THE CORIOLIS PROPOSAL

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RÉSUMÉ *- Les futurs modèles globaux de prévision océanique tels que MERCATOR ou GODAE assimileront des données satellitales et in situ. Pour satisfaire les besoins opérationnels en mesures in situ, le groupe français CORIOLIS recommande de (1) poursuivre l'effort actuel de mesures en Atlantique, (2) construire un réseau de 600 profileurs T,S lagrangien et eulérien répartis régulièrement dans tout l'Atlantique. Ce réseau devra se mettre en place progressivement dans un cadre internationnal tel qu'ARGO.*

ABSTRACT *- The future global ocean prediction models will require to assimilate satellite and in situ data. To satisfy the in situ needs,the French group CORIOLIS recommends to (1) Continue the present in situ monitoring of the Atlantic, (2) Build a new in situ network made of 600 profiling floats T, S of both lagrangian and eulerian type, covering all the Atlantic on a regular space-time grid. Such a network will be deployed progressively in an international framework like ARGO.*

1 - INTRODUCTION

The French working group “CORIOLIS” was formed in 1997 to provide recommendations on the in situ data component available for future operational ocean models as the ocean prediction project MERCATOR (part of GODAE) which will assimilate satellite and in situ data. It includes representatives of the main six agencies dealing with oceanography (IFREMER, ORSTOM (IRD), CNES, FMTO, INSU/CNRS, SHOM) and is led by IFREMER The group focused on the Atlantic Ocean.

2 - THE PRESENT SITUATION

2.1 - An ocean under-sampled :

The in situ monitoring of the global Ocean and the Atlantic in particular is dramatically insufficient, limited in spatial coverage, in time distribution, in quantity and restricted mainly to

temperature measurements. No salinity data are available on a regular basis. In addition, a fraction only of the observations are accessible in real time on the GTS. The observation system is composed mainly of:

- Drifting buoys (SST)
- Expandable XBT : About 600 XBT are collected every month along ship routes in the upper 500m depth range
- The scientific PIRATA network made of 12 buoys collecting T, S data in the 0-500m depth range
- P-floats PALACE deployed in the Atlantic in the framework of international programs
- Conventional ship-based sections and bathysonde profiles, with the big contribution of WOCE

2.2 - New automatic instruments :

The global monitoring is now technically feasible with the development of new autonomous and automatic profiling floats of lifetime exceeding 3 years and able to collect T,S profiles on a regular basis. Among the instruments available or still in development, the CORIOLIS group pointed the two major P-floats developed by IFREMER : the multicycle drifting profiler PROVOR and the expandable Eulerian profiler EMMA.

- PROVOR is the profiling version of the successful subsurface drifter MARVOR (170 floats were deployed during the last 5 years, and 70% are still in operation after 4 years at sea). Equipped with T or C, T sensor, it is able to drift at a given depth, then to dive until 2000m and ascent to the surface, delivering it's recorded T, S descent and ascent profiles through the ARGOS satellite system. A new generation of such profiler will be developed, to cope with full operational requirements : minimum cost, deployable from ship of opportunity or aircraft's, with increasing sensor lifetime [Loae 98].
- The expandable lighter-than-water probe EMMA, equipped with CTD sensor will profile the water column from the bottom (i.e. 5000m) to the surface and transmit the data through the ARGOS link when surfacing. A marginal cost per probe is estimated to be less than $1000 in production quantities [Cono 98]

3 - THE CORIOLIS PROPOSAL

The working group CORIOLIS concludes that it is essential to remedy to the dramatic undersampling of the ocean [Marc 99]. He considers its contribution as a proposal for the Atlantic to the ARGO proposal and recommends :

(i) To continue and improve the existing observing systems such as the VOS-XBT lines, surface drifters operated by Met-offices, PIRATA tropical Array.

(ii) To implement a new automatic and permanent in situ network covering all the Atlantic and composed of :

- 500 profiling floats (such as PROVOR) as a contribution to the ARGO project, basically on a 5^{o} x 5^{o} grid with denser sampling (2^{o} x 2^{o}) in specific areas.
- 100 Eulerian expandable pop up probes EMMA, profiling from top to bottom on a monthly basis on a 10^{o} x 10^{o} grid.

Floats are a cost effective means to collect in situ data over the global ocean. Several advantages can be pointed out when mixing fixed and drifting profilers : (1) EMMA probes will not be ejected

from high dynamic zones, they will collect time series of T, S at fixed location and in a synoptic way all over broad areas ; (2) high quality of T, S measurements are expected from EMMA probes because of their protected CTD before popping up ; Calibration of P-float can then be envisaged ; (3) Collecting data in all the water column is useful to evaluate the possible climatic signal of deep waters.

The CORIOLIS proposal (released in December 1998) would represent a significant contribution to ARGO. As a consequence, it is plan presently in France :

- To develop a full operational version of the PROVOR profiler and to develop the EMMA Eulerian probe.
- To deploy floats in the North Atlantic as a CORIOLIS contribution to ARGO, including 30 PROVOR in the 1999-2000 period (during the scientific experiment POMME) and 50 floats/year during the 2001-2003 period financed by IFREMER. In addition, the French contribution will be complemented through a European proposal “Gyroscope” to be submitted to the European Union 5th framework program, which will require a total of 150 additional floats on the same period. We thus envision a French direct contribution to ARGO of about 50 floats per year which could be complemented by 50 additional floats through a EU proposal, giving a total of 100 floats per year and 300 floats at sea in 2003 after 3 years of deployment.

REFERENCES

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