Along satellite track evaluation of GODAE Class 4 sea level anomaly files

Jinshan Xu¹, Fraser Davidson², Gregory Smith³

¹ Fisheries and Oceans Canada, Dartmouth, Canada
² Fisheries and Oceans Canada, St John's, Canada
³Environment and Climate Change Canada, Dorval, Canada

Introduction

The GODAE Ocean View Class 4 file, permits the evaluation of the reproduction of eddy kinetic energy and along track wave spectrum of the participating GODAE Ocean View Global forecast systems. Herein we examine for the North West Atlantic the forecast evaluation of Eddy Kinnetic Energy and Along track wave spectrum versus the satellite observations. We investigate the gradient and slope of the sea level anomaly fields through the use of along track Homevoller plots.

1. Year 2015 EKE Estimation from Along Track SLA Data Northwestern Atlantic The property of the property of

Participating Forecast Centres and Model Specifies

	GIOPS	FOAM	PSY3	PSY4	RTOFS	OceanMAPS
Model	NEMO 3.1 CICE 4.0	NEMO 3.2 CICE4.1	NEMO 3.1 LIM2_EVP	NEMO 3.1 LIM2_EVP	HYCOM	OFAM
Horizontal Res	1⁄4	1⁄4	1⁄4	1/12	1/12	1/10 and 2
Vertical Resolution	50 levels	75 levels	50 levels	50 Levels	32 hybrid	51 levels
Atmosphere Forcing	GDPS 25 km 3h	MET UM NWP 3h 1h wind	ECMWF 3h	ECMWF 3h	GFS 3h	ACCESS-G
Forecast (days)	10	5	6	6	8	7
SST/SLA/In-situ	SAM2 SEEK	NEMOVAR	SAM2+3DVAR	SAM2+3DVAR	NCODA	BODAS
Sea Ice	3DVAR	NEMOVAR				

Current Approach









2. Year 2016

EKE Estimation from Along Track SLA Data Northwestern Atlantic for year 2016





Proposed New Approach

Method



component of kinetic energy from the cross-track geostrophic velocity multiplied by 2 under the assumption of local isotropy (Stammer 1997).



Data Processing

 $K_E = \frac{g^2}{(2\Omega\sin\phi)^2} \left(\left(\frac{\partial\eta'}{\partial s} \right) \right)$









Along Track SLA Data Northwestern Atlantic of year 2016

SLA

FOAM

GIOPS GIOPS20

PSY3



Conclusions

- Along track data due to better retracking algorithms, suggest that current class 4 GOV SLA file data may under-represent energy in the ocean.
- Our results suggest that higher resolution GOV systems increase the eddy kinetic energy in the predictions, but still underestimates the energy compared to coarse observed (7km) along track SLA data.



- Along track wave spectrum plots in the Gulf Stream region show good agreement at low wave numbers with marked differences across GOV systems and satellite observations and higher wave numbers (i.e between 80-300 km).
- Our results suggest interesting ways to determine impact of new data assimilation approaches and other upgrades on the GOV prediction systems. While in GODAE Ocean View, Class 4 metrics are the comparison between predicted and observed values, here we present a "derived" Class 4 approach where the class 4 files are used to construct derived fields for further verification.

References

Wunsch, C. and Stammer, D., 1998. Satellite altimetry, the marine geoid, and the oceanic general circulation. *Annual Review of Earth and Planetary Sciences*, 26(1), pp.219-253.

Fu, L.-L. 1983. On the wavenumber spectrum of oceanic mesoscale variability observed by the Seasat altimeter. *Journal of Geophysical Research* 88:4,331-4,341. Holloway, G. 1986. Estimation of oceanic eddy transports from satellite altimetry. *Nature* 323:243-244, doi:10.1038

Stammer, D. 1997. Global characteristics of ocean variability estimated from regional TOPEX/POSEIDON altimeter measurements. *Journal of Physical Oceanography* 27:1,743-1,769.

