

Theme #2.3 Regional ocean prediction



Four-dimensional variational Ocean ReAnalysis for the seas around Japan over 60 years (FORA-JPN60)



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What is FORA-JPN60?

FORA-JPN60: Four-dimensional variational Ocean ReAnalysis for the seas around Japan over 60 years

- First-ever dataset covering the seas around Japan over 60 years
- Successor to FORA-WNP30 (Usui et al. 2017)
- Produced under the MEXT-program for the advance studies of climate change projection

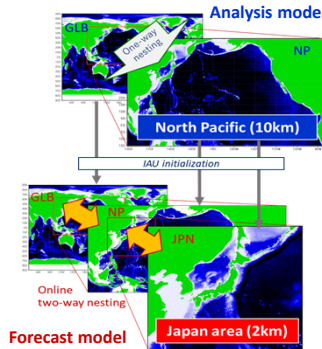
DA system: MOVE/MRI.COM-JPN

Analysis model

- North Pacific (NP, 10km) and global (GLB, 100km) models
- 4D-Var assimilation scheme

Forecast model

- Japan area (JPN, 2km), NP (10km), and GLB (100km) models
- Initialized by IAU method using 4D-Var results (IAU down scaling)

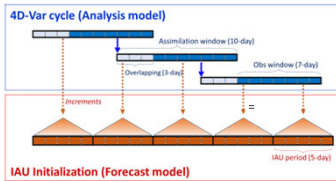


Reanalysis settings of FORA-JPN60 and FORA-WNP30

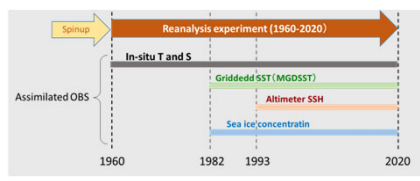
	FORA-JPN60	FORA-WNP30
Ocean Model	MRI.COM v5.0 • JPN:2km, NP:10km, GLB:100km • Online two-way nesting • Tide and SLP forcing	MRI.COM v2.4 • WNP:10km, NP:50km • One-way nesting
Forcing	Atmosphere: JRA-3Q (3 hourly) River: JRA-55 and JMA runoff index (hourly)	Atmosphere: JRA-55 (daily) River: n/a
Data assimilation	MOVE_V4 • Ocean: 4D-Var + IAU downscaling • Sea ice: nudging	MOVE_V3 • Ocean: 4D-Var • Sea ice: nudging
Observations	SST • MGDSSST SSH • Along-track SLAs (14 satellites) • Offline correction of non-steric components In-situ T and S • EN4, WOD18, GTSPP, JODC, FRECO, KODC • Observations conducted by Japanese local governments and government agencies Sea ice concentration (SIC) • SSM/I, SSM/IS • JMA's SIC analysis in the Sea of Okhotsk	SST • MGDSSST SSH • Along-track SLAs In-situ T and S • WOD13 • GTSPP Sea ice concentration (SIC) • SSM/I, SSM/IS
Period	1960-2020	1982-2016

Assimilation cycle and assimilated observations

- Combination algorithm of 3D-Var and 4D-Var, in which 3D-Var is first conducted and 4D-Var starts from 3D-Var result
- 10-day assimilation window with 3-day overlapping
- Initialize the forecast model by Incremental Analysis Update (IAU) using 4D-Var analysis results

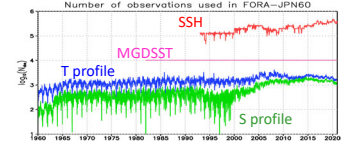


FORA-JPN60 assimilation cycle

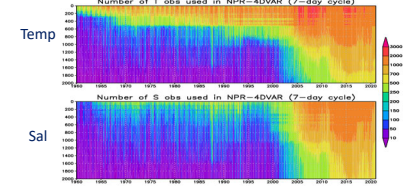


Observations used in the reanalysis experiment

Time series of the number of observations

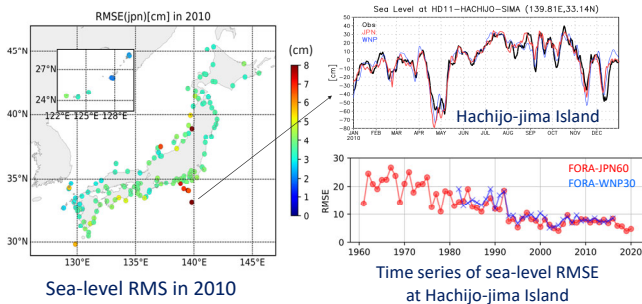


Time-depth section of the number of T and S observations

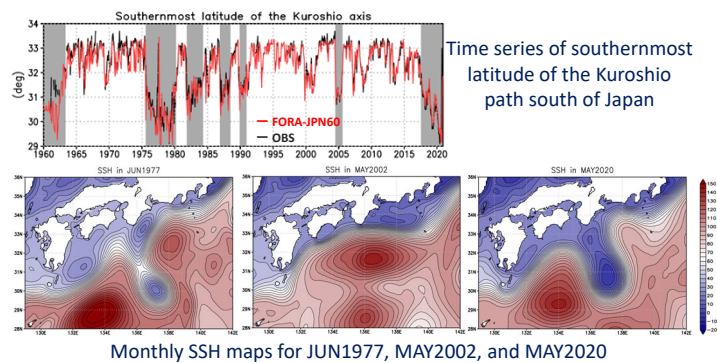


Validation

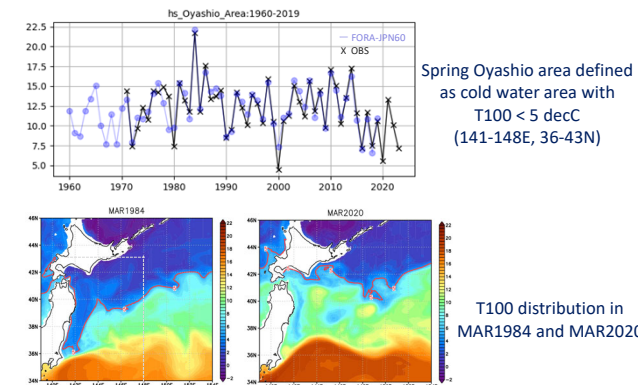
Coastal Sea Level



Kuroshio south of Japan



Oyashio



Japan Sea throughflow transport

