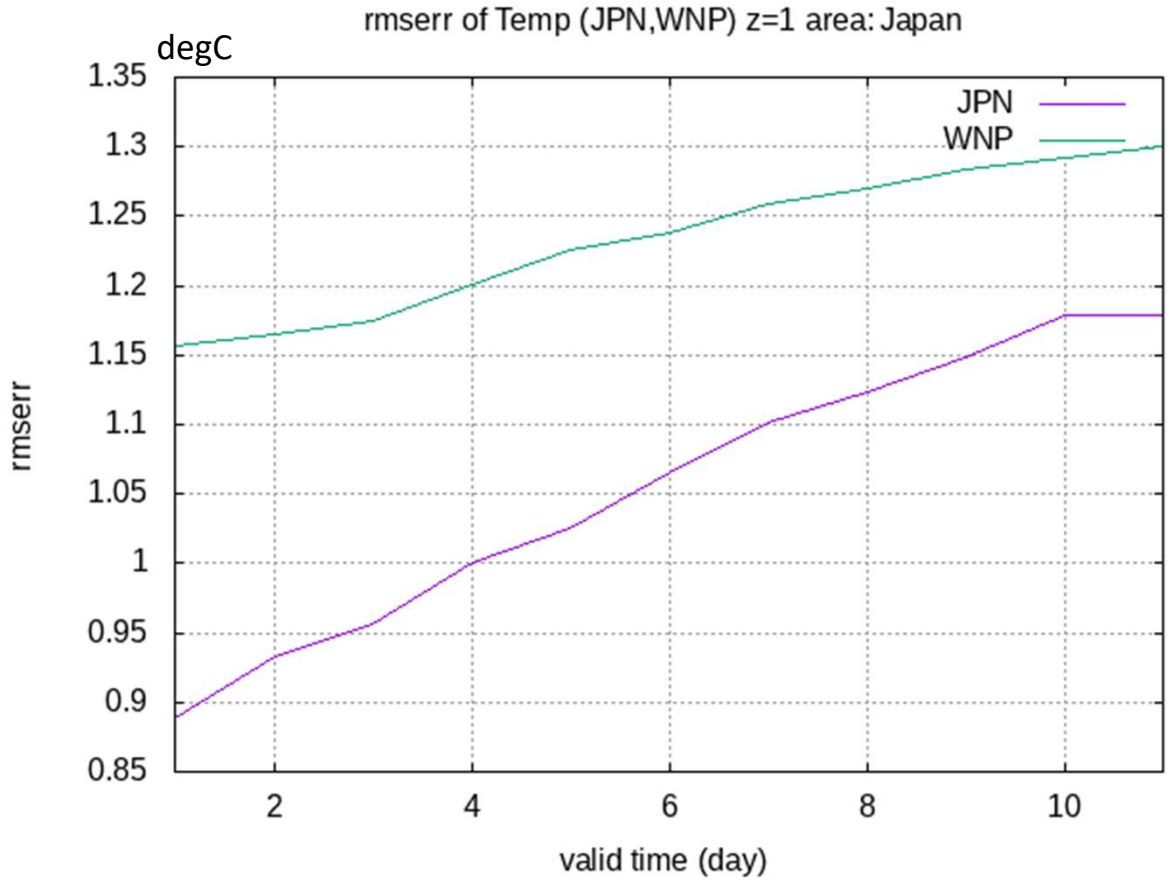
JPN（T 50m）



JPN shows similar shape of the cold water (< 20℃) and Kuroshio's warm water to Himawari 8.

Validation of SST forecast vs. MGDSST

Accuracy of JPN > WNP-3DVAR



RMS ERROR of SST forecast (FT = 1 – 11 days)

Validation period 2019/9～2020/5

SST forecast vs. in-situ data (float, buoy,ship)

Summary

- JMA provides some ocean products in order to support maritime safety, economical ship routing, fishery service, marine pollutants, and they are also used in weather forecasts and climate monitoring in JMA.
- The ocean products are provided through JMA website, NEAR-GOOS, Radio fax, etc.
- JMA operates some kinds of SST analysis and Sea Ice analysis, and they have different areas and features.
- The forecast products and the analysis of currents and subsurface temperatures are constructed by an ocean forecasting system which is composed of ocean model and data assimilation developed by Meteorological Research Institute (MOVE/MRI.COM) .