

# INITIATING AN OPERATIONAL CANADIAN GLOBAL ASSIMILATION AND PREDICTION CAPABILITY FOR THE COUPLED ATMOSPHERE- OCEAN-ICE SYSTEM

Harold Ritchie and many colleagues  
May 28 2007

Funded by the Canadian Foundation for  
Climate and Atmospheric Sciences



# Initiating an Operational Canadian Global Assimilation and Prediction Capability for the Coupled Atmosphere-Ocean-Ice System

Harold Ritchie <sup>(1)</sup>, Doug Bancroft <sup>(2)</sup>, Normand Scantland <sup>(3)</sup>,  
Greg Flato <sup>(4)</sup>, John Loder <sup>(5)</sup>, Keith Thompson <sup>(6)</sup>  
and Dan Wright <sup>(5)</sup>

<sup>(1)</sup>Meteorological Research Division, EC

<sup>(2)</sup>Marine and Ice Services, EC

<sup>(3)</sup> Directorate of Meteorology and Oceanography, DND

<sup>(4)</sup> Canadian Centre for Climate Modelling and Analysis, EC

<sup>(5)</sup> Bedford Institute of Oceanography, DFO

<sup>(6)</sup> Dalhousie University, Halifax NS

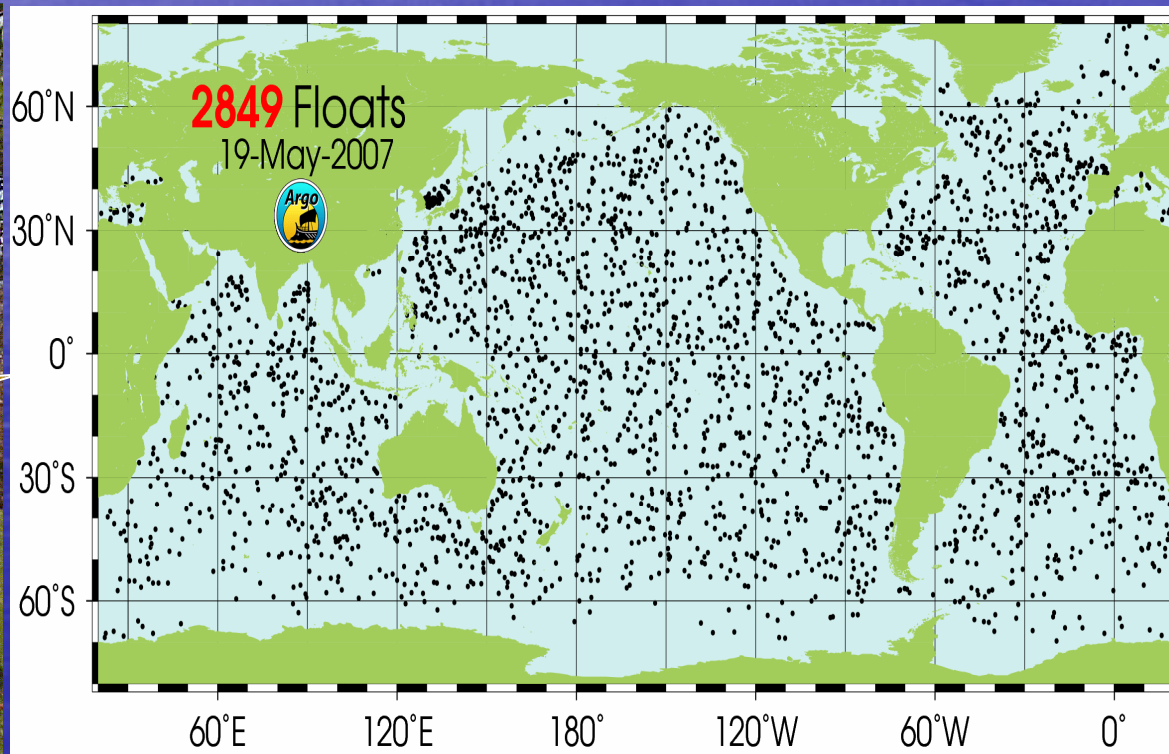
# Outline

- Introduction
- Recent developments / status report
- Next steps
- Summary

# Introduction

- An initiative to establish an operational Canadian global coupled atmosphere-ocean-ice assimilation and modelling system
- To take advantage of improvements in ocean models and the new, real time global oceanographic data sets in order to
  - produce new ocean products
  - improve weather and climate predictions

# new ocean data streams such as Argo



# Summary of needs to be met

- Environment Canada's (EC) operational atmospheric data assimilation (4D-var) and forecast (GEM model) system at the Canadian Meteorological Centre (CMC) needs to be coupled to ocean and ice models to improve forecasting skill in some areas. Analyses will also benefit seasonal to interannual climate forecasts.
- Many Department of Fisheries and Oceans (DFO) and Department of National Defence (DND) applications will benefit from improved oceanic and meteorological information.

# Interdepartmental planning

- For cost effectiveness, EC, DFO and DND are collaborating on this major initiative.
- After more than four years of planning by an inter-departmental panel we are initiating the Canadian Operational Network of Coupled Environmental Prediction Systems (CONCEPTS)

# Recent developments

- Endorsement of initial report by departments
- Panel has produced an implementation plan, building on initial report with additional input from sub-group of experts
- Research and development network on “Prediction and Predictability of the Global Atmosphere-Ocean System from Days to Decades” approved by Canadian Foundation for Climate and Atmospheric Sciences (CFCAS, academic funds 16 PIs for 4 years)



# Draft Implementation Plan

- Three-Track approach :
- Operational: with a “fast start” provided by importing the Mercator ocean data assimilation and modelling system and coupling it with GEM
- Research and development: consisting of long-term government research and complementary academic research networks
- Products: to identify, develop and disseminate relevant products & outputs

# “Fast start” status

- Panel reviewed candidate systems for the “fast start” and selected Mercator as being most suitable.
- Several Canada-Mercator planning visits have been very constructive.
- Discussions are well advanced on a Canada-Mercator collaboration

# Resource status

- 2 new EC-ASTD PY's starting with transfer of imported system (Jean-Marc Bélanger at RPN, RES selection in progress)
- CMC hired a high level technical support scientist (François Roy)
- DFO has re-aligned 4 PY's to implement the Mercator model for basin-global and regional scales
- EC and universities supporting initial computational requirements
- DFO to enhance computer resources over the next 2 years

# Next steps

- Finish milestones and deliverables to complete implementation plan
- Sign EC-DFO-DND MOU for Canadian collaboration
- Presentation of plan to and by senior EC, DFO, DND managers to seek required long-term resources
- Finalize partnership with Mercator and move the initiative into the pre-operational stage

# Core projects for CONCEPTS

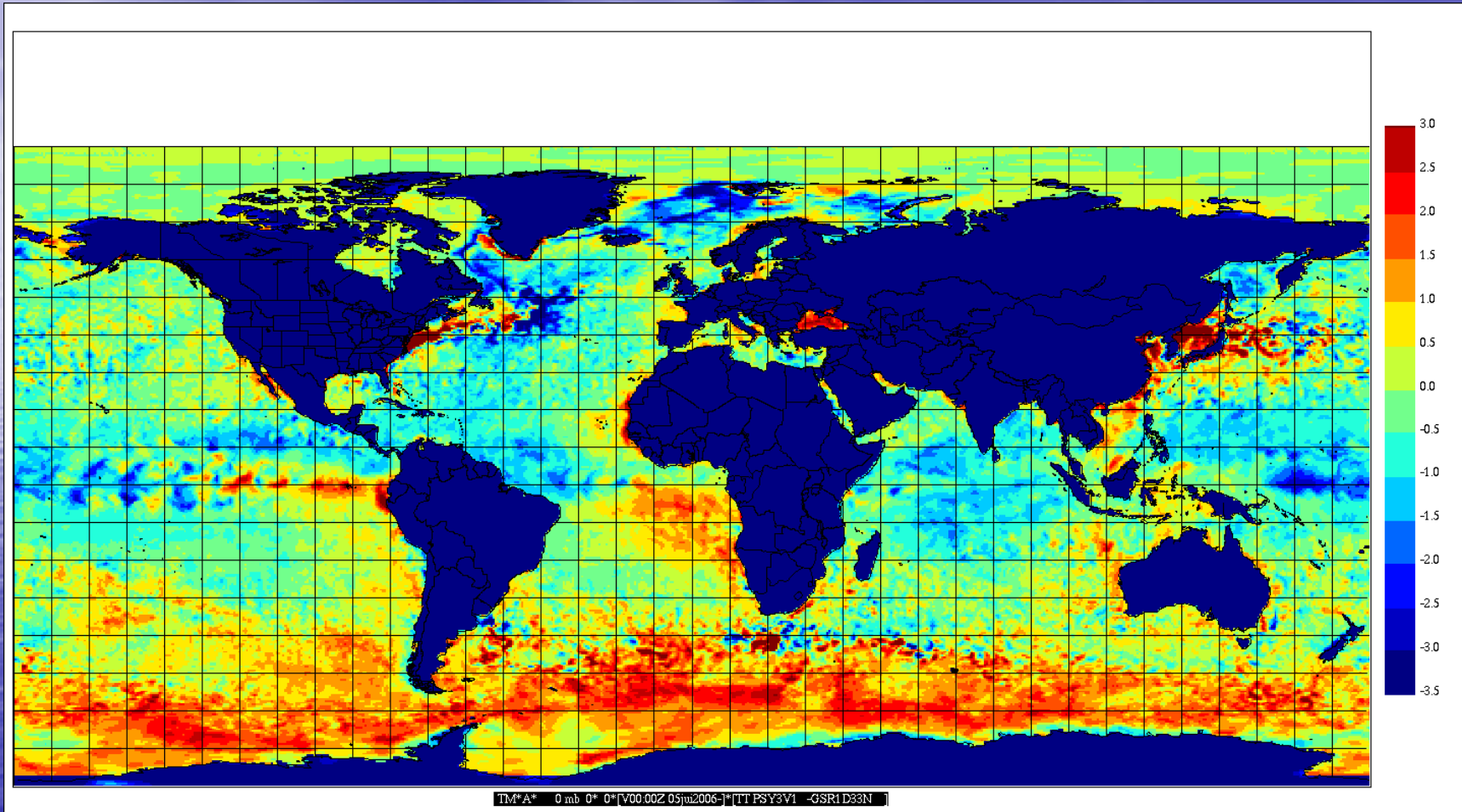
- Core CMC systems installation, coupling and support
- Basin-to-global ocean analyses for prediction and validation studies
- Demonstration of regional ocean prediction capability and applications
- Sea ice modelling and data assimilation
- Improved ocean data assimilation capabilities
- Physical / biological ocean modelling

# Comparison of SST analyses

- Jean-Marc Bélanger, EC, in preparation for coupling Mercator OPA and EC GEM
- Mercator global  $\frac{1}{4}$  degree PSY3v1 (SAM1, univariate sea level anomalies) cf CMC, NCEP and other global SST analyses
- One case shown, but similar for others
- Improvements coming with SAM2 (Marie Drevillon, Mercator)

TM Mercator (0.5 deg) - TM CMC (0.33 deg)

20060104

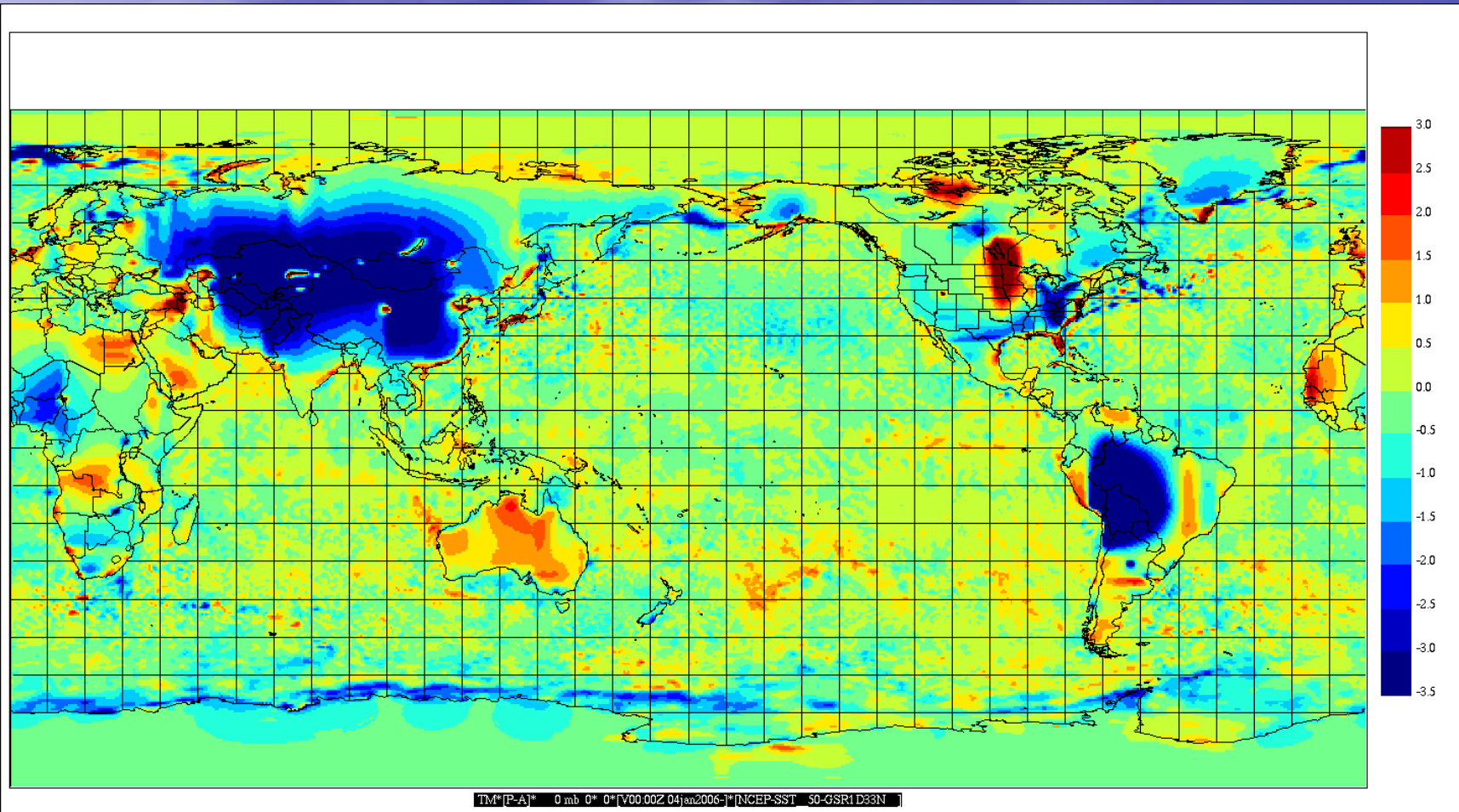


June 12, 2007

15

TM NCEP (0.5 deg) - TM CMC (0.33 deg)

20060104





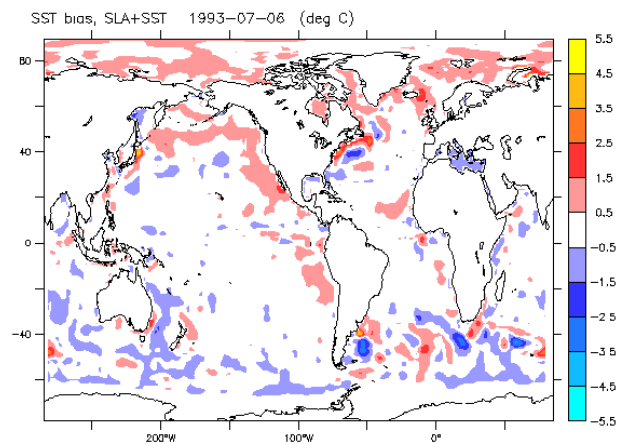
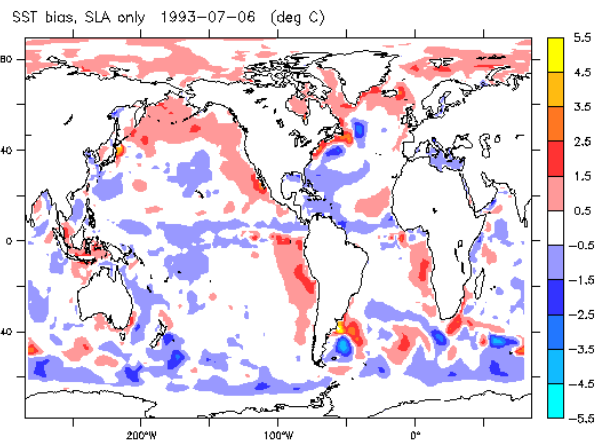
# Aiming at the 1/12° global system

## multivariate data assimilation in the 2° global system

**SLA only**

**SLA + SST**

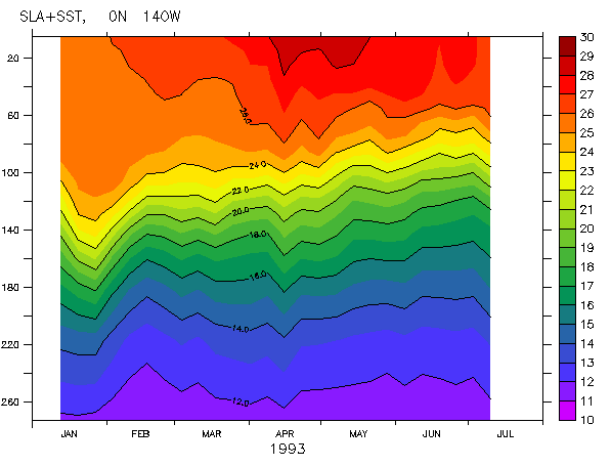
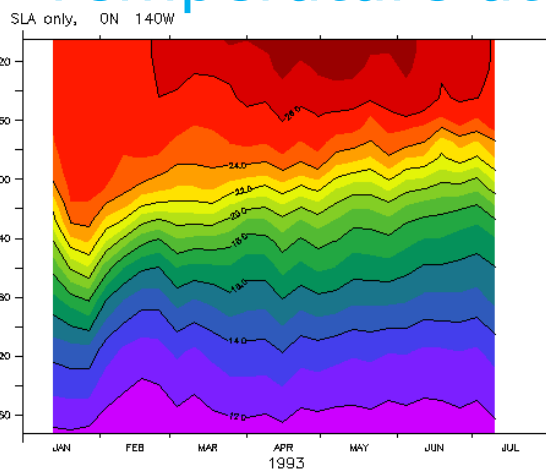
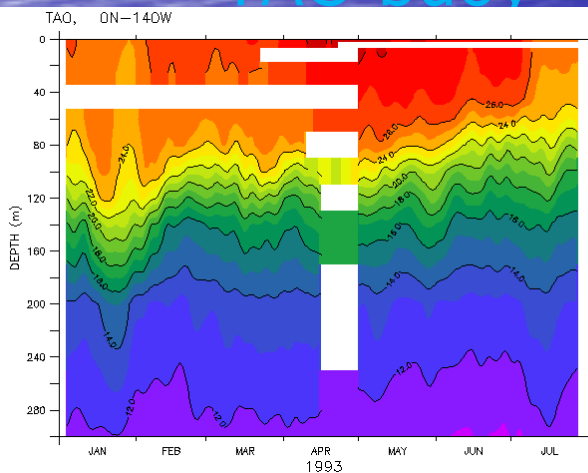
**SST bias**



First results:  
January to July 1993

TAO buoy

Temperature at 0N-140W



# Summary

- Development of an operational Canadian global assimilation and prediction capability for the coupled atmosphere-ocean-ice system has begun.
- There will be strong interactions with the complementary Global Ocean-Atmosphere Prediction and Predictability (GOAPP) research network funded by CFCAS.
- Collaborative core research projects are in progress.



# Thank you!

