Modification of the OI parameters for effective introduction of
in situ data obtained by Japanese local fisheries research institutions into the JCOPE ocean forecast system

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Objectives

• Modifying the data-assimilation parameters of JCOPE ocean forecast system, in order to increase the accuracy of JCOPE by incorporating effectively *in situ* data monitored by Japanese prefectural Fisheries Research institutions.

• Increasing reproducibility of reanalysis and forecast by improvement of correlation scales of the Optimal Interpolation (OI) in the first process of the data-assimilation.
JCOPE (Japan Coastal Ocean Predictability Experiment)

Operational ocean forecast system developed by FRCGC (JAMSTEC), composed of a nested OGCM (POM, 1/12°X1/12°) assimilated with

1. Satellite SSH (Jason1, GFO),
2. Satellite SST (NOAA),
3. *In situ* data (Temp. and Sal. ) from Global Temp. –Sal. Profile Program (GTSPP, MEDS)

ex. 100m-temp. in Oct.2003

However, *in situ* data distributed in (semi-) real-time are very sparse, in the Pacific !!!

http://www.jamstec.go.jp/frcgc/jcope/index.html
Utilizing FRDATA

FRDATA

- are *in situ* data (Temp. & Sali.) monitored monthly by Japanese prefectural Fisheries Research institutions
- almost have *not* been distributed in real-time via Global Telecommunication System (GTS), consequently have *not* been used for operational ocean predictions until now.
JCOPE

Initialization

Satellite
SST, SSHA

In situ data
GTSP (MEDS)

GTS

Buoy

Ship

OL (gridding)

MOI (reconstruction)

Analysis

IAU (filtering-out)

POM (Simulation)

Reanalysis

Forecast

Forecast

visualization

Prefectural
Fish. Res. Inst.

Prediction

7 days

time
FRDATA is distributed globally and used in operational ocean predictions.
Effect of FRDATA incorporation

Current with FRDATA

Ex. 2003/1/25, 100m

Grid value by OI

O GTSSPP, + FRDATA
Accuracy increase of the Kuroshio forecast

Current JCOPE

Initial
2004/4/2

2 month

Forecast
2004/6/3

FRA-JCOPE ver.15

Kuroshio path (JCG)

Shimizu et al. (2006)
Problem and Modification

• Hydrographic structures are ambiguous in the Oyashio and Mixed Water regions, regardless of incorporation of FRDATA.

• Main reason is that current JCOPE OI is parameterized presupposing that realtime in situ data are very sparse: Correlation scale is too large.
Decrease of Correlation scale
(ex. Zonal scale for 100m & 200m temp.)

Before | After
---|---
100m | 300-500km | 100-200km
200m | 100-150km | 50-100km
Improvement of Grid value by OI modification
Grid value  (ex. 100m temp. in 18. Oct. 2003)

Before

Reference
100m Temp.
in Oct. 2003
(TNFRI, FRA)

After

A warm core got clearer.
A cold region got clearer.

Blank is bridged by increasing the allowable limit of error.
Improvement effect of Grid value on Reanalysis (Initial value) and Forecast
Reanalysis (ex. 100m temp. in 18. Oct. 2003)

Before

After

Reference
100m Temp.
in Oct. 2003
(TNFRI, FRA)

A warm core got clearer.
Hindcast: 100m temp.

Oct/31/2003 (Initial)  Nov/14/2003 (Hind)

Reference
100m Temp. in Nov. 2003 (TNFRI, FRA)

The position of the warm eddy got proper.
Summary

- OI parameters were modified for effective incorporation of FRDATA into JCOPE ocean forecast system.
- The decorrelation scales of OI were properly reduced, and hydrographic structures of T/S Grid values were improved.
- Reanalysis (Initial value for prediction) was improved, as a result the prediction accuracy increased from hindcast experiments.
- FRA-JCOPE will start to operate ocean forecast and WEB exhibition on Apr. 2007.