N93-24921

Operational Seasonal and Interannual Predictions of Ocean Conditions

Ants Leetmaa

Summary

Dr. Leetmaa described current work at the U.S. National Meteorological Center (NMC) on coupled systems leading to a seasonal to multi-seasonal prediction system. He described the way in which ocean thermal data is quality controlled and used in a four dimensional data assimilation system. This consists of a statistical interpolation scheme, a primitive equation ocean general circulation model, and the atmospheric fluxes that are require to force this. This whole process generated dynamically consist thermohaline and velocity fields for the ocean. Currently routine weekly analyses are performed for the Atlantic and Pacific oceans. These analyses are used for ocean climate diagnostics and as initial conditions for coupled forecast models. Specific examples of output products were shown both in the Pacific and the Atlantic Ocean.

As part of the development of an operational forecast system, this data assimilation system is being used to retrospectively analyze the ocean fields from 1982 to the present. This data set can be used to diagnose ocean variability during this period and will also serve as initial conditions and verification fields for the coupled forecast system. A separate effort at NMC is undertaking the task of performing a retrospective analysis for the atmosphere for the last 35 years. Both ocean and atmospheric reanalyses will be a recurring process which will repeated as more data is added and as the analysis system continues to be improved.

Currently much of the information about surface thermal variations in the ocean is derived from satellite measurements. The recent volcanic eruptions can cause serious errors in these estimates, and a solid system of in-situ measurements is needed to correct for such problems. This illustrates the need, while quality control is being performed, of having access to data from different kinds of measurement platforms. At operational centers, such as NMC, accessing diverse data sets from ships, buoys, xbts, and satellites in realtime is relatively easily done. This timeliness and easy data accessibility facilitates quality control. Data management procedures in the future should stress these principals.

Dr. Leetmaa concluded requesting that data management planners think about :

(a) multivarient, multi-year data set accessibly - the various ocean and atmospheric data sets being consolidated for climate forecast systems and the dynamical reanalyses produce diverse, already quality controlled, and large data sets. How will these be distributed and by whom?

(b) the study of annual & interannual variability is central to understanding climatic variability - this requires long time series data for the ocean and atmosphere; data centers can help in this by making a special effort to consolidate whatever historical information is available.
(c) international cooperation - development of these retrospective analyses for the ocean and atmosphere will be a continuing process and will require an international effort in data assembly, quality control, and verification.

Question Period

Q. As there are changes in the model, is there a need for reanalysis?
A. NMC is in the process of doing this. Ocean reanalysis is not as time consuming as one might imagine.

Q. Are these forecasts used in support of agricultural forecasts?
A. That is a goal

Q. What data types are the most valuable?
A. The main source of information about the ocean at present consist of thermal data from satellites, ships, buoys, and XBTs. In the future sea level altimetry from satellites such as TOPEX and current from drifting buoys will become more important.

Q. How adequate are the data now used for reanalysis?
A. There is some evidence that valuable data needed to complete the historical data sets is not yet available to Data Center, which are the data sources used by forecasting centers such as NMC. Since reanalysis is not that difficult improved historical data sets would be most welcome.