

Intercomparison and ensemble project of all regional prediction models in Japan

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COSS DA Systems in Japan

	DREAMS_Ep	FRA-ROMSII	JCOPE-T-1ks	LORA	MOVE-JPN	OE_x
Organization	RIAM, KU	FRA	JAMSTEC	RIKEN	MRI, JMA	JAMSTEC/OE
PI	Nick HIROSE	NAGAI	MIYAZAWA	OHISHI	Nari HIROSE, USUI	TANAKA
HP	https://dreams-d.riam.kyushu-u.ac.jp/vwp/	https://fra-roms.fra.go.jp/fra-roms/	https://www.jamstec.go.jp/jcope/	https://www.eorc.jaxa.jp/ptree/LORA/index.html	https://www.data.jma.go.jp/gmd/kaiyou/data/db/kaikyo/daily/t100_HQ.html	https://oceaneyes.co.jp/
H grid, spacing	B, 1'x0.8'	C, 6'x6'	C, 0.5'x0.5'	C, 6'x6'	B, 1.818'x1.2'	B, 1'~1.2'
V coordinate	z, 114 levels	s, 48 layers	z- σ , 46 layers	σ , 50 layers	z*, 60 levels	z*, 35 levels
Met forcing	GPV/MSM, 1h	JRA55, 3h + CFS, 6h	NCEP-GFS, 1h	JRA55-do, 3h	GPV/GSM, 3h	NCEP-GFS, 3h
Tide	Explicit	None	Explicit	None	Explicit	Explicit
Parent model	DREAMS_M	ROMS 0.5°NP	JCOPE-T DA	SODA 3.7.2	MOVE-NP	MOVE-NP
DA method	RoKF	3D-Var + IAU	Spectral nudge	LETKF	IAU downscale	IAU downscale
Reference	https://doi.org/10.1007/s10872-021-00629-y	https://doi.org/10.4236/ojms.2017.71006	https://doi.org/10.3390/rs13132431	https://doi.org/10.1007/s10236-023-01541-3	https://doi.org/10.1007/s10236-019-01306-x	

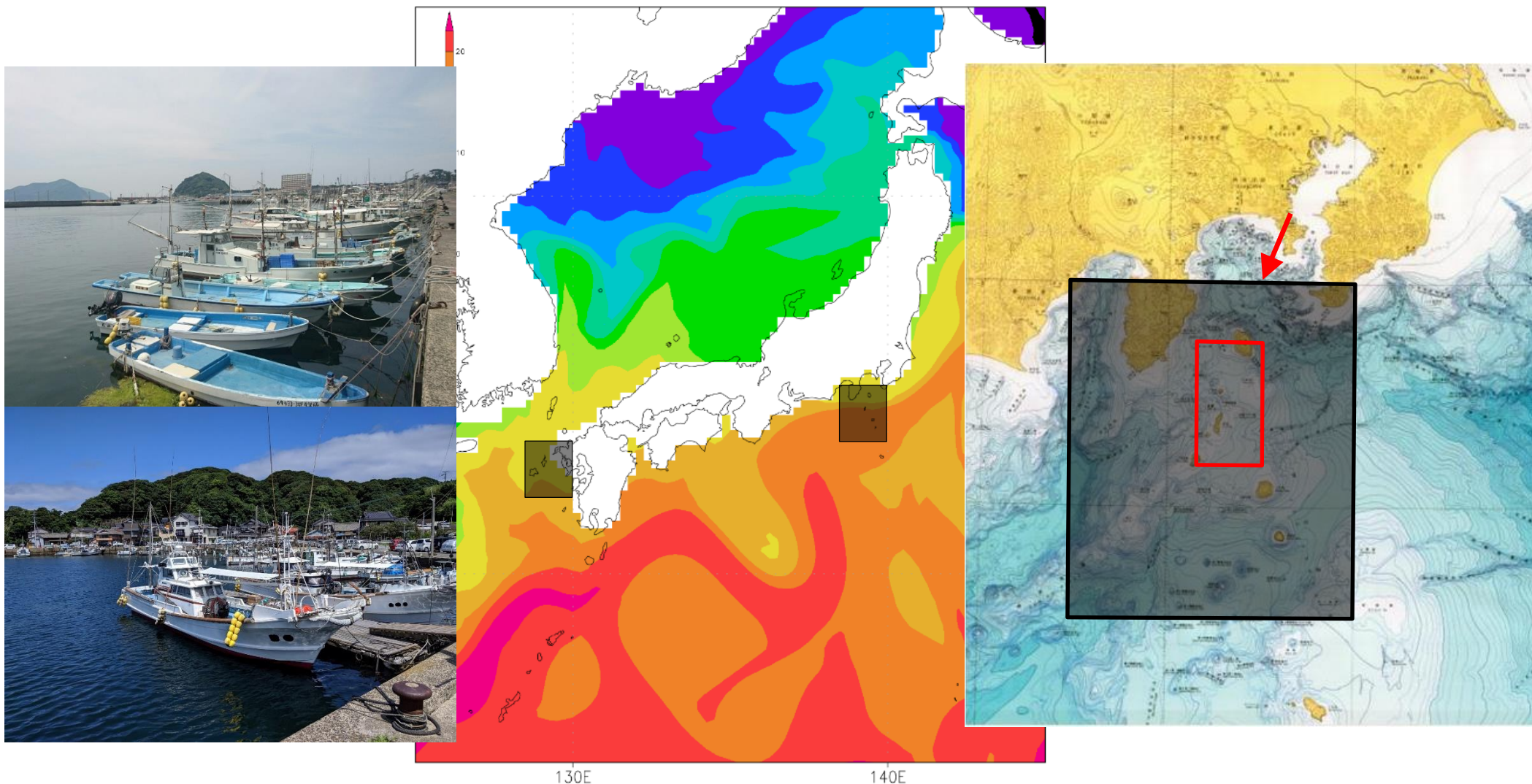
Users may vacillate...

Motivation

- ❑ **Synthesis of 6 systems for better accessibility**
 - ✓ Start with the intercomparison
 - ✓ Experience of multimodel ensemble

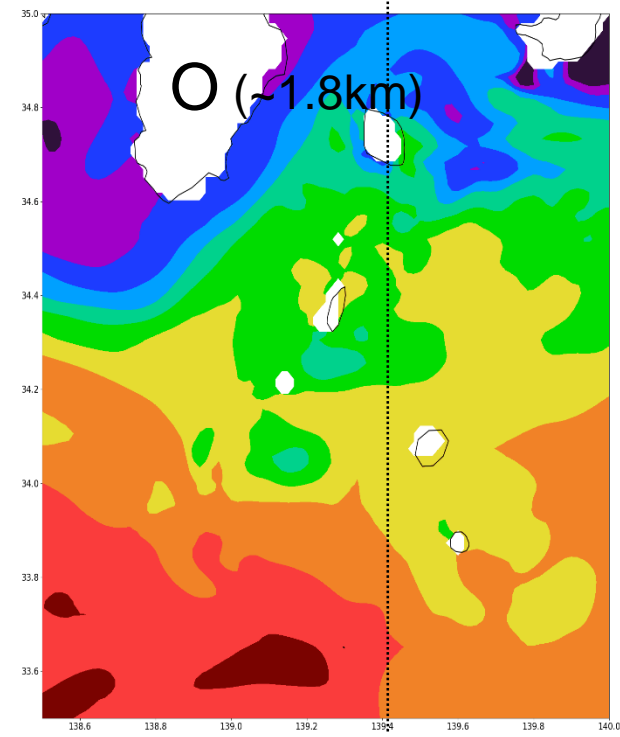
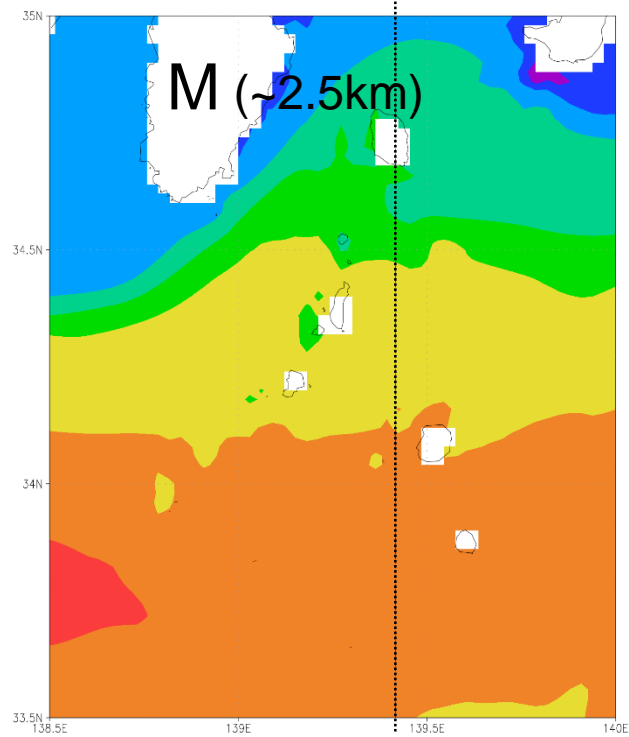
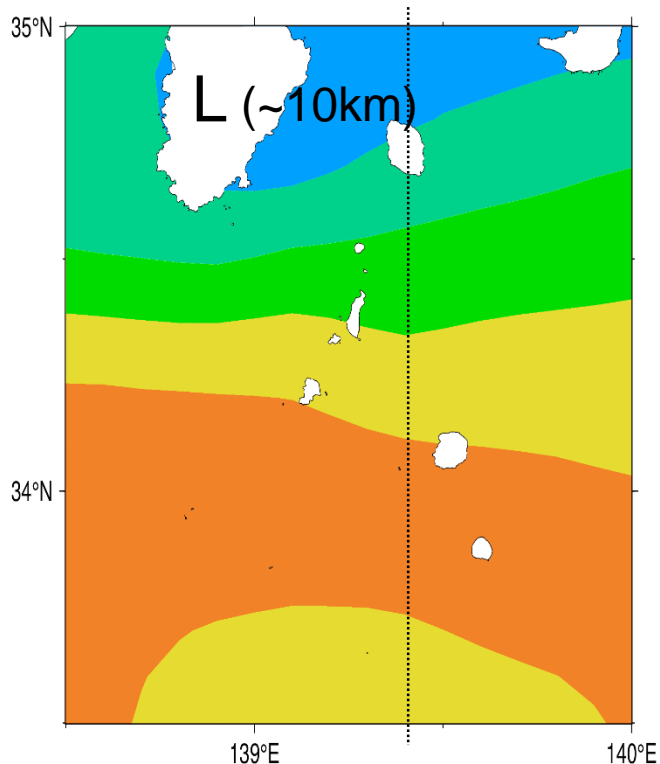
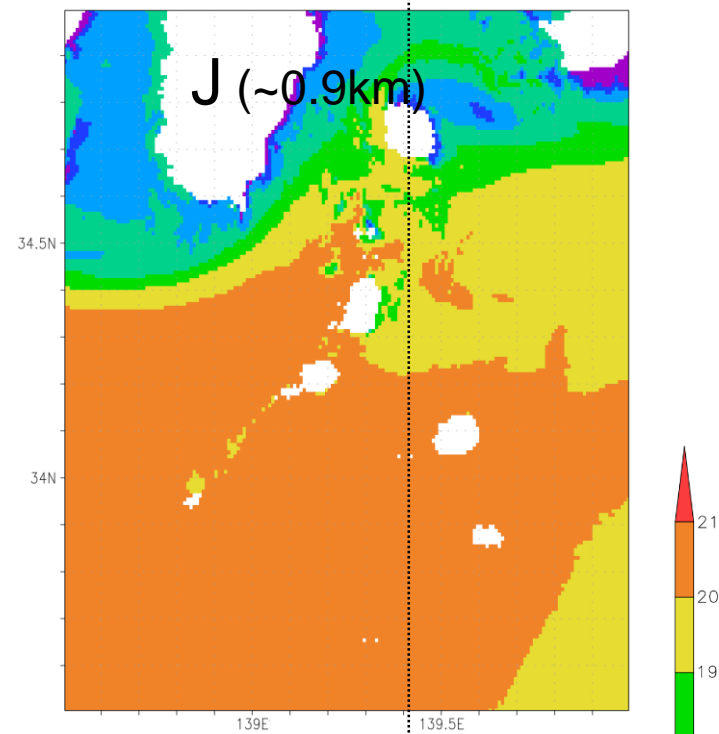
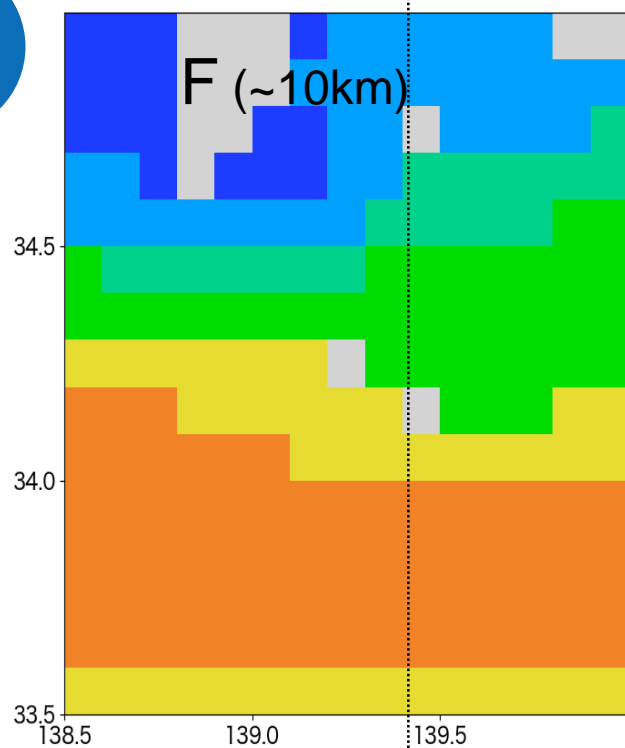
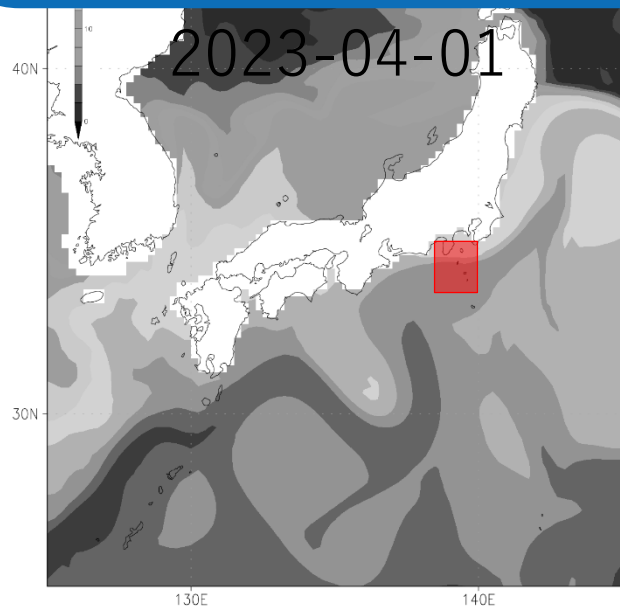
- ❑ **Advantage of COSS observation campaign**
 - ✓ Big research project is under review
 - Lead by JAMSTEC
 - R&D of new instruments
 - ✓ Chance of intensive measurement data for COSS DA at the campaign field(s)

Candidate zones



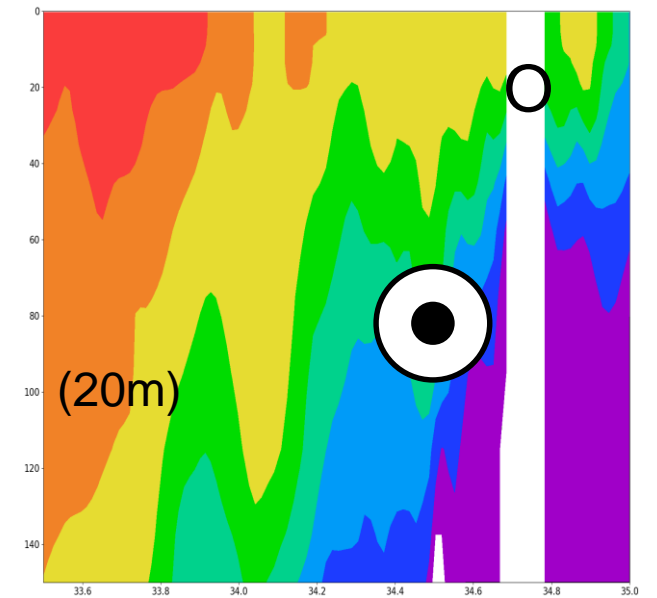
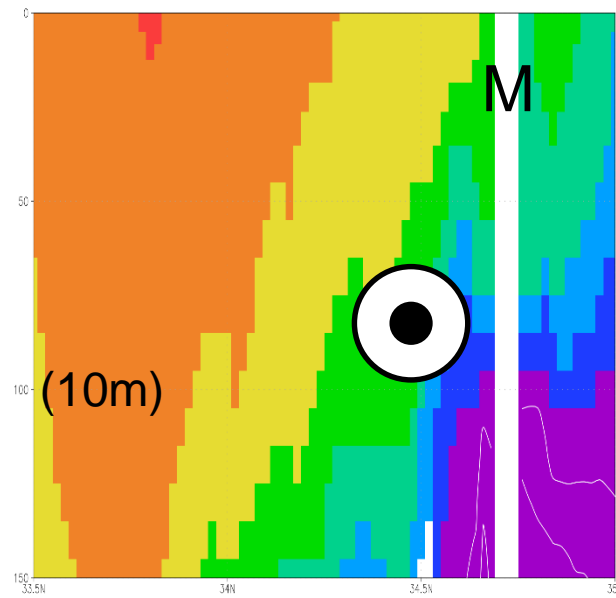
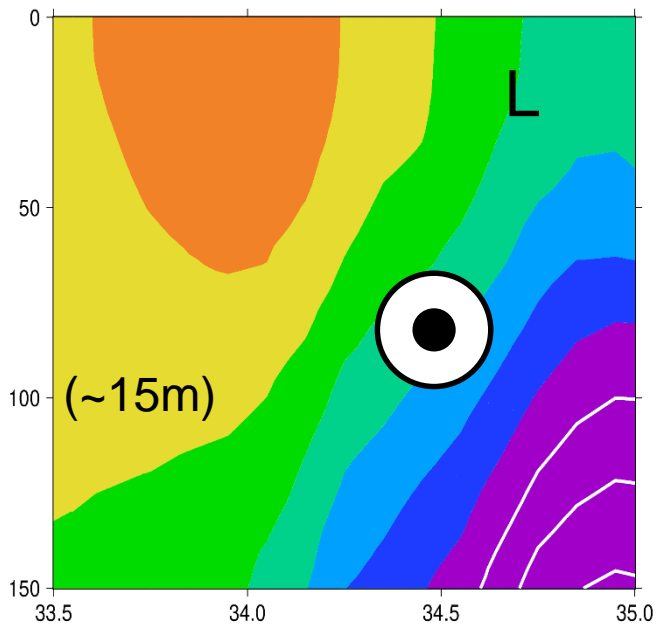
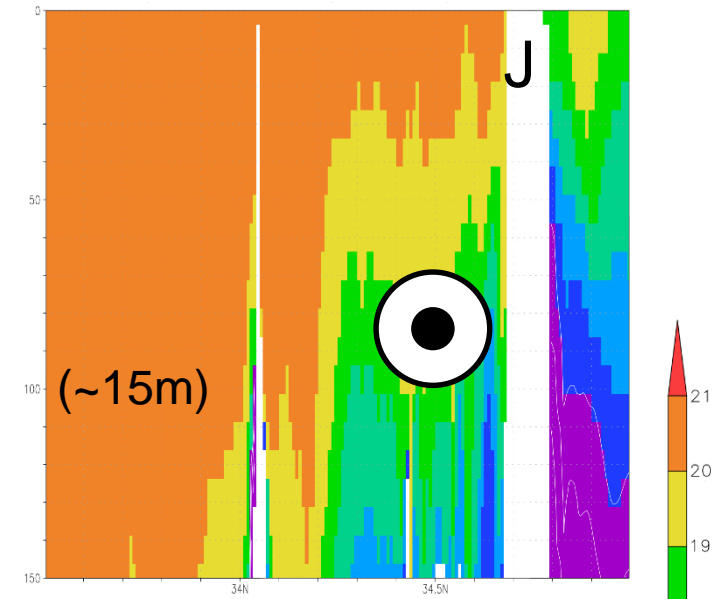
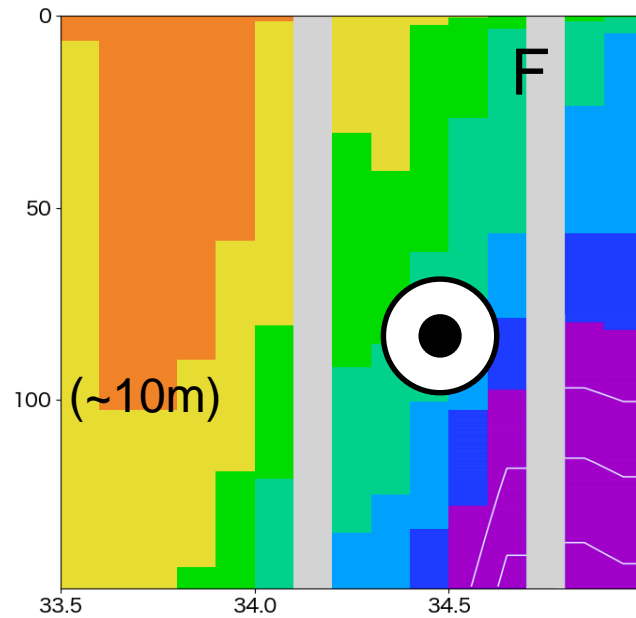
DR_B Temp, 50m, 2023-04-01

T 50m

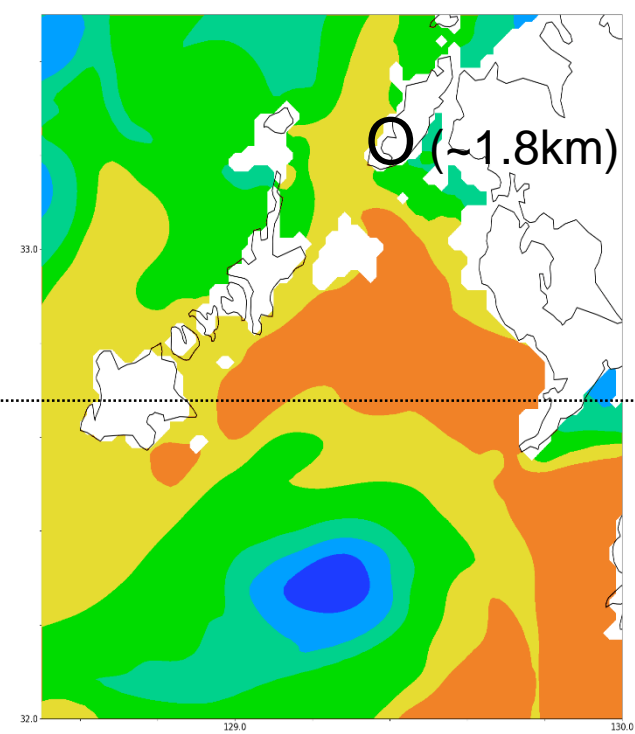
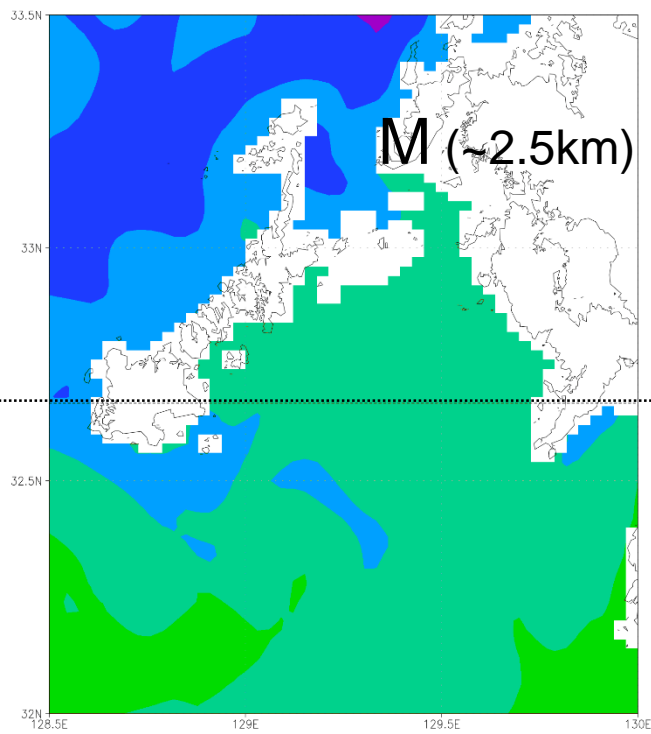
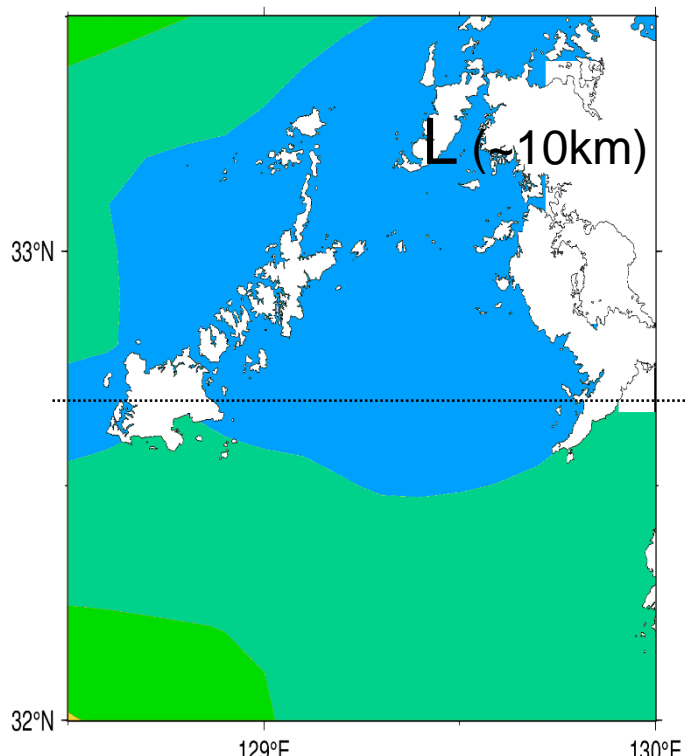
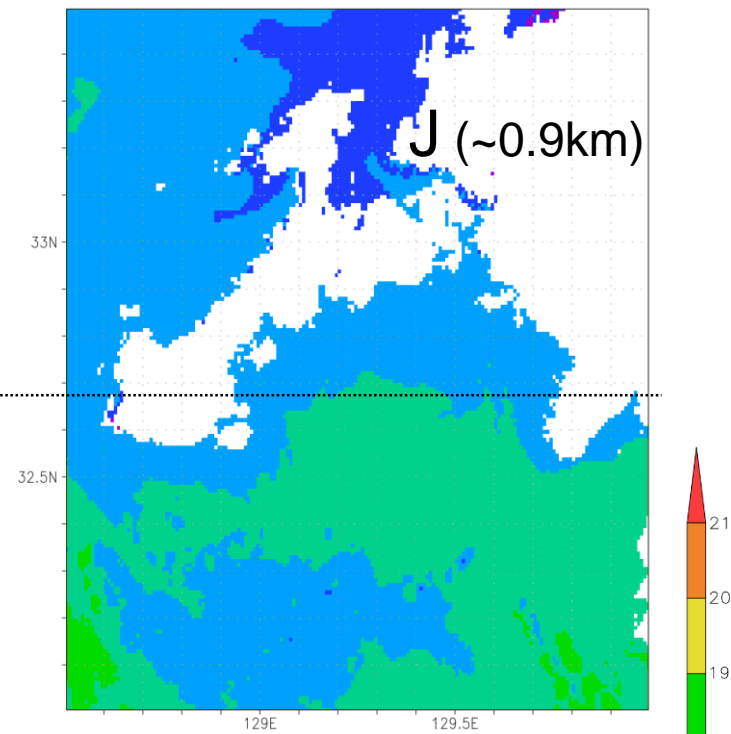
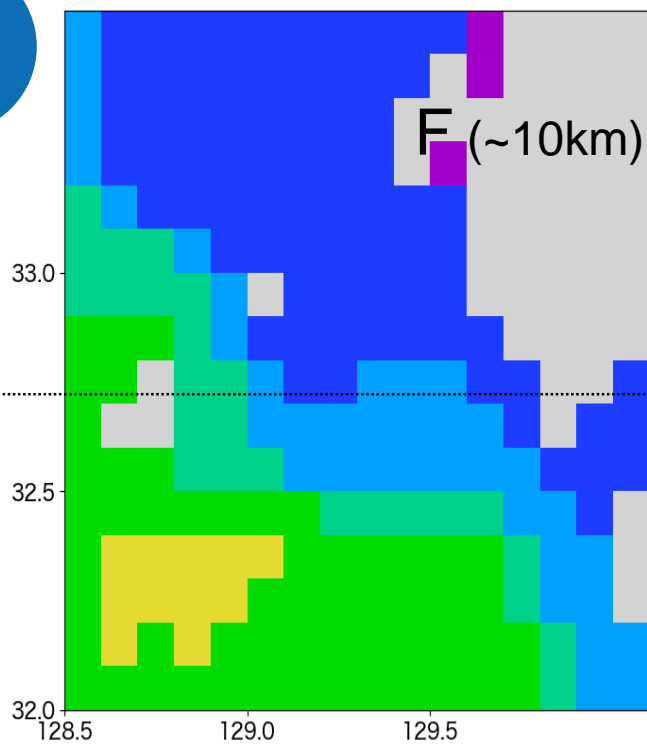
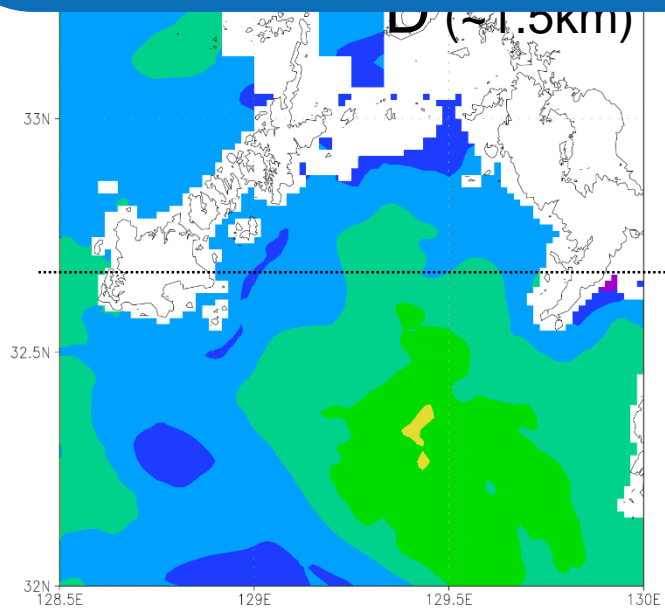


Temp 139°25'E

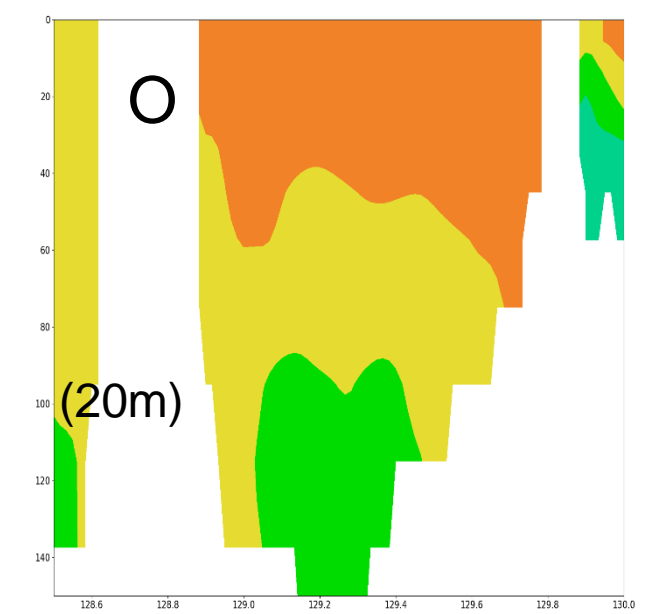
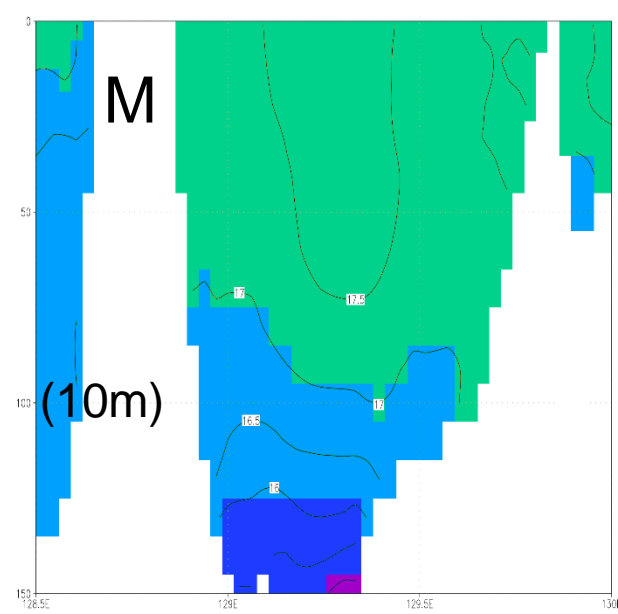
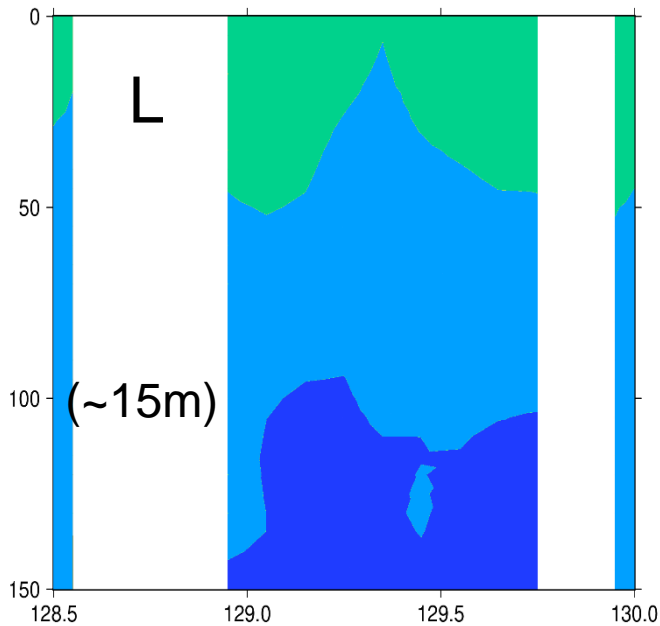
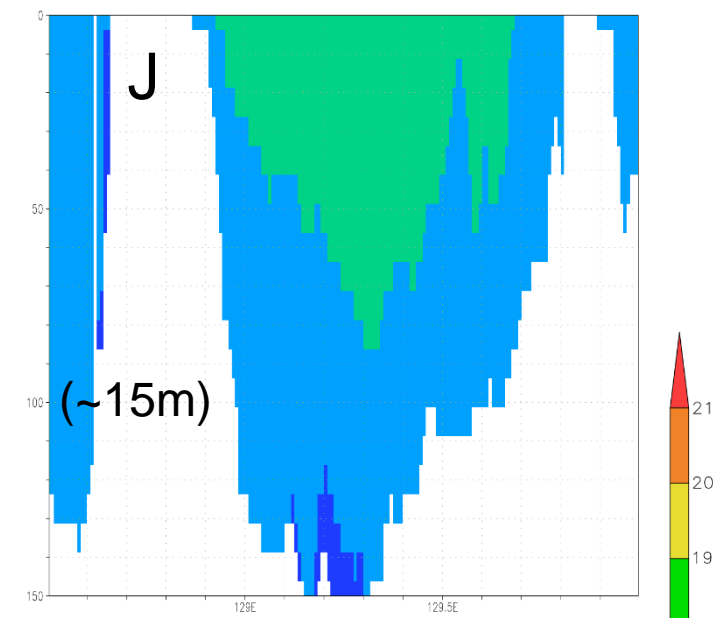
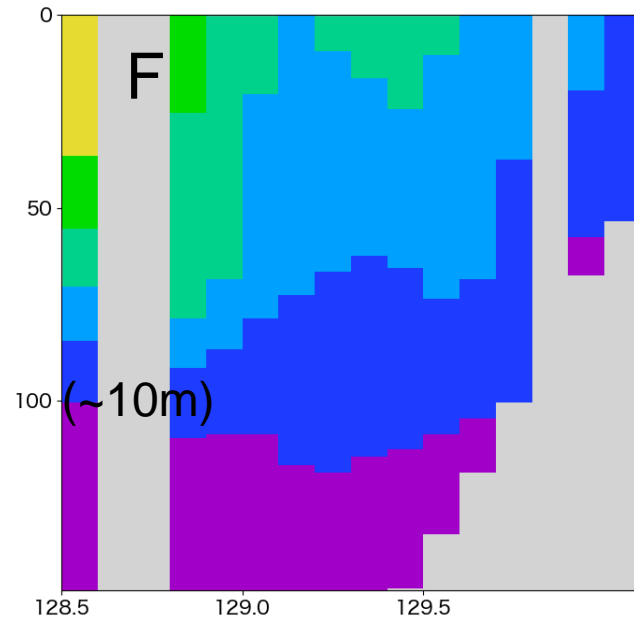
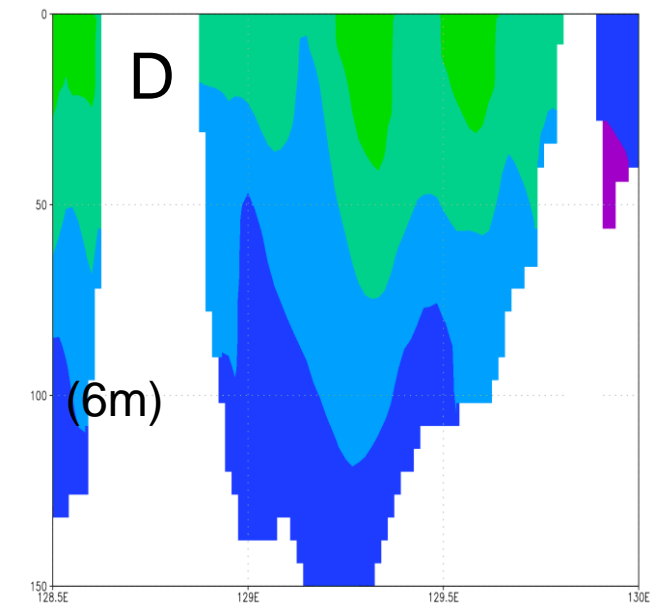
2023-04-01



T 50m



Temp 32°40'N

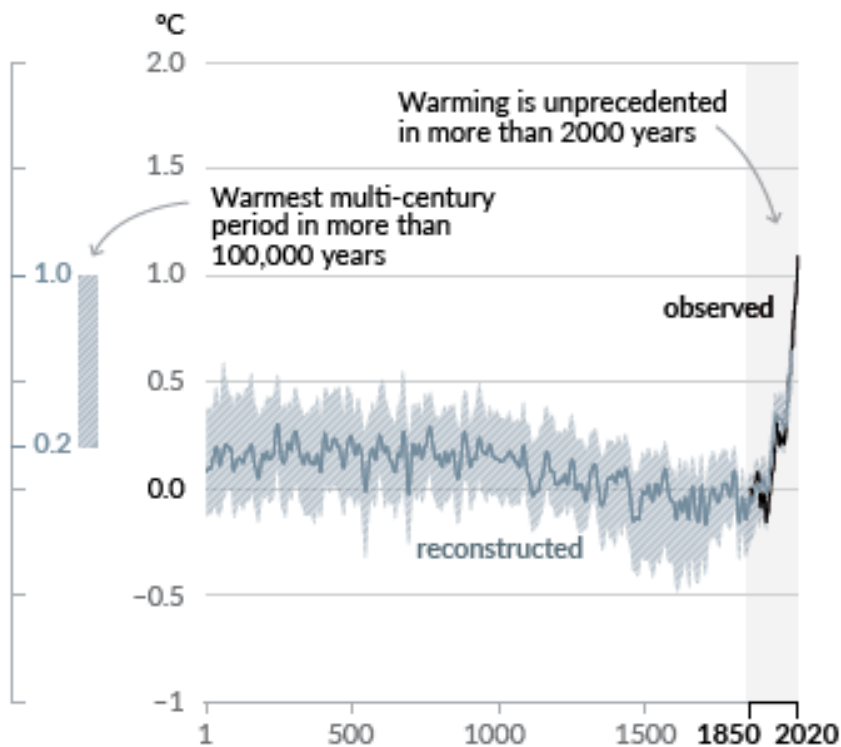


CMIP Model Ensemble

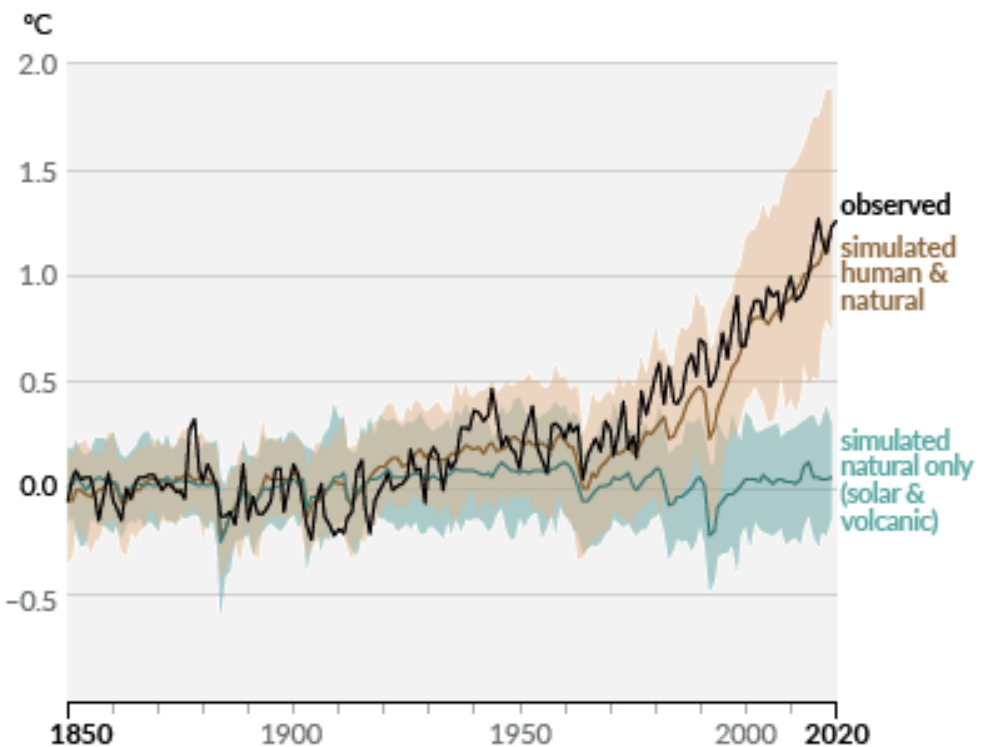
Human influence has warmed the climate at a rate that is unprecedented in at least the last 2000 years

Changes in global surface temperature relative to 1850–1900

(a) Change in global surface temperature (decadal average) as reconstructed (1–2000) and observed (1850–2020)

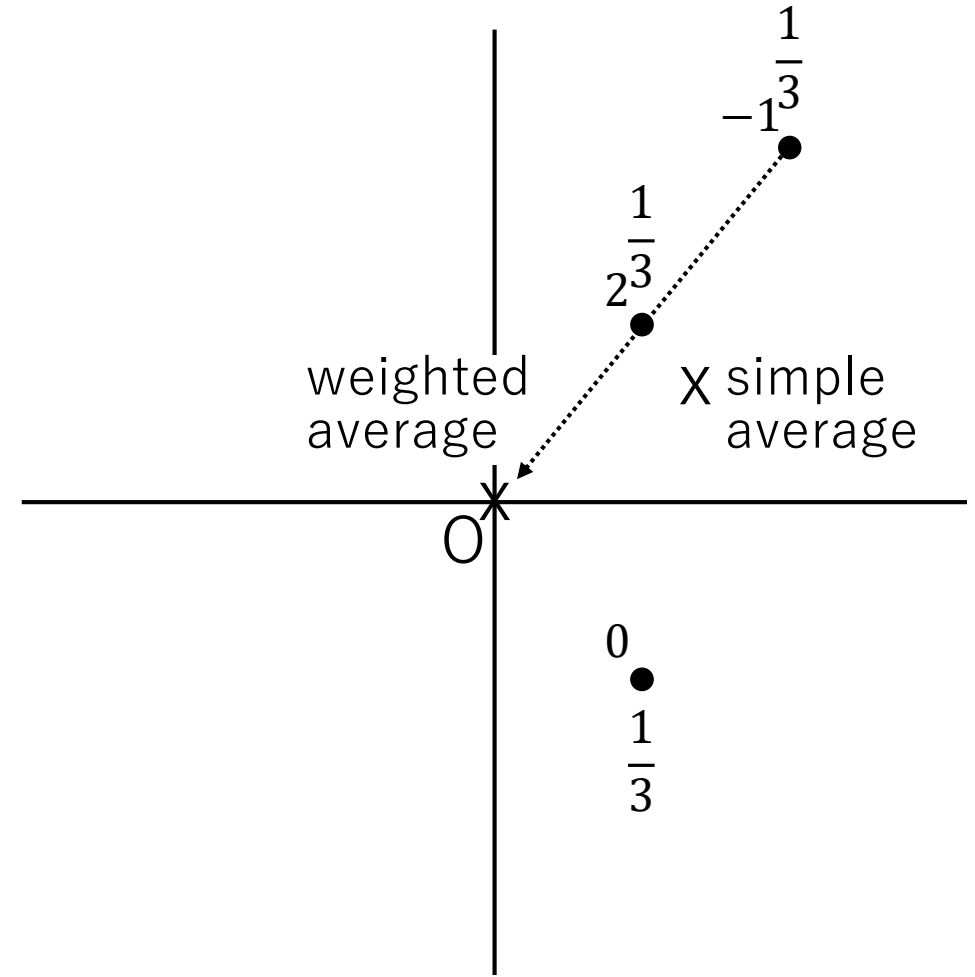
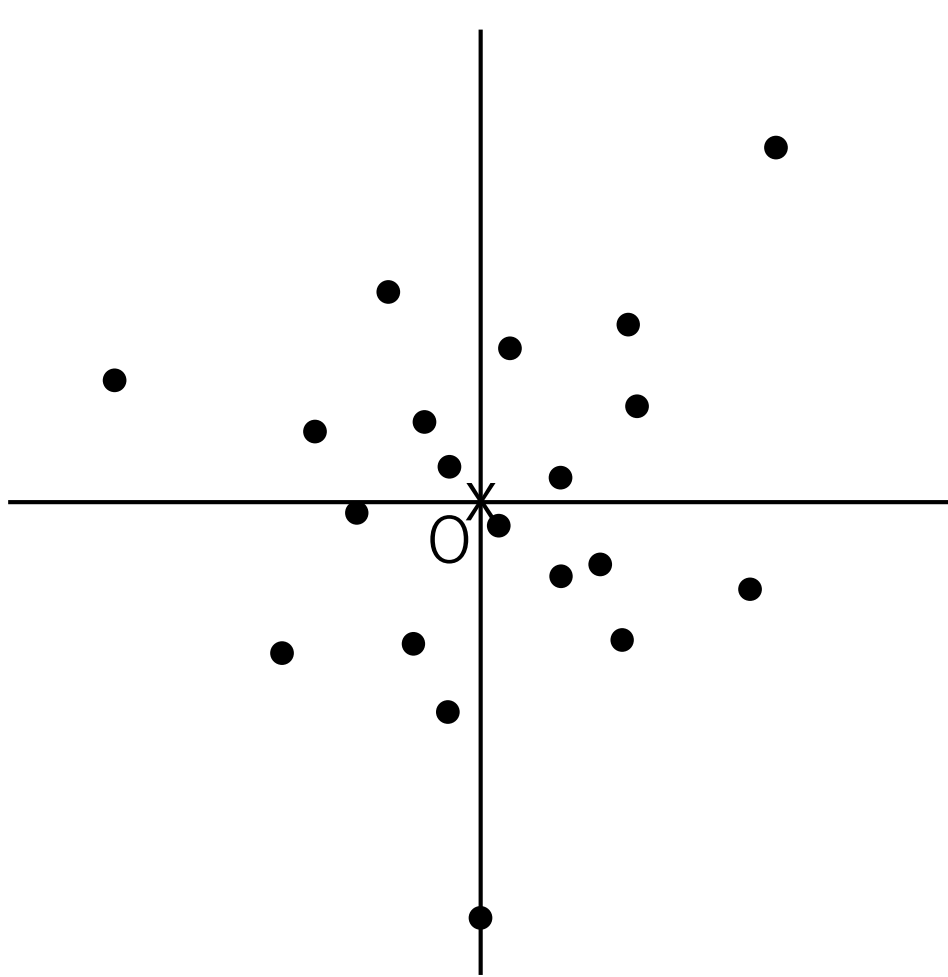


(b) Change in global surface temperature (annual average) as observed and simulated using human & natural and only natural factors (both 1850–2020)



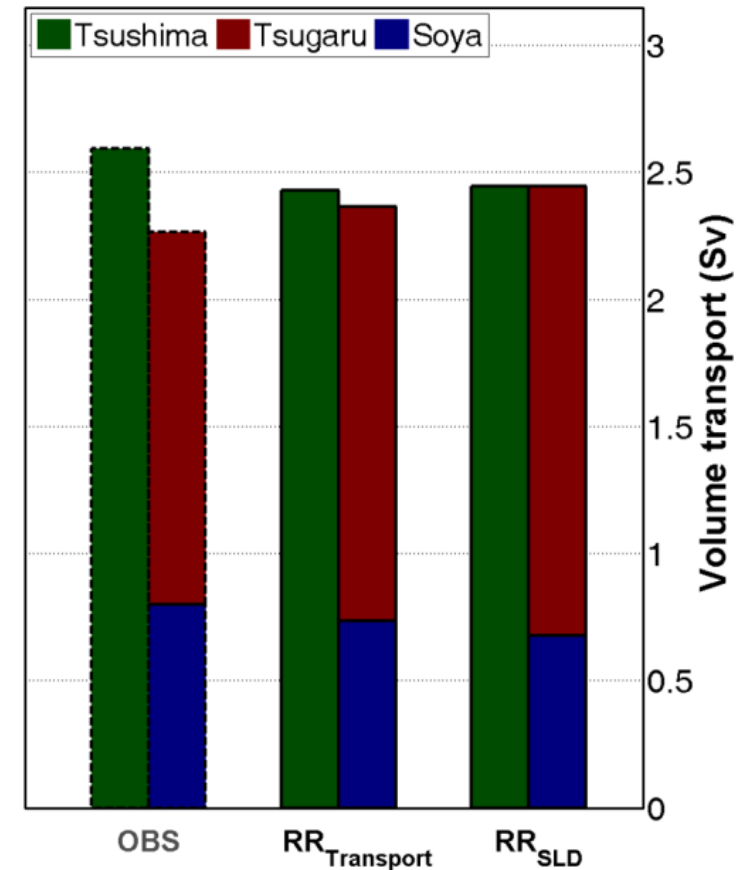
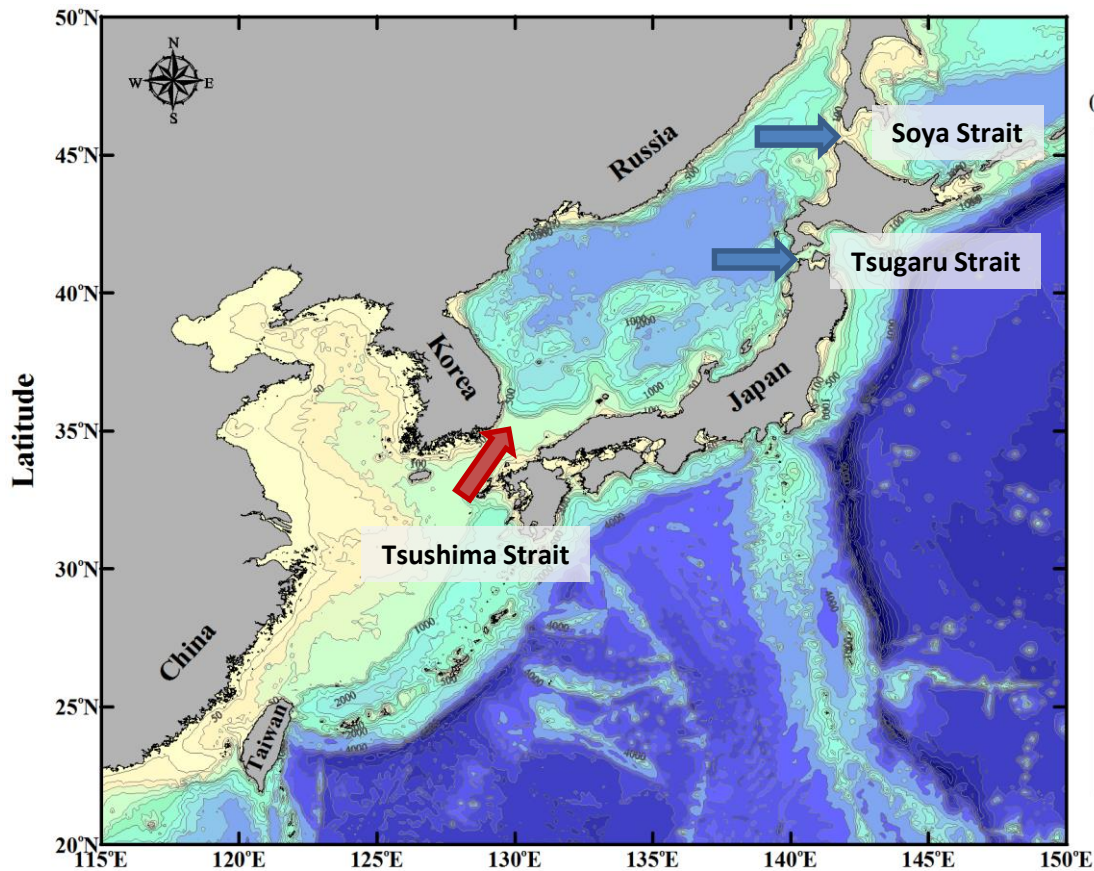
IPCC AR6, Fig.SPM.1

Simple or Weighted Average



Regional Ocean MME

Han et al., *Ocean Dyn.* (2016)



y_i	β_0	$\beta_1 x_{i,1}$	$\beta_2 x_{i,2}$	$\beta_3 x_{i,3}$	$\beta_4 x_{i,4}$	TOTAL ($\beta_1 + \beta_2 + \beta_3 + \beta_4$)
MME(RR)		DREAMS	MOVE	JCOPE	HYCOM	
y_{VT}	-0.053	+0.503 x_1	+0.503 x_2	-0.352 x_3	+0.301 x_4	0.954
y_{SLD}	0.000	+0.069 x_1	+0.464 x_2	+0.142 x_3	+0.228 x_4	0.903

First 5 years (2023-28)

□ Metrics

- ✓ Statistics >> Dynamics ?

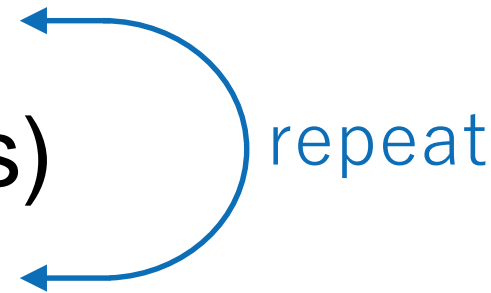
□ Individual assimilation models

- ✓ Must be improved

□ MME at the target zone(s)

- ✓ Intercomparison
- ✓ Multiscale ensemble average?

- To overcome the differences in configurations of tide, resolution, topography, ...



In 10 years

- ❑ MME analysis/prediction will be extended from zone to area
- ❑ Users (in Japan) straight access to the unified COSS information
 - ✓ Regardless of public or commercial purpose
- ❑ Applications expected
 - ✓ Effective fishery and marine food sustainability
 - ✓ Detection and control of marine lives and objects
 - ✓ Contributions to marine renewable energy
 - ✓ ...