Report of the GyroScope Kickoff Meeting

Brest – February 1 and 2nd, 2001

The list of participants and the agenda are given in annexes. The objectives of the meeting were given as :

1. Objectives of the meeting

- Get together as a group, so that every participant can appreciate the scope of the project. Give an opportunity for each participant to present what he intends to do.
- Adjust the work plan if necessary
- Tune the various contributions to encourage complementary, to avoid duplication of efforts, and to foster collaboration
- Discuss such issues as data sharing, availability of numerical models, forcing fields, other type of data available, etc…
- Details of the actions for the first year, in particular: field work and technical aspects

2. Overview of the meeting

The format of the meeting allowed it to proceed in an informal way, with ample time for exchanges. For each agenda item, there was a presentation followed by a discussion. This report will not attempt to summarize the contributions – which follow the description of work, as given in the contract – but rather to highlight some of the comments, remarks and action items. Some administrative matters and management issues were also addressed.

The overview of the project and its context was given by Y.Desaubies, the main objectives being to deploy the floats and make the data freely available; to estimate the information content of the array; to develop procedures for real time field estimation; to study ocean processes (heat and salt balances, fluxes and transports, water mass characteristics, subduction, seasonal variability) using the float data, as well as complementary data; to develop a cost effective observing array for the North Atlantic.

As the first deliverables of the project are related to field work, this issue was discussed at some length during the meeting.

3. Summary by work packages

WP 1. Array design, Field work

1.1 Array and experiment design

P.Y. Le Traon presented preliminary simulations of float arrays to resolve large scale monthly variability. The importance of taking explicitly into account the various scales of

ocean variability is stressed. Aliasing by meso-scale processes is a key issue in this low signal to noise ratio situation. The signal to noise ratio varies considerably in space. Further work will use simulation in a higher resolution ocean model (CLIPPER 1/6° run). Comparisons of eulerian (fixed point observations) and lagrangian (drifting sensors) network will also be done.

Studies of mapping errors of various arrays are a necessary guide to the design of the observing system; other constraints stem from ship availability (see the discussion below on ships and cruise planning). In that case, the strategy must be adapted according to ship tracks (density of deployments along tracks). LPO and IFM will consider those points, as well as the parameters to be programmed into the floats (cruising depth, sampling scheme in the vertical). The choice of a 10 day cycle and profiling depth to 2000 m were adopted; cruising depth according to water mass of interest.

1.2 Float purchase

Two types of floats adapted for the project are presently available : the APEX (manufactured by WRC in the USA), and the PROVOR (by MARTEC in France). Quotes received and technical characteristics were presented by W. Zenk. The APEX and the PROVOR have very similar characteristics and price (14835 € and 14635 €, respectively). They can be equipped with either SeaBird or FSI sensor packages (although the SeaBird package is still under development at MARTEC, and is likely to be slightly more expensive).

The APEX : The price quoted by WRC is for orders of 40 instruments or more; price is the same for either sensor package. Delivery date for first batch (about 10 units) is 4 months, which would allow deployments to start in June. IFM has used that type of equipment previously.

The PROVOR : is a new product, based on the successful MARVOR concept. First units could be available during the last quarter of 2001, with FSI sensors.

Conclusions : if deployments are to start in summer of 2001, it is urgent to place orders. GyroScope has proposed to test and compare different types of instruments. IFM will order APEX floats; if and when other programmes at the IFM order floats from WRC, thus contributing to the quorum of 40 units, other types of floats (MARVOR) might be ordered. LPO will order from MARTEC a mix of FSI and SeaBird equipped floats.

1.3 Field work

Several opportunities for float deployments were presented: in particular German cruises in the subpolar gyre in the summer of 2001, a dedicated cruise organized by CMO/SHOM in November of 2001, and a cruise to be organized by IEO in March or April 2002. Deployments depend on the delivery of floats by manufacturers. They will be co-ordinated with other national plans, an issue that will be discussed at the forthcoming International ARGO Science Team (IAST) meeting in Sidney, BC, Canada (March 20-22, 2001).

For the North Atlantic (North of 20°N) the ARGO contributions of European countries that were identified at the meeting consist of the 80 EU GyroScope– funded floats, 10 UK floats (5 already deployed), and 65 French floats. Additionally, a German proposal is pending; Canadian and US contributions will be reviewed at the IAST meeting.

IEO will work with LPO to plan IEO cruise in Canaries Basin.

Conclusions : are summarized in the table. This preliminary plan will be refined in the coming months (deliverable due in June). The main conclusion is that for the GyroScope region there will be several opportunities for deployments from research vessels. The calendar must be paced with float production by manufacturers. By early summer 2002, all GyroScope floats should be deployed and delivering data, as proposed in the contract.

Summary of anticipated initial GyroScope float deployments

Date	Region	Number / type of float	Vessel	Institute
June 2001	Iceland Basin, Irminger Sea	10 APEX	Poseidon	IFM
November 2001	North East Atlantic (35 to 50°N)	15 PROVOR	BSHM (SHOM)	LPO + CMO
March 2002	Canaries Basin	15 PROVOR	To be decided	IEO + LPO
May–June 2002	Subpolar Gyre	30 APEX	Poseidon, Meteor	IFM
June 2002	Subpolar and inter- gyre	10 PROVOR	Thalassa	LPO

WP 2 Float performance monitoring and evaluation

Most of this work awaits float deployments; automatic correction procedures will be developed and delivered to Data Centre in Month 9. (action LPO and IFM).

WP 3 Data Centre

A preliminary version, the CORIOLIS Data Service, operating with automatic quality controls within 12 hrs of data reception, was presented by G.Maudire. Visual control of the data rejected by the automatic QC is done within 24hrs (working days). As one of the ARGO Data Centres, it will make available all ARGO data. It will process all the GyroScope floats, PROVOR and APEX. Within 12h of full reception of the profile, it will : decode Argos hexa messages from float, collect messages to reconstruct data profile, distribute raw data to float owner (mailing list), check quality according to ARGO recommendations before public distribution, post on GTS and Coriolis/Argo web and ftp site.

It is essential that CRC codes be used in Argos messages transmitted by APEX floats to insure data integrity during Argos transmission; a "mail service" must be subscripted with service ARGOS to push data directly to Coriolis data centre (the extra cost is about 0.07 € / Kbytes compared to the normal service). G. Maudire and W. Zenk will consult with WRC to settle the data format issues.

M. Bell raised the point of loss of data (data redundancy might also be a problem) through the transmission chains (either ARGO Centre or GTS). This will be checked.

Beyond the short time delivery data, the project states that “diverse data synthesis products will be displayed and retrievable on the web site for scientific use and general public information”. Some of those products are presently being developed (objective analysis), the results of real-time inverse analysis (WP5) is another example. Further work on this is needed, which will be discussed at the next meeting.

WP4 : Information content

P.Y. Le Traon presented a method to compare altimetre and float data. He combines the data sets (Riser’s Atlantic floats) to obtain dynamic height at float position and reconstruct a corrected synthetic geoid. Since most of the floats are T° only, T/S relationship is derived from Levitus. Discrepancies between float and altimetre data can be used to validate float data.

M. Bell showed results from three FOAM integrations : without assimilation, with SST and temperature profiles, with altimetre data. Float data will be useful to improve SST statistics, to determine spatial dependence of error covariances, and to extrapolate to depth the altimetre data.

On the detection of climate change signal (work with H. Banks and R. Wood), the issue is to determine a sensitive observable, as well as critical regions, so as to maximize SNR. In the Indian ocean, salinity on isopycnals is such a signal. For the Atlantic, one

should investigate mode waters (although the long term climate signal might be masked by strong inter-annual variability).

The LPO finite difference inverse model (P. Le Grand and H. Mercier) will be used in two modes: in near real time (WP5) and for the full data inversion. It combines data with dynamical constraints, and adjusts density field, SLA, and reference velocity to obtain optimal solution. The model needs surface fluxes, including wind. Those could be available from UK Met and /or ECMWF.

ICM (S. Ruiz) will develop statistical analysis methods (objective analysis) for the float data. It is suggested to look closely at the scales of variability that can be resolved with the sparse float array, in relation to ocean processes; i.e. what is the signal to be mapped. Possible extensions could consider empirical orthogonal function (EOF) analysis to determine the vertical and horizontal scales of variability.

WP5 Real-time field estimation

Two approaches to real – time field estimation: inverse modelling (P. Le Grand) and combining QG and mixed layer model (D. Jourdan). The former aims to provide quick look synthesis of float data, temperature fields in the first phase, velocity fields later. Because of the real time constraint, Ekman velocity will be based on monthly climatology from ERS. The possibility to use float displacement to improve velocity estimates will be investigated.

The suggestion is made to use altimetre data in the inversion, to reduce aliasing by mesoscale processes. SLA gridded fields can be provided by CLS with 7 days delays.

The QG model of CMO/SHOM will be used in analysis and forecast modes, in combination with a 1-D mixed model. There is no dynamical interaction between the models. The model will be run daily for a two month test period (April – May 2002 is proposed), over a region delimited by 24° to 54°N, 0 to 35°W. Maps of stream function, SST, and mixed layer depth delivered to web site. The impact of float data on forecast skill will be assessed. Time permitting, a “best effort” will be made to obtain off-line re-analysis.

WP6 Study of ocean processes

The ocean processes to be considered have been listed in the Description of Work. They deal essentially with heat and salt budgets (storage, transports, fluxes), water mass characteristics, mixed layer dynamics, convection, circulation and seasonal to inter-annual variability. Several models will serve as a basis for the scientific analysis, for instance : output of objective analysis for mapping main thermocline (R. Schopp); LPO inverse model

for time evolving fields (H. Mercier); OCCAM 1/12° for surface flux validation (B. King); inverse box model for Canaries basin circulation (A. Hernandez).

Some of the issues that were discussed include: how to compare inverse and forward model outputs (they must use the same surface fluxes); the possibility to estimate the velocity field independently from surface fluxes; will the OCCAM runs correspond to the actual GyroScope period, when will they be available ? It might be advisable to use initially the FOAM 1/8° model, at least to set up the methodology.

Some questions were raised on whether a box model is appropriate for the geometry and sparseness of the float data, and the impact of the mesoscale on the determination of the mean circulation. An descriptive analysis of the individual float profiles in that area (as in all areas) can yield valuable information (on water masses and mixing, for instance: P. Velez).

WP7 Management and reporting

Some additional deliverables have been added at the request of the Commission :

1. User Requirement Document (URD, 3 months) :
    a. identify and characterize main user groups
    b. specify sort of results they would find useful
    c. may include targeted surveys of key users
    d. may be amended as project progresses

2. Short glossy brochure (150 copies !) (12 months)
    a. *"the tone should be lively with plenty of pictures and graphics"*
3. Six months management reports (about 4 pages)

Contributions are requested for the URD : examples from other projects if available, identification of user groups (science, meteorological services, fisheries, defence, the general public). The URD should be written in anticipation of the Technical Implementation Plan that will be required at the end of the project.

The illustrations and layout of the glossy brochure will also serve on the project web site – which however must be established as soon as possible. LPO will establish the web site and open it to the project participants for comments before being accessible to the general public. The site will include a password-protected domain.

4. Deliverables and milestones

The deliverables and milestones for the coming year are summarized in the following table.

	3 Month	6 Month	9 Month	12 Month
WP1 Experiment		Definition, Begin deployment		
WP2 Monitoring Evaluation			Automatic corrections to data Centre	
WP3 Data Centre		Be ready, Deliver data to web server		
WP4 Information Content				Start comparisons with altimetry
WP5 Real Time		Procedure for OA of T/S fields		
WP6 Ocean Processes				
WP7 Management and reporting	URD document	Management report		Glossy brochure ; annual interim report

Bold underlined : deliverables ; other : milestones

4. Administrative matters

The attention of the participants was drawn to some of the points of the contract, which figure in the Annex II. The following recommendations were discussed

1. when requested, provide necessary statements or reports in a timely fashion. Otherwise the whole project is held back;
2. the possibility of signing a Consortium Agreement was considered, but deemed unnecessary. The nature and size of the project do not warrant such an agreement. The Contract in itself covers adequately all contractual issues;
3. all participants in the project will exchange and share freely all data and results acquired in the course of the project (i.e. *the knowledge* in the sense of Annex II); they will also have access to the *pre-existing knowledge* from the participants, when necessary for the project;
4. be aware of accounting rules, in particular, keep monthly time sheets to justify personnel costs;
5. the co-ordinator is the interlocutor of the project with the Commission; keep him informed of difficulties or changes.

5. Next meeting

The next project meeting will be held in a year (March 2002), tentatively in Spain (Madrid or Canaries). G. Parrilla and P. Velez will explore the possibilities.

GyroScope Kickoff Meeting

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Agenda

9h00 : Welcome, logistics, administrative information..... Y.Desaubies
9h10 : Overview of the project ..... Y.Desaubies
9h40: *Estimating ocean state from float data* :
Simulations in PE equation models ..... P.Y.Le Traon
Comparing altimeter and float data ..... P.Y.Le Traon
Estimating vertical structure and statistics ; climate signal detection
..... M.Bell
Inverse modelling (finite difference) ..... P. LeGrand
Objective analysis techniques ..... S.Ruiz

12h30 Lunch

14h00 *Deployment of the array, and data stream*
Characteristics of the floats, purchases..... Y.Desaubies, W.Zenk
Options for deployments.....Send, Parrilla, Desaubies
The CORIOLIS data center..... G.Maudire
Experimental parameters ..... Send

15h30 Break

16h00 *Real time field estimation*
Operational analysis and forecast.....D.Jourdan

17h30 *Visit of MARTEC Instrumentation facility*

Friday , Feb. 2

09h00 *Ocean Processes*
Upper ocean response .....R.Schopp
Heat and fresh water budgets.....H.Mercier, B.King
Water masses..... Hernandez, King, Mercier, Parrilla, Send
11h20 *Action items, planning, next meeting*..... Desaubies

13h00 Lunch

14h00 Experiment and cruise planning; instrumental aspects
16h00 End of meeting