

TOWARDS AN OPERATIONAL CANADIAN GLOBAL COUPLED ASSIMILATION AND MODELLING CAPACITY

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1. INTRODUCTION

*This poster presents a proposal to establish an operational Canadian global coupled atmosphere-ocean-ice assimilation and modeling system. Section 2 gives the background on why such a proposal is being made at this time, section 3 reports on a workshop that was held to assess its feasibility and desirability, section 4 outlines the terms of reference of an inter-departmental panel that has been preparing the associated recommendations, and section 5 presents a status report.

2. BACKGROUND

It is now widely recognized that weather and climate prediction models need good representation of interactions with the oceans. Recent improvements in basin and global-scale ocean models and the availability of global oceanographic data have made it reasonable to consider the development of coupled ocean-atmosphere models with assimilation of data into both components – potentially providing more reliable hindcasts, nowcasts and forecasts of ocean and atmosphere states.

Of particular relevance, the Argo float program, to which Canada is a major contributor, is expected to have about 3000 floats deployed in the global oceans by the end of 2003. Together with other data sets (e.g., altimeter, remotely sensed SST, and tropical moored arrays) there is tremendous potential for the development of data assimilative ocean models.

3. CMEP WORKSHOP

With this in mind, a two-day workshop on the theme of “Assessing Operational Global Marine Environmental Prediction for Canada” was held under the auspices of the Centre for Marine Environmental Prediction (CMEP) based in the Department of Oceanography of Dalhousie University. There were presentations outlining related needs within the Meteorological Service of Canada (MSC), the Department of Fisheries and Oceans (DFO), and the Department of National Defence (DND). Experts from other countries that have embarked on similar programs shared their experience and helped assess whether this is feasible and desirable for Canada. Keynote presentations on the international Global Ocean Data Assimilation Experiment (GODAE) and the related ocean observing program set the scientific context. There were 68 participants including invited speakers, research scientists, managers and students. After considering the available Canadian expertise, participants held discussions and decided to recommend that Canada move ahead with the development and implementation of an operational global marine environmental data assimilation and prediction program.

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Participants also discussed the most effective way of proceeding. The workshop was sponsored by MSC's Atmospheric and Climate Science Directorate. The workshop presentations are available at www.cmc.ec.gc.ca/rpn/cmep.

4. INTER-DEPARTMENTAL PANEL

As a follow-on to this workshop, an inter-departmental advisory panel (Doug Bancroft (DFO), Hal Ritchie (EC), Andy Cameron (DND) and Keith Thompson (Dalhousie University) was established to make specific recommendations on an operational Canadian coupled modeling capability. The panel is investigating the need, opportunity and feasibility of developing and implementing an operational Canadian atmosphere-ocean-ice modeling system to i) perform real-time "state-of-the-art" four dimensional data assimilation using Argo profile observations, as well as global satellite derived Sea Surface Heights (SSH) and Sea Surface Temperature (SST), and ii) perform three dimensional atmosphere-ocean-ice model predictions on short to long term time scales, both on global and higher resolution regional domains. The panel is formulating recommendations, including system development, research, implementation and operations, to be considered by EC, DFO and DND management. This program would be a long term inter-departmental activity, requiring new A-base resources from the collaborating departments. The panel is addressing partnerships and collaborations, as well as estimates of timeliness for operational implementation.

5. STATUS REPORT

We have reviewed and endorse the CMEP workshop report and recommendations. More specifically, we recommend that the global system, with nested and coupled regional models dictated by scientific considerations (e.g., tropical Pacific), be run operationally at the Canadian Meteorological Centre (CMC) as an increment to the existing infrastructure. Regional enhancements required by DFO (e.g., ecosystem models, search and rescue) would be controlled by regions and not necessarily run at CMC. We emphasize the importance of new long term funding and permanent positions for this new activity. We recognize a good opportunity to contribute to GODAE and also benefit from the current international activity on this theme. We recommend the development of some products by the end of the GODAE demonstration phase in

2005. Suggested products to be developed in the short term (within three years) include: global analyses of large scale ocean temperature, salinity and currents for operational DFO and DND needs; global wave forecasts for operational DND needs; and a prototype sea ice prediction system. Suggested products to be developed in the medium term (within five years) include seasonal forecasts of SST for atmospheric models, three dimensional initial ocean fields for climate simulations, and global forecasts of large scale ocean temperature, salinity and currents for operational DFO and DND needs. Suggested products to be developed in the longer term (beyond five years) include an operational model-assimilation coupled system for forecasting changes in the global ocean-atmosphere-ice conditions; re-analyses of marine environmental conditions (e.g., extreme currents at the shelf break, mean circulation patterns); and intra-decadal warnings of significant climate variations.

We are recommending a two-track approach: a "fast track" based on an imported system installed at CMC and extended to meet short term goals and demonstrate utility of Argo data; and a parallel "slow track" enhancing research and development for a tailor-made Canadian system and generating Canadian capacity. We have reviewed candidate systems for the "fast track" approach and have selected one that we consider to be most suitable for our needs. Discussions have begun regarding its availability. We are also proposing that a major collaborative network be established to conduct the "slow track" research and development.

The panel's report is expected to be submitted by the end of 2003. The latest status will be indicated in the poster, with an emphasis on the potential uses in forecasting the weather and climate of the atmosphere and ocean.