GODAE OceanView (GOV) COSS-TT
International Coordination Workshop 1 (ICW-1)
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Data assimilation Research of the East Asian Marine System

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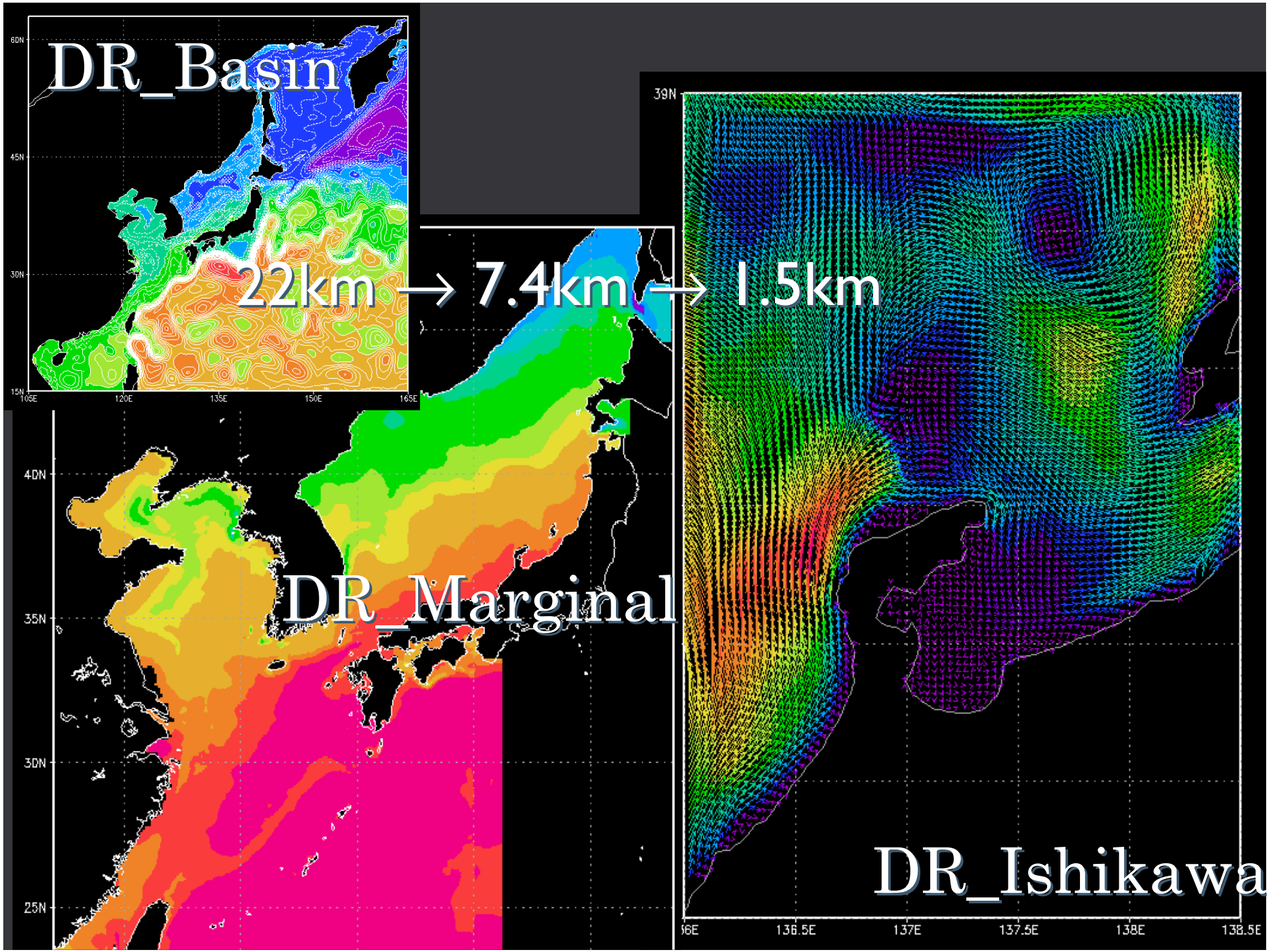

DR_Basin
22km → 7.4km → 1.5km
DR_Marginal
DR_Ishikawa
60N
45N
30N
15N
105E
120E
135E
150E
165E
40N
35N
30N
25N
39N
136.5E
137E
137.5E
138E
138.5E

DREAMS: models

- RIAM Ocean Model
  - Free-surface, z-coordinate, hydrostatic PE OGCM
  - MPI parallelization
- Vertical levels: 38
- Major rivers (Amur, Huanghe, and Changjiang)
  - with minor river effect accounted by coastal precipitation (~80km)
- Bottom topo: JTOPO1 + SKKU + TaiDBMv6 + ETOPO1

	DR_Basin	DR_Marginal	DR_Ishikawa
grid spacing	$1/4° \times 1/5°$	$1/12° \times 1/15°$	$1/60° \times 1/75°$
open boundary	monthly climate	DR_B	DR_M
surface forcing	JRA25+GSM, daily	JRA25+GSM, 6 hourly	GPV/MSM, hourly
tide	no	NAO.99Jb	DR_M

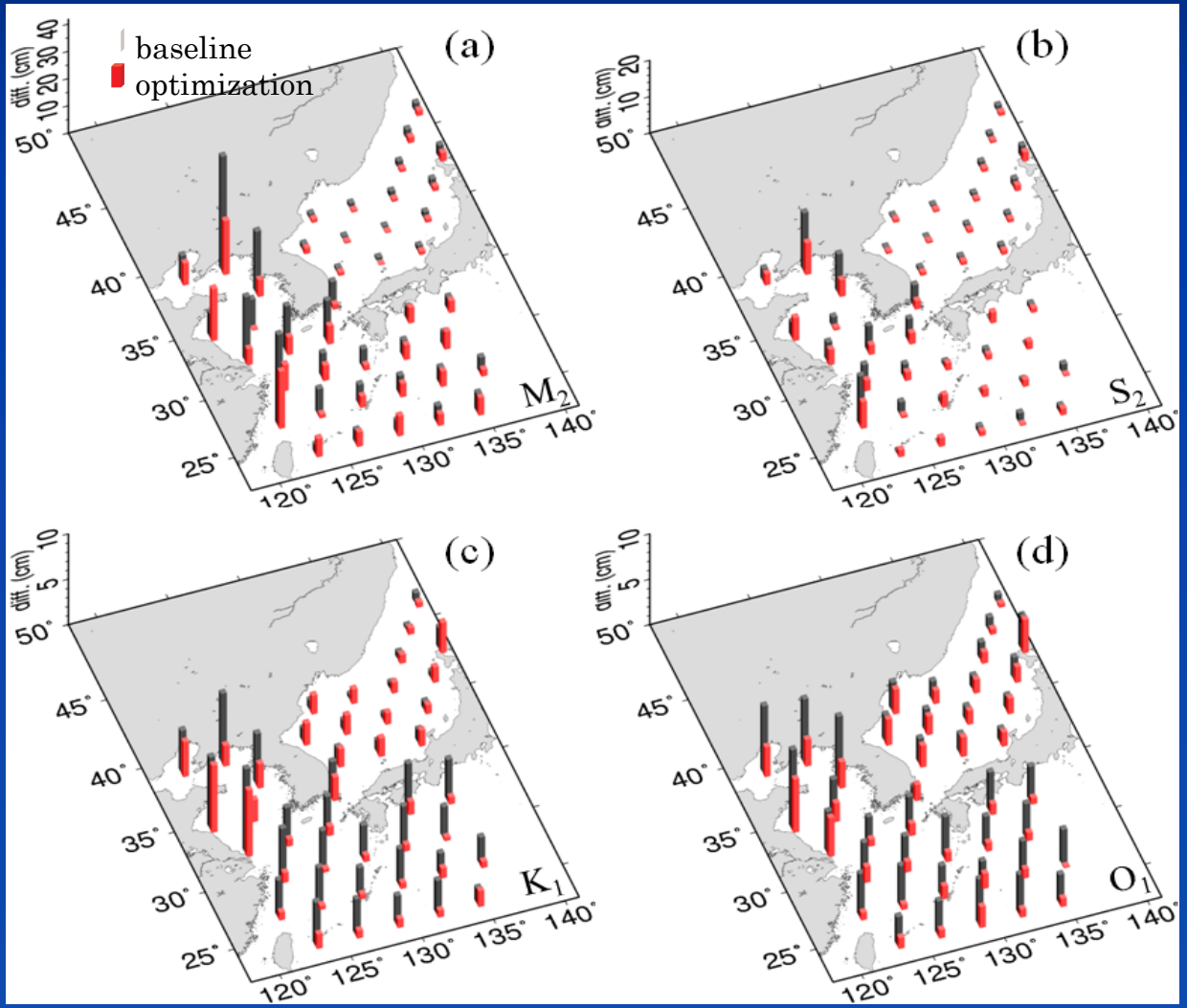
Tide and topography

- RMS error and cost functions compared to the satellite observation for three bathymetry datasets

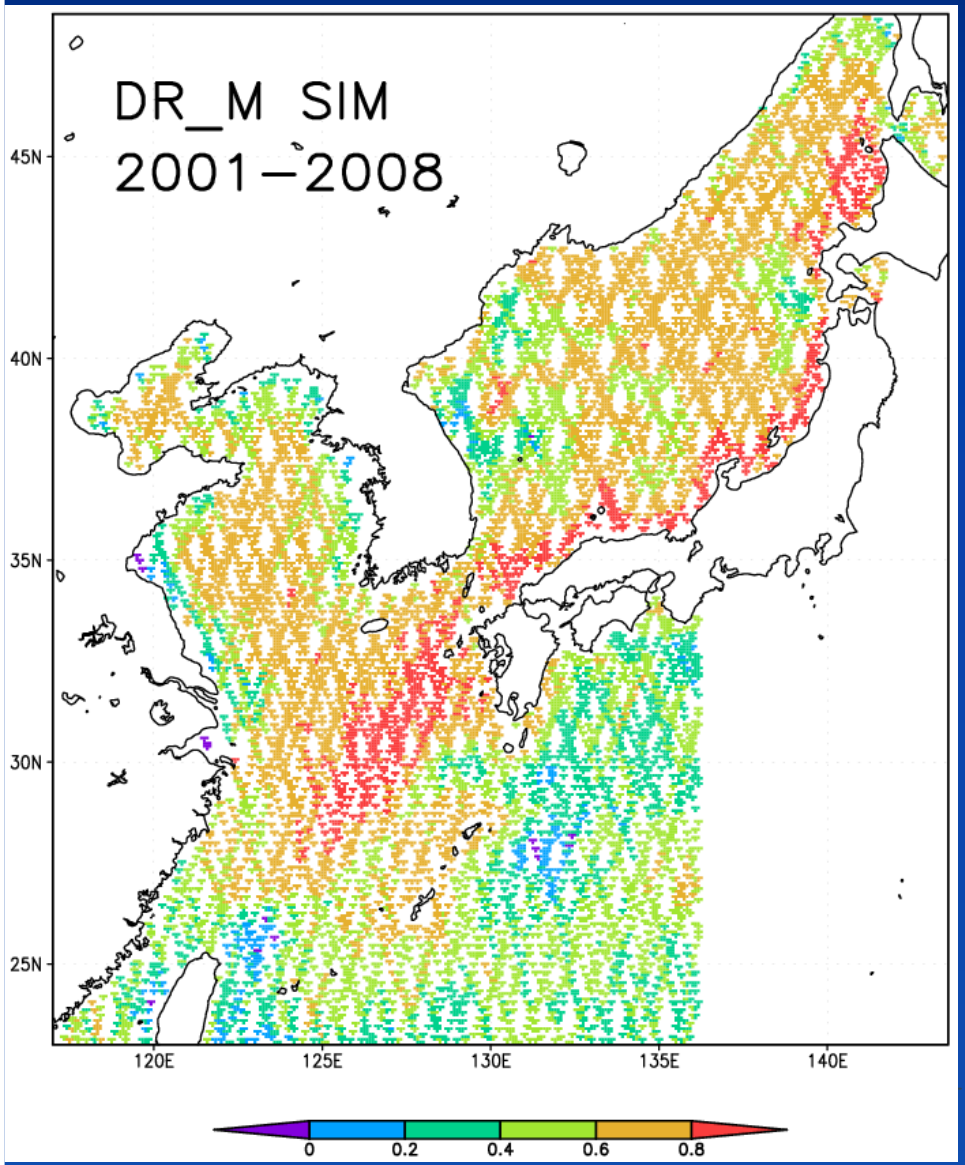
	M2	S2	K1	O1	Cost
Hirose (2005)	5.19	1.93	2.15	2.40	722.9
GEBCO (2008)	7.23	2.56	2.30	2.49	1309.7
ETOPO1 (2008)	6.61	2.09	2.28	2.47	1037.9

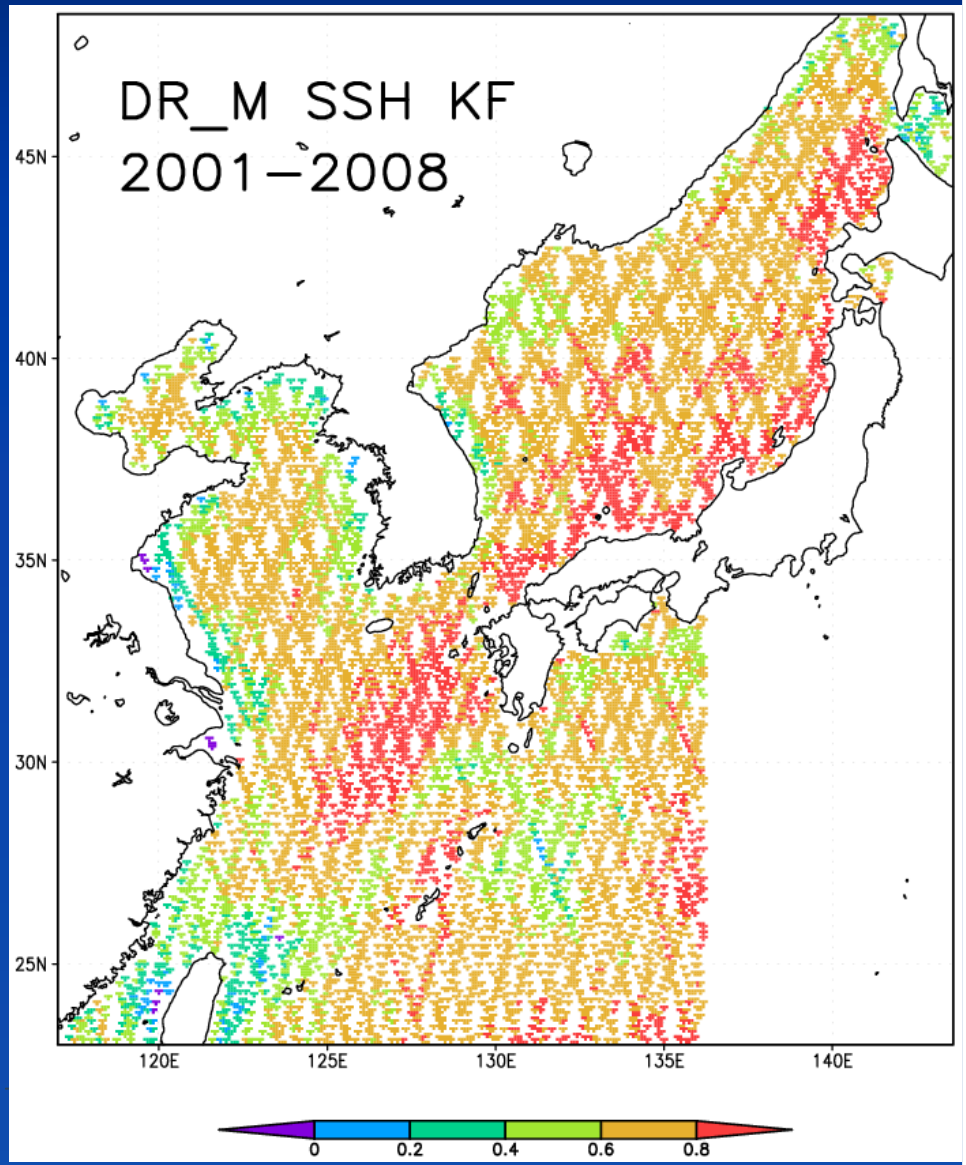
Moon et al., J. Oceanogr. (2012)

Comparison of ΔA (cm) values of major four harmonic constants after optimization



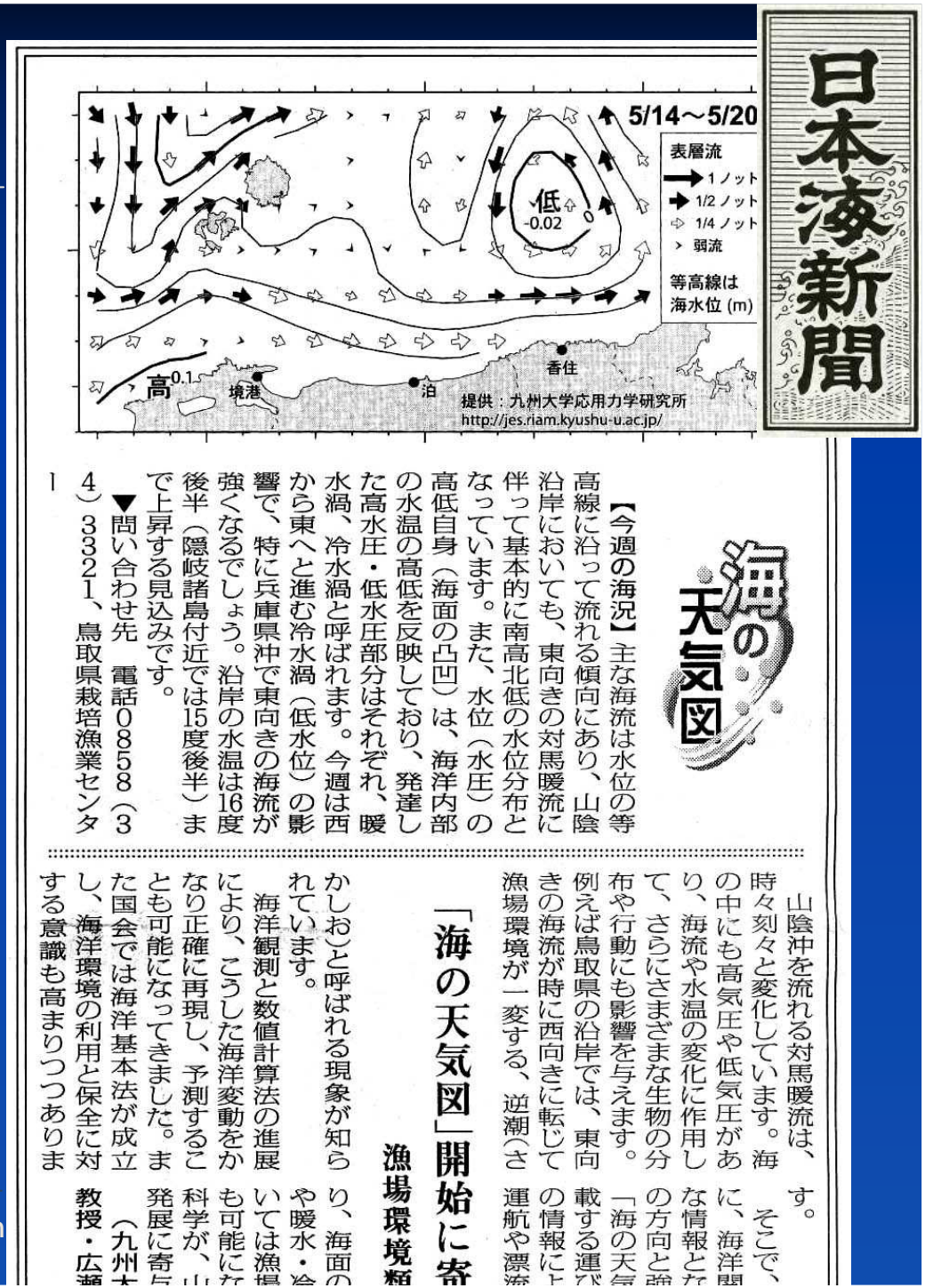
Correlation of SSH (DR_M, daily)





Applications

- Newspaper
- Fisheries
  - JADE (giant jellyfish, squid, ...)
  - Kyucho
  - ecological model
- Coastal guard
  - litters
- RI tracers
- Marine meteorology



日本海新聞

海の天気図

【今週の海況】主な海流は水位の等高線に沿って流れる傾向にあり、山陰沿岸においても、東向きの対馬暖流に伴って基本的に南高北低の水位分布となっています。また、水位（水圧）の高低自身（海面の凸凹）は、海洋内部の水温の高低を反映しており、発達した高水圧・低水圧部分はそれぞれ、暖水渦、冷水渦と呼ばれます。今週は西から東へと進む冷水渦（低水位）の影響で、特に兵庫県沖で東向きの海流が強くなるでしょう。沿岸の水温は16度後半（隠岐諸島付近では15度後半）まで上昇する見込みです。

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「海の天気図」開始に寄

漁場環境類

山陰沖を流れる対馬暖流は、時々刻々と変化しています。海の中にも高気圧や低気圧があり、海流や水温の変化に作用して、さらにさまざまな生物の分布や行動にも影響を与えます。例えば鳥取県の沿岸では、東向きの海流が時に西向きに転じて漁場環境が一変する、逆潮（さかしお）と呼ばれる現象が知られています。

海洋観測と数値計算法の進展により、こうした海洋変動をかなり正確に再現し、予測することも可能になってきました。また国会では海洋基本法が成立し、海洋環境の利用と保全に対する意識も高まりつつありま

す。

そこで、に、海洋関な情報とな の方向と強 「海の天気 載する運び の情報に上 運航や漂流

り、海面の や暖水・冷 いては漁場 も可能にな 科学が、山 発展に寄与

（九州大 教授・広瀬

Marine litter arriving coastline

Photo: northern coast of Tsushima Islands

yoon_et_al2010.pdf - Adobe Reader
ファイル(F) 編集(E) 表示(V) ウィンドウ(W) ヘルプ(H)
448 (1 / 16) 117% ツール 注釈

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Modeling of marine litter drift and beaching in the Japan Sea

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Japan Sea
Lighter
River basin
Tsushima Straits

ABSTRACT

Characteristics of drift and beaching of floating marine litter in the Japan Sea are examined numerically using the reanalysis data of the Japan Sea Forecasting System of Kyushu University. The residence time of model marine litter deployed uniformly over the surface of the Japan Sea strongly depends on the buoyancy ratio. However, almost all litter beaches or flows out through straits within 3 years. Experiments with inputs of litter imposed at large cities and the Tsushima Straits as well as river basins of the Japan Sea exhibit a good agreement with beach surveys with regard to country ratios of beached litter along the Japanese coast in cases of lighters. In a case of lighter, almost all lighters originating from Japan beach along the Japanese coast, while almost all lighters originating from a country surrounding the Japan Sea except Japan beach along the coast of that country and the Japanese coast.

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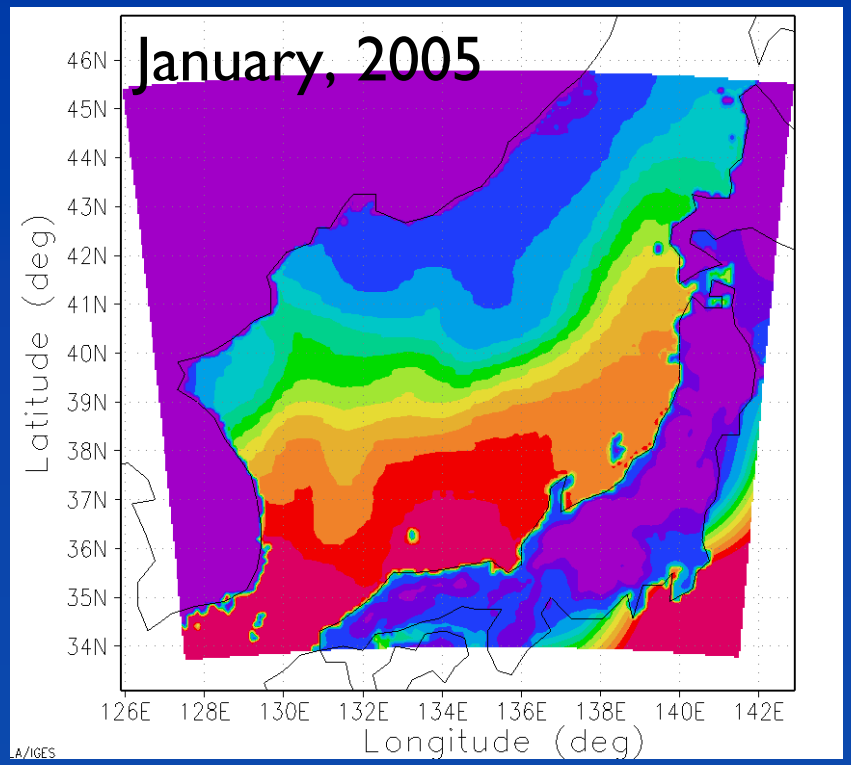
210 x 280 mm

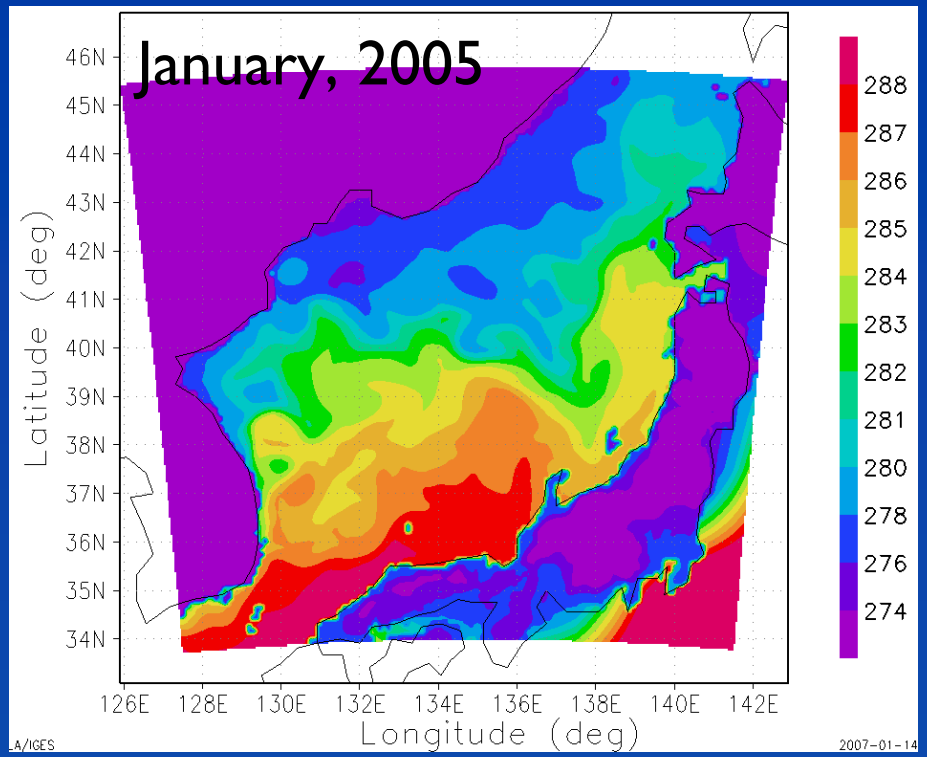
Monthly-mean SST (K)

Optimal Interpolation



http://www.ocean.caos.tohoku.ac.jp/

Data Assimilation

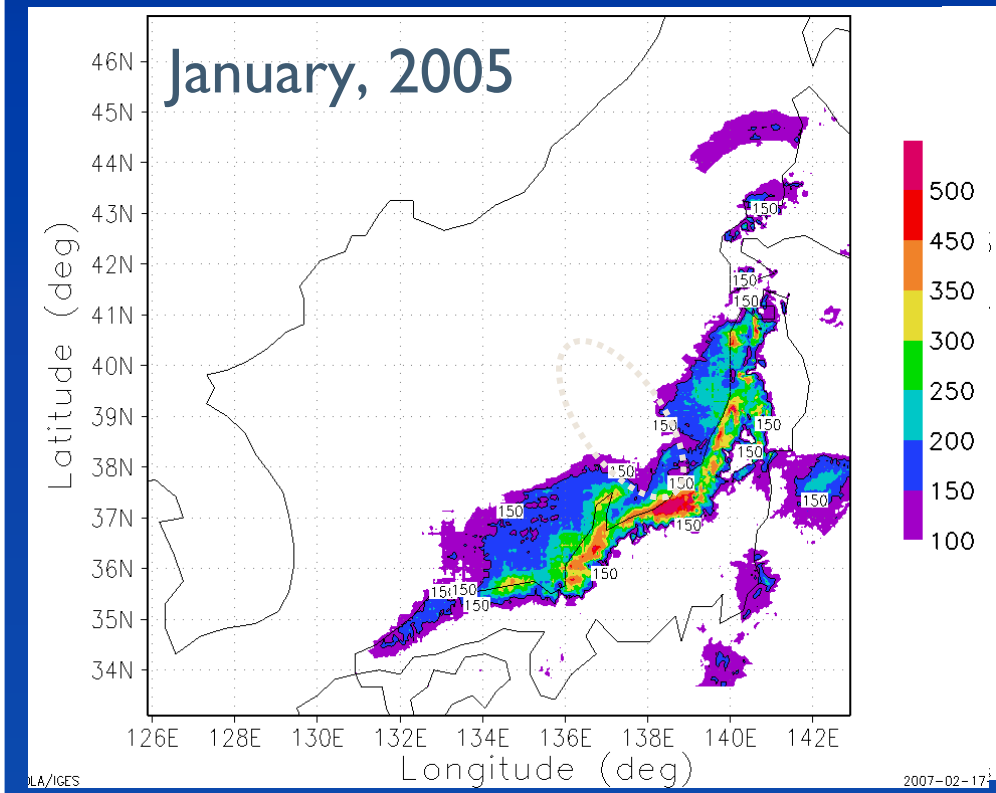


http://jes.riam.kyushu-u.ac.jp/

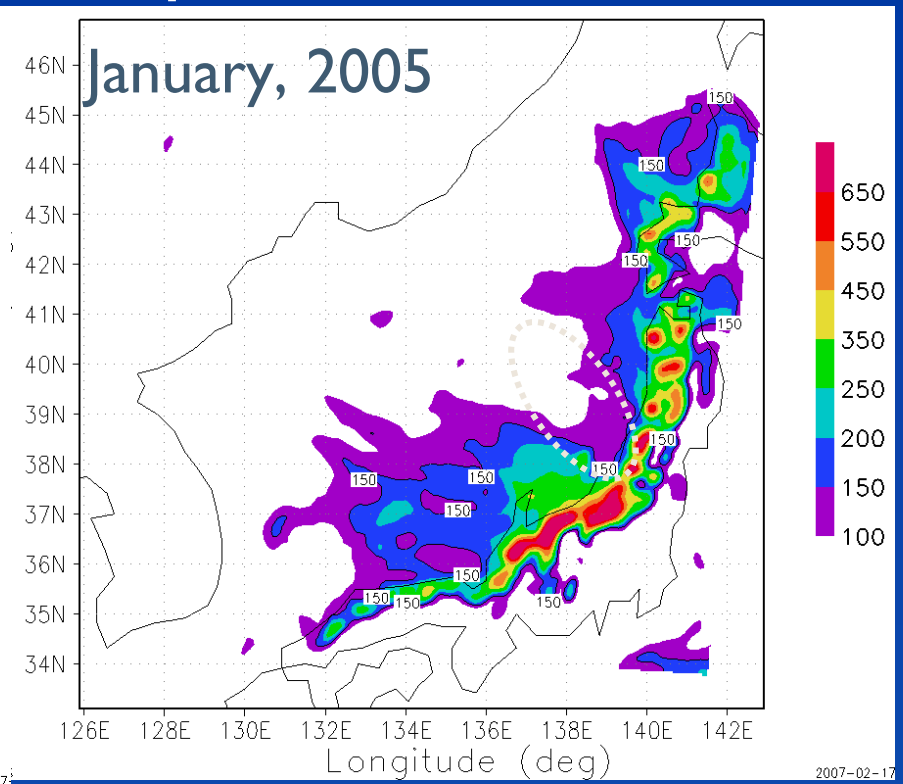
Yamamoto and Hirose, MWR (2009)

Monthly-mean precipitation (mm)

Radar AMeDAS



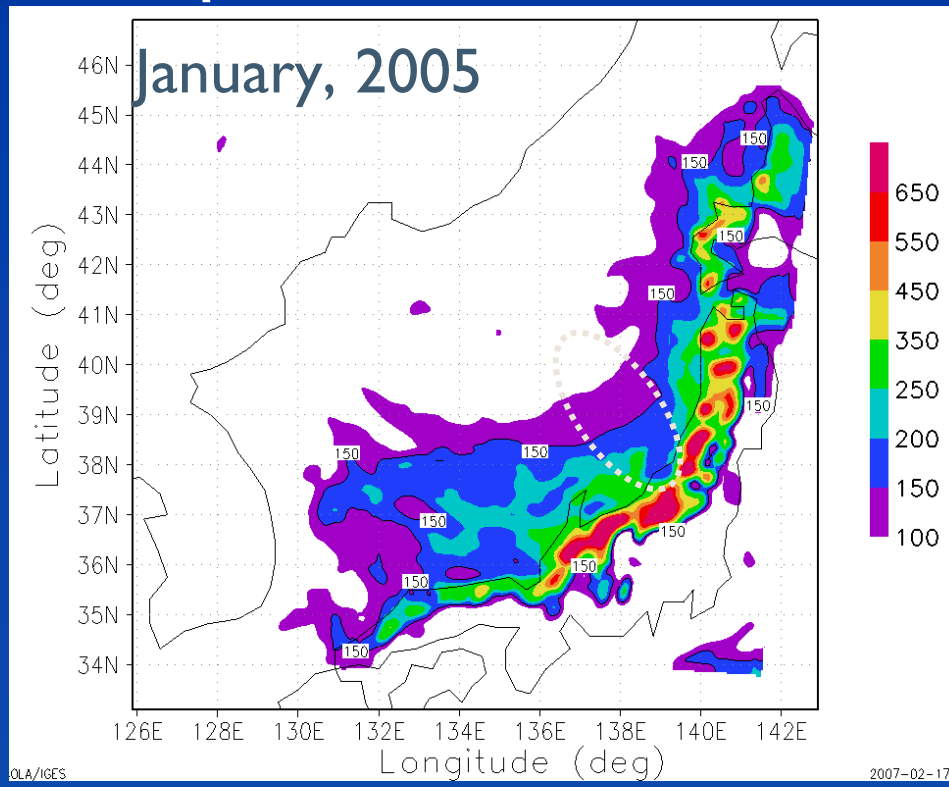
Exp. R



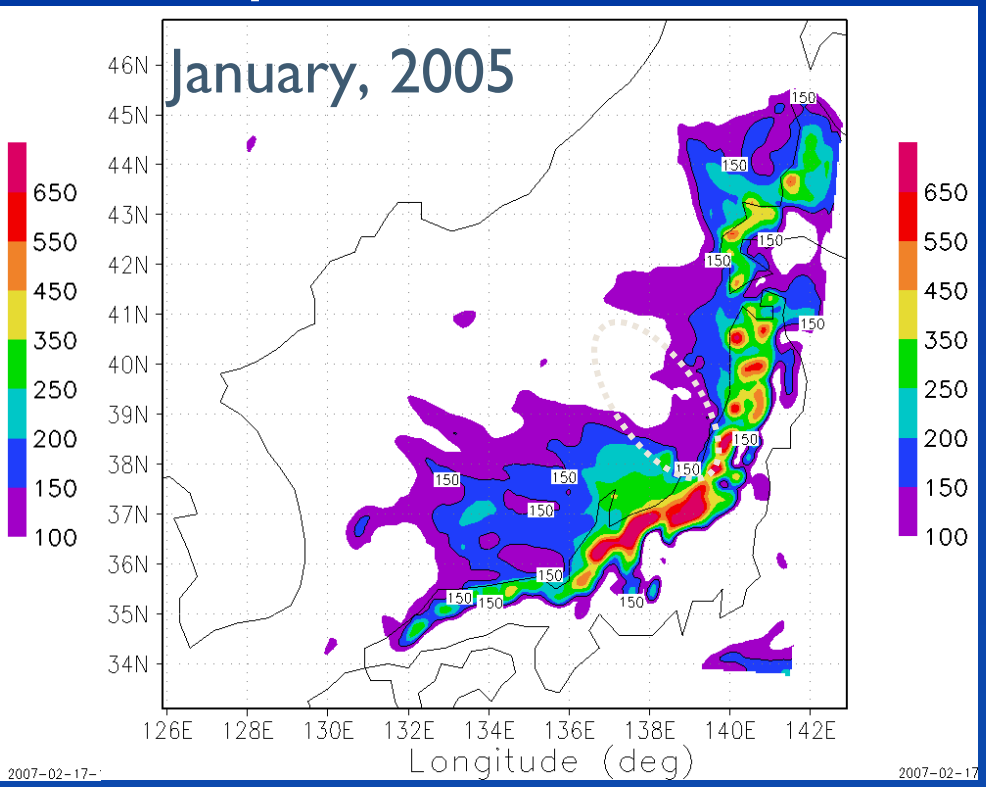
Cold water ~ Less precipitation

Monthly-mean precipitation (mm)

Exp. N

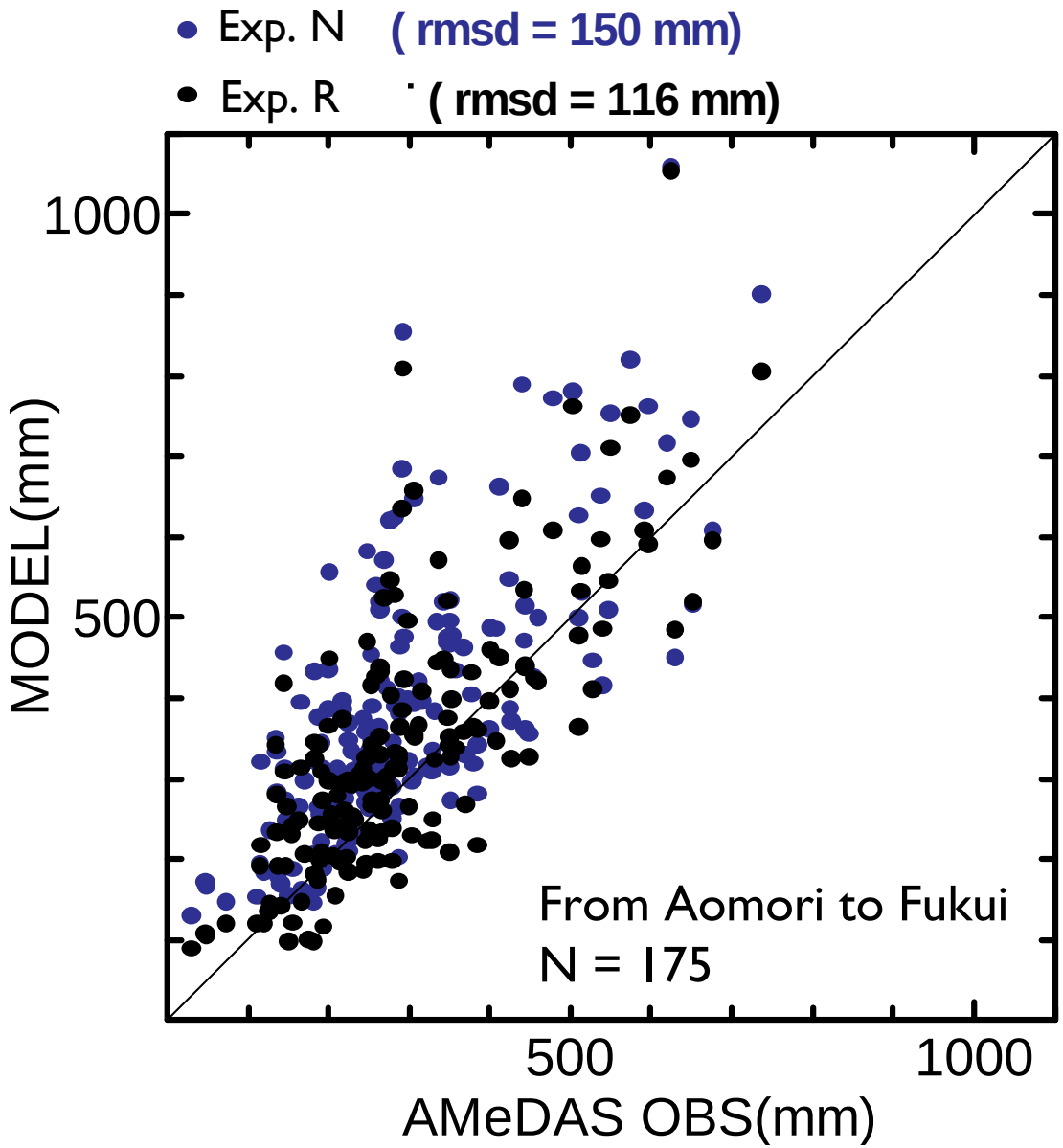


Exp. R



Cold water ~ Less precipitation

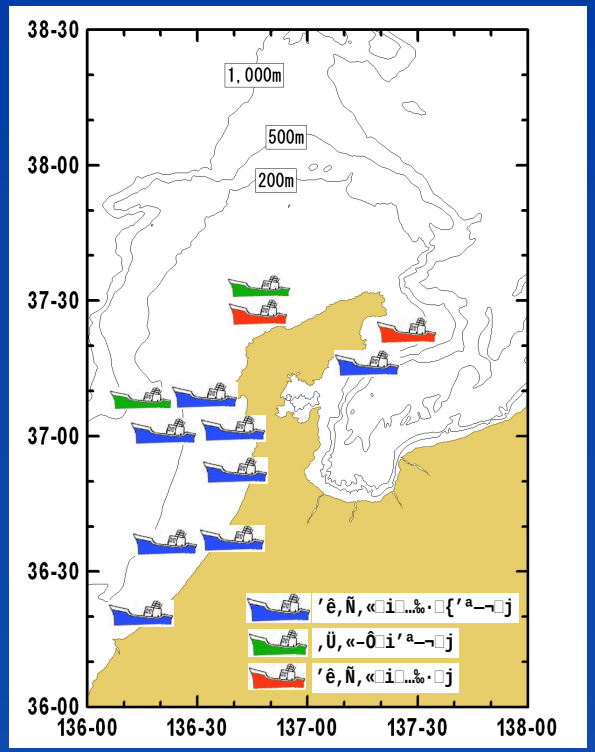
Model-Data Comparison



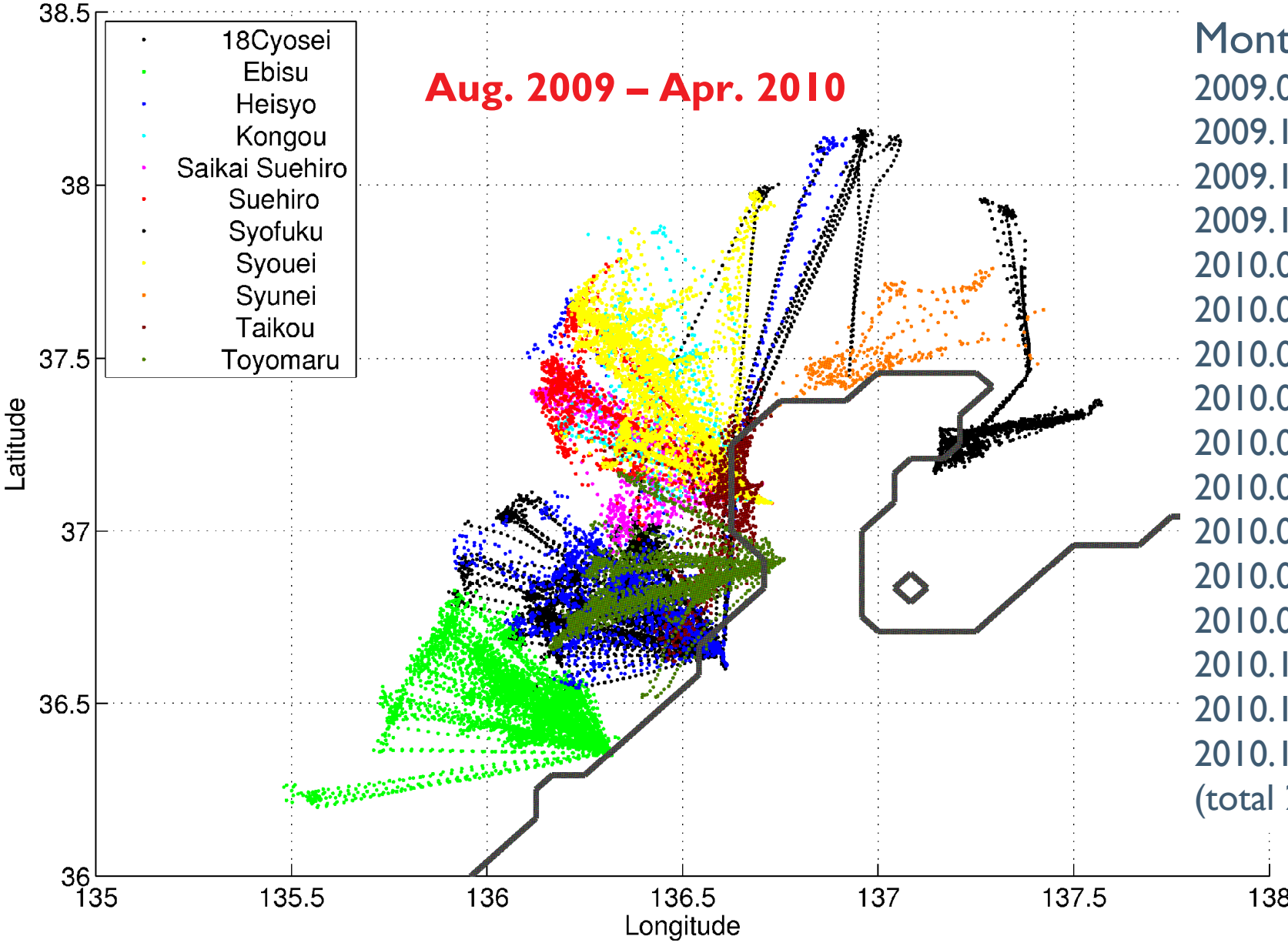
Velocity Data Collection

ADCP of fishing vessels typically measures three depths of velocity but does not store any record.

Data logger recording time, position, velocity, and depth.



ADCP Data Records



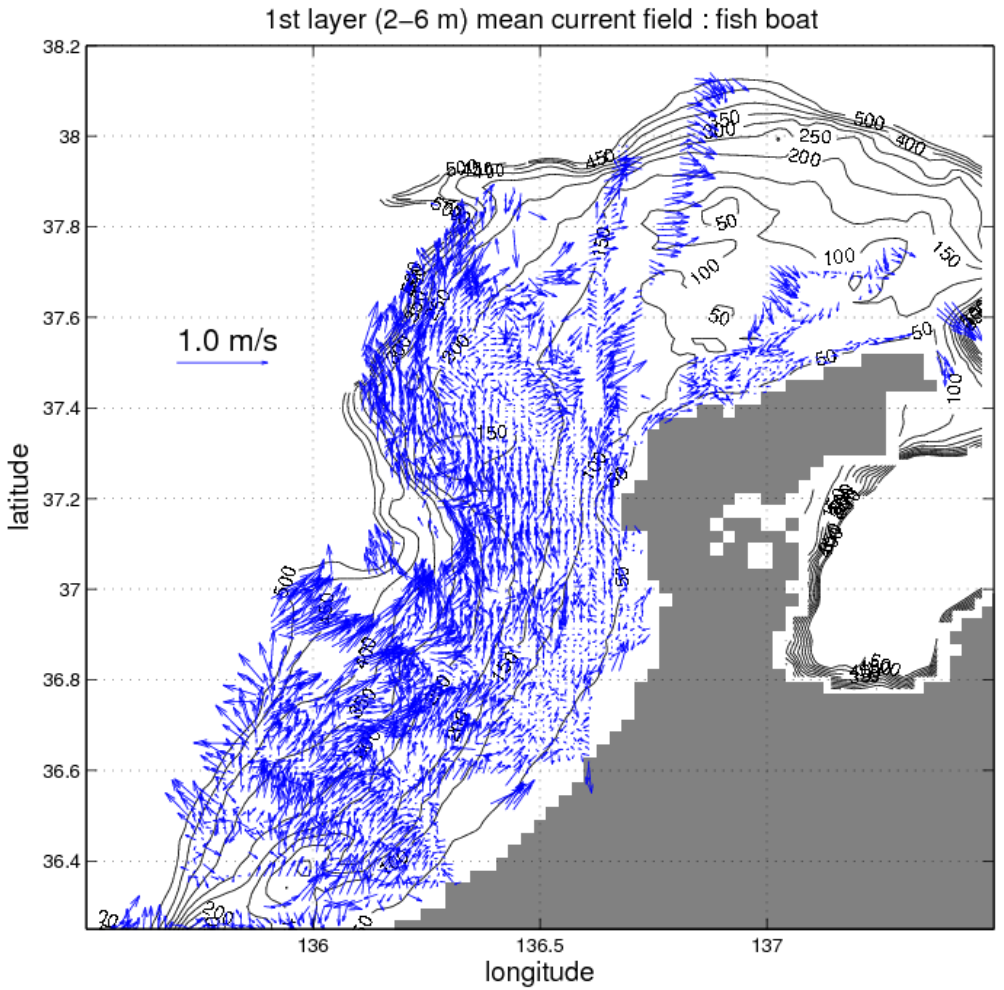
Month	hours
2009.09	780
2009.10	2,070
2009.11	2,890
2009.12	1,990
2010.01	1,290
2010.02	1,490
2010.03	1,700
2010.04	1,730
2010.05	2,350
2010.06	3,040
2010.07	200
2010.08	120
2010.09	1,850
2010.10	1,830
2010.11	1,560
2010.12	940

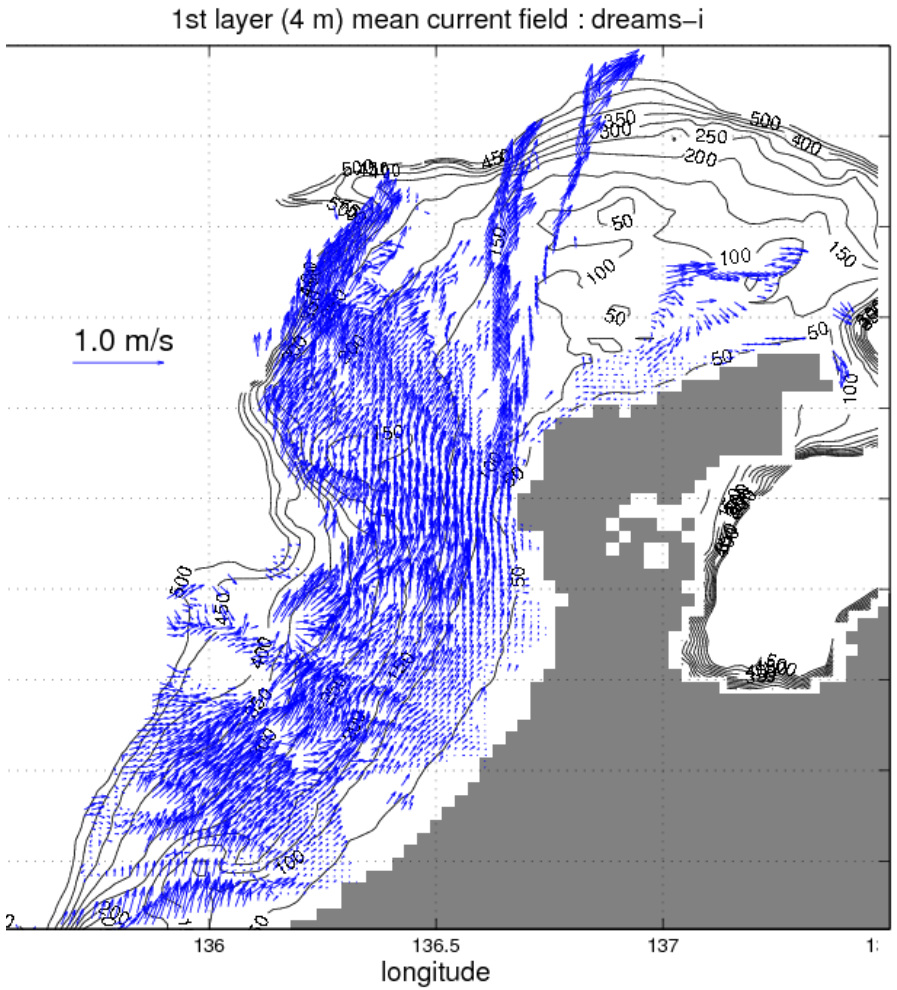
(total 25,830h)

Time-Mean Surface Velocity

Fishing-boat ADCP

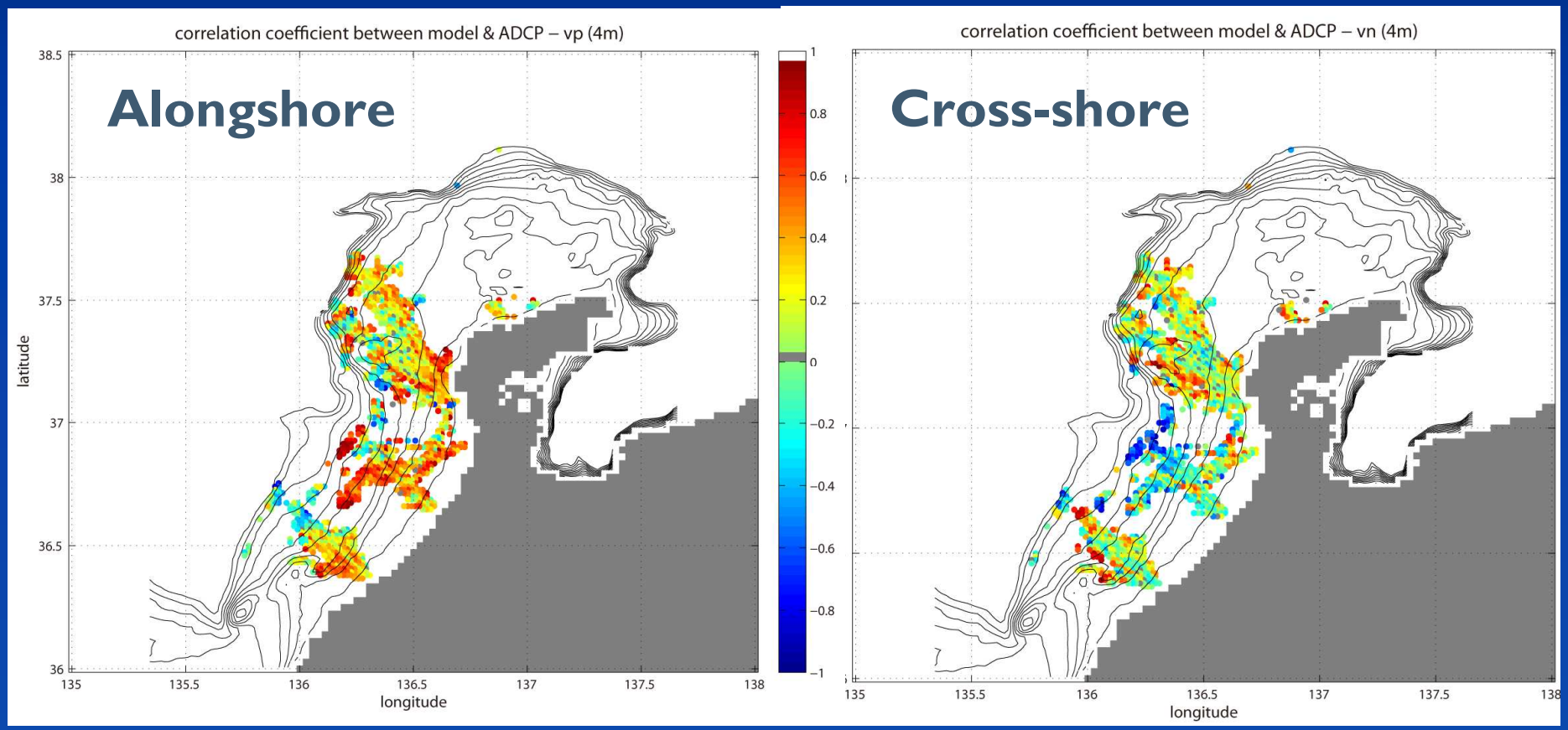
DREAMS_I Model





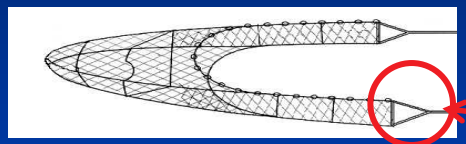
Averaging period: Sep 2009 – Apr 2010

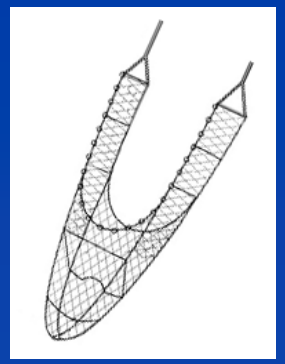
Correlation

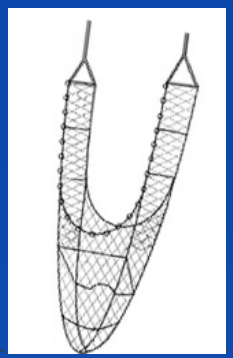


Measuring Temperature with Trawling Net

Sinking velocity:
10–20 meter/min





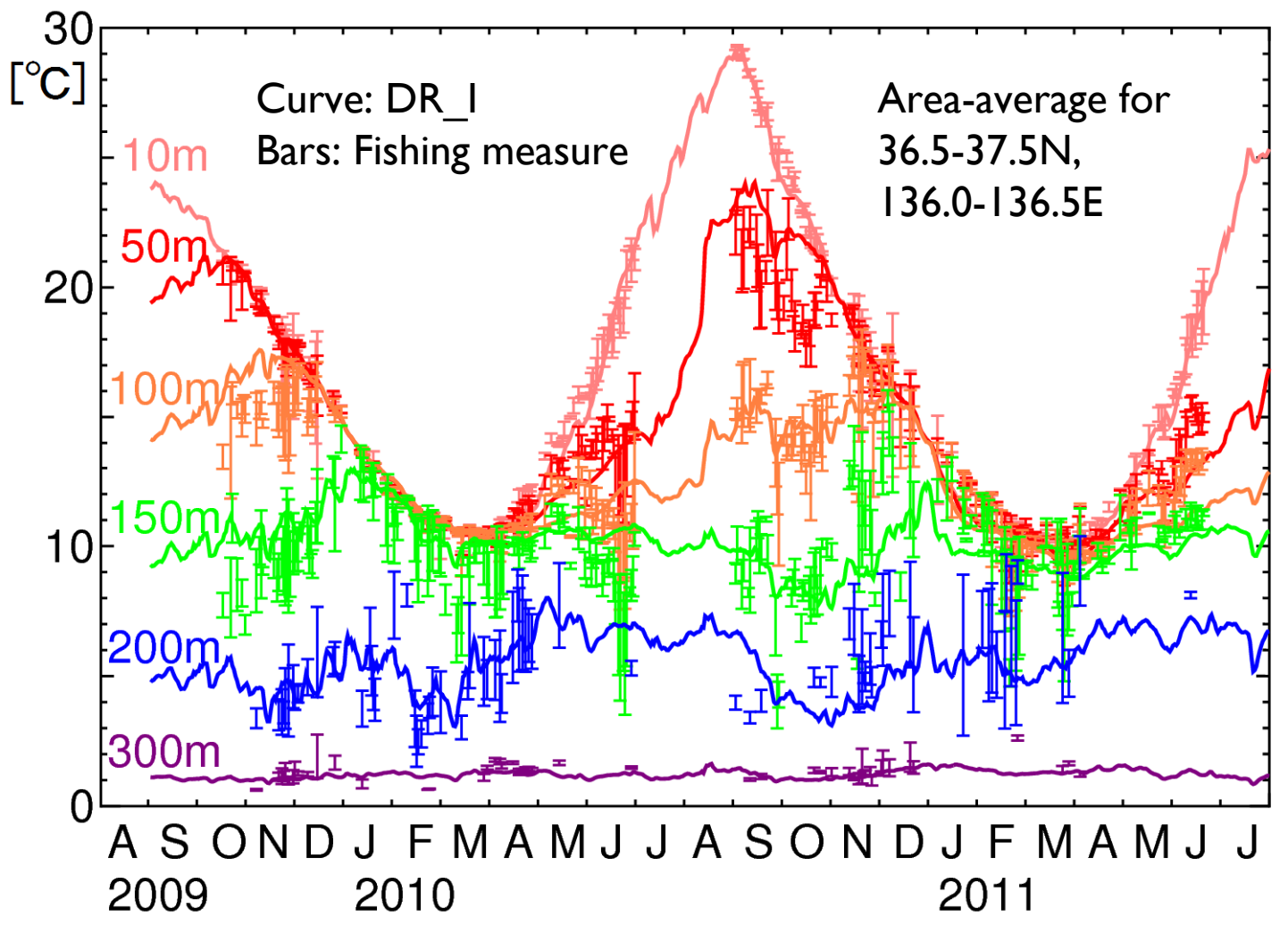


TD sensor

sampling interval: 15sec

- Data recovered every month
- Regrid to 5m interval from surface to 300m depth

Time series of temperature for fishing site



Summary

- DREAMS system consists of Basin (Δx~22km), Marginal (~7.4km), and Ishikawa (~1.5km) models.
- Bottom topography is crucial for the tidal modeling but calibration of the open boundary condition also improves the accuracy significantly.
- Realistic Tsushima Warm Current in the DR_M model by SSH DA with RoKF
- Many applications already
  - Benefit: good fishing grounds, marine litters, marine weather forecast, etc.
  - Feedback: fish-boat measurement of velocity and temperature profiles assesses and even improves the DR_I coastal model.
- Visit our homepage at http://dreams-i.riam.kyushu-u.ac.jp/