Report Documentation Page

Form Approved
OMB No. 0704-0188

1. REPORT DATE	2. REPORT TYPE	3. DATES COVERED
30 SEP 2002		**00-00-2002 to 00-00-2002**

4. TITLE AND SUBTITLE	5a. CONTRACT NUMBER
Open Ocean Data Assimilation	5b. GRANT NUMBER
	5c. PROGRAM ELEMENT NUMBER
6. AUTHOR(S)	5d. PROJECT NUMBER
	5e. TASK NUMBER
	5f. WORK UNIT NUMBER
7. PERFORMING ORGANIZATION NAME(S) AND ADDRESS(ES) **College of Oceanic & Atmospheric Sciences,,Oregon State University,104 Ocean Admin Bldg,,Corvallis,,OR, 97331**	8. PERFORMING ORGANIZATION REPORT NUMBER
9. SPONSORING/MONITORING AGENCY NAME(S) AND ADDRESS(ES)	10. SPONSOR/MONITOR'S ACRONYM(S)
	11. SPONSOR/MONITOR'S REPORT NUMBER(S)

12. DISTRIBUTION/AVAILABILITY STATEMENT
Approved for public release; distribution unlimited

13. SUPPLEMENTARY NOTES

14. ABSTRACT
Development and dissemination of four-dimensional variational assimilation systems for operational and research models, allowing for coordinates and data in both Eulerian and Lagrangian forms, in ocean basins and open ocean regions.

15. SUBJECT TERMS

16. SECURITY CLASSIFICATION OF:			17. LIMITATION OF ABSTRACT	18. NUMBER OF PAGES	19a. NAME OF RESPONSIBLE PERSON
a. REPORT **unclassified**	b. ABSTRACT **unclassified**	c. THIS PAGE **unclassified**	**Same as Report (SAR)**	**3**	

Open Ocean Data Assimilation

Andrew F. Bennett
College of Oceanic & Atmospheric Sciences
Oregon State University
104 Ocean Admin Bldg
Corvallis OR 97331-5503
phone: (541) 737-9352 fax: (541) 737-8681 email: bennett@coas.oregonstate.edu

Grant Number: N000149910040

LONG-TERM GOALS

Development and dissemination of four-dimensional variational assimilation systems for operational and research models, allowing for coordinates and data in both Eulerian and Lagrangian forms, in ocean basins and open ocean regions.

OBJECTIVES

1. Derive the adjoint of the free surface Bryan and Cox model; code the adjoint for optimal performance on parallel computers.

2. Conduct the 3rd Summer School on Inverse Methods and Data Assimilation at COAS.

APPROACH

1. Derive the adjoint of the analytical free surface Bryan and Cox model in a general form that distinguishes between the errors in each component of the parameterized flux vectors and tensors; rederive for the conventional Bryan and Cox finite-difference scheme (jointly with Boon S. Chua of COAS); develop optimal code for a single processor; develop hybrid OpenMP/MPI code for shared/distributed processor architectures, develop efficient I/O (jointly with Boon S. Chua and Richard Loft of NCAR SCD). Document the analysis, algebra and code.

2. Upgrade and expand existing workstation laboratory.

WORK COMPLETED

1. All derivations and coding have been completed, preliminary scientific testing is in progress and documentation is substantially under way (Chua and Bennett, 2001).

2. The Summer School was conducted from July 22 to Aug 2, and attended by 57 graduate students, postdocs, beginning and experienced civilian and defense research scientists from around the world. The 25 one-hour lectures were supplemented with 4 hours of invited presentations by collaborators in an NSF ITR project to develop a modular ocean data assimilation system. Lectures were supported by a new textbook (Bennett, 2002), and complemented with analytical and computing exercises. Labs housing 30 new and 20 late model UNIX workstations were available 14 hours each day.

RESULTS

See Work Completed

IMPACT/APPLICATIONS

1. The 'Inverse Bryan and Cox model', which will be constructed from the adjoint code, may be used for the dynamical mapping of data, for testing parameterizations and assessing observing systems.

2. The 170 attendees of the three Summer Schools (1997, 1999 and 2002) have received a coherent presentation of all major methods of advanced data assimilation, in the uniquely intense and stimulating environment provided by the gathering of so many able and enthusiastic young scientists

RELATED PROJECTS

NSF ITR Collaborative Research: Modular Ocean Data Assimilation. A modular system for inverse ocean modeling is being developed at OSU and the National Center for Atmospheric Research. It accepts any dynamical model (and its adjoint subroutine), and implements weak-constraint space-time variational assimilation of data of any type. Collaborators at Oregon State Univ., Scripps Inst. of Oceanography, Arizona State Univ., Univ. of Colorado, Rutgers Univ., Univ. of Illinois., and Univ. of North Carolina will combine the system with their oceanic and geophysical models and data sets. Other prospective users include NRL MRY, NRL SSC, Univ. of Rhode Island (NSF PARADIGM Project), and the Inst. of Ocean Sciences (Canada).

REFERENCES

Chua, B. S. and A. F. Bennett, 2001: An inverse ocean modeling system. *Ocean Modelling*, **3**, 137-165.

Bennett, A. F., 2002: *Inverse Modeling of the Ocean and Atmosphere*. Cambridge University Press, Cambridge, UK, 234pp.

PUBLICATIONS

nil

PATENTS

nil