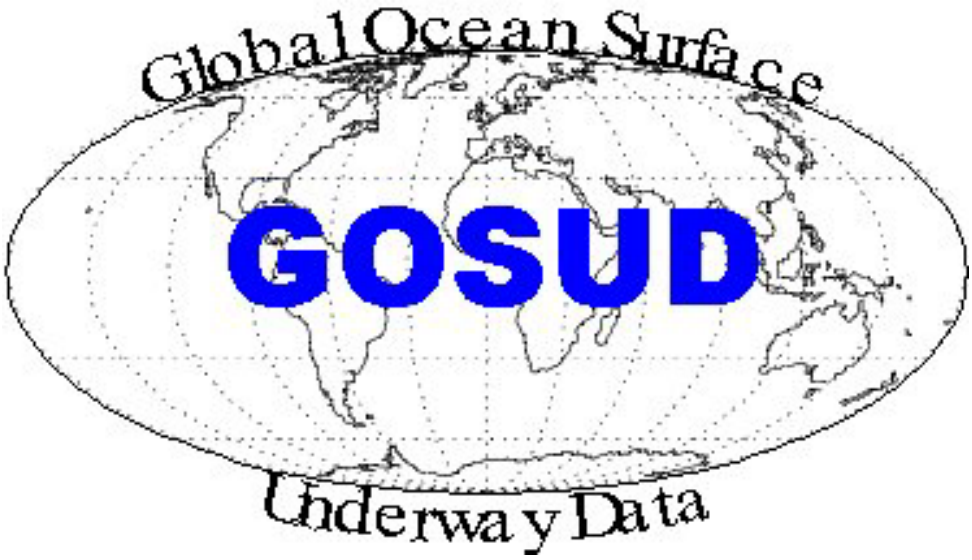
Limited Distribution

IOC/IODE-XVII/37-Annexe
Paris, 21 February 2003
Original: English

International Oceanographic
Data and Information Exchange



Project Plan

Last updated:31 Jan, 2003

GOSUD Project Plan

1. Introduction

The Global Ocean Surface Underway Data (GOSUD) Project is an Intergovernmental Oceanographic Commission (IOC) programme designed as an end to end system for data collected by ships as they traverse their ocean tracks. The goal of the GOSUD Project is to develop and implement the data system for ocean surface data, to acquire and manage these data and to provide a mechanism to integrate these data with other types of data collected in the world oceans. For the purposes of this Project, the data concerned are those collected as a platform is underway from the ocean surface down to about 15m depth.

Development of the GOSUD Project began in 2000 with expressions of interest at the IODE meeting in Lisbon, Portugal. A preliminary meeting was held in Brest, France, in November, 2001 at which a strategy to develop a project plan was agreed. This was followed by a Meeting in Ottawa, Canada, in September 2002 at which components of the draft plan were reviewed and the preparation of the first project plan formulated.

This document sets out the goals of the project and the range of activities required of participants in order to achieve the goals. The participants of the preliminary meetings have expressed interest in meeting certain of the objectives and these are recorded in this plan. Other participants will be needed in order to meet the goals of the project.

2. Rationale for the Project

The Ocean Observations Panel for Climate, OOPC, and its predecessors examined the usefulness of surface salinity data in the context of climate change detection. They state that "At high latitude, sea surface salinity is known to be critical for decadal and longer time scale variations associated with deep ocean over turning and the hydrological cycle. In the tropics, and in particular in the western Pacific, and Indonesian Seas, and in upwelling zones salinity is also believed to be important." They quote the benchmark sampling strategy to be one sample per 200 km square every 10 days and with an accuracy of 0.1 PSU. They also state that the tropical western Pacific and Indian Oceans and high latitudes should receive the highest priority.

In the paper titled "The ENSO Observing System" presented at the Ocean Observations Conference in 1999, the authors (McPhaden, et. al.) state "Analyses of CTD show that the lack of surface and subsurface salinity observations (in the western and central equatorial Pacific) can sometimes lead to errors in dynamic height that are comparable in size to the ENSO signals of interest. Errors in dynamic height affect the pressure field and large-scale ocean circulation and, if uncorrected, lead to errors in initial conditions for coupled ocean-atmosphere model ENSO forecasts."

The following is an excerpt from the Final Draft (March, 2002) of the report titled "A Global Ocean Carbon Observation System - A Background Report, A Contribution to the Integrated Global Observing Strategy (IGOS) (Doney, et. al.)".

"The current ocean carbon observation base, while serving many of the needs of the international science community, is insufficient to these tasks. Only through a coordinated ocean sampling programme and improved, basic scientific understanding of the marine carbon cycle will the overall goal of skilful forecasts of future atmospheric CO_2 trajectories be attained. This document outlines the necessary components of an ocean carbon observing system consisting of three main elements and goals:

i. in situ observations conducted on appropriate space and time scales;
ii. integration of these data to the surface signal measured by satellites; and
iii. improved models of the behaviour of the carbon system, including data integration via inverse (diagnostic) modeling and data assimilation.

We also advocate aggressive, linked efforts in ocean process studies, sampling platform and sensor technology development and forward (prognostic) model development and evaluation.

The global carbon cycle is a single system with multi-faceted aspects cutting across the three major domains: the ocean, land, and atmosphere. Many of the most important advances in the field over the last decade involve combining data sets and models for the different reservoirs in new ways because results from one domain often place invaluable constraints on the workings of the other two."

The response by OOPC at its meeting in Kiel, 2002 to this document included
"

- OOPC does believe it is timely to begin implementation of routine VOS observations for pCO2. The Ship Observation Team of the JCOMM PA should begin a process for embracing such measurements. There are several candidate lines (eg, Germany EC funded program CAVASOO), the Australian lines (the recent JCOMM Ship Observations Team addressed implementation issues).
- OOPC will entrust development of a detailed plan to the process initiated by Doney et al, with due consideration of issues for integrating the ocean part with other elements, development of the Carbon Cycle program, etc

"

At the same meeting OOPC noted "Efforts are being made to extend the SOOP to "new" observations such as pCO_2 (see above), using initiatives in Europe and elsewhere to “prove” the approach. From the OOPC perspective, we believe the extension of the SOOP into non-physical measurements is justified and would view the pCO_2 initiative as perhaps the start of a more significant “pilot” activity into measurements related to the carbon cycle. Works continues in the transition of SOOP to “line mode”."

This project has decided to deal with the broader issue of handling data (e.g. temperature, salinity, pCO_2, fluorescence, etc.) collected while a platform is underway, rather than concentrating on surface salinity data only.

- In the first place, it is clear that there are a variety of measurements of variables that can be successfully made while a platform is underway. There is no good reason to isolate salinity when all of the variables will share commonalities in collection techniques and are complementary for climate-related studies.
- In the second place, it is clear that what can be done today (e.g. for surface salinity), will be a subset of what can be done in the near future. We, therefore, need to build a data system that is flexible enough to accommodate future data collection systems that operate with sufficiently similar characteristics.
- Third, it is clear that systems to make routine and reliable observations for more than just surface physical variables are sufficiently advanced that it is opportune to design the data system that can cope with this diversity of data types.

3. Objectives

CLIVAR planners have stated what they think are the attributes of a successful data and information management system. In the Proceedings of the International CLIVAR Conference held in Paris in 1998, one attendee states that the following points are likely to be prominent.

- Swift assembly and distribution of data, ready availability and free access.
- Data sets and products are comprehensive in terms of the variables
- Encourage exploration of historical and paleo data sets.
- Encourage processing methods that eliminate or minimize the production of spurious signals.
- Ensure that adequate and timely data are available for the initialization and validation of climate forecast systems.
- Maximize the utility of the sustained observing system for various process or intensive studies.
- Work with GOOS/GCOS, World Weather Watch and Global Atmosphere Watch in development and implementation of the strategy.

The latest draft data and information management plan under development for GOOS advises an end-to-end system for the various components contemplated. In particular, it suggests strategies that should be employed to develop the systems.

With these thoughts in mind, the objective of this plan is to organize the surface underway data that are now collected and to work with data collectors to improve what is presently collected to try to meet the benchmarks of spatial, temporal sampling and data accuracy set forth by OOPC. The resulting data management system should meet as many of the attributes of a successful system as stated by CLIVAR (as quoted above). More specifically, the project has the following goals.

- To build a comprehensive archive for surface underway data. This encompasses data collected by any instrumentation at any time. It will contain sufficient metadata that users will have clear information about accuracy, instrumentation, sampling, etc.
- To add value to the archive by refining and standardizing existing quality assessment procedures carried out on real time and delayed mode data and documenting both what was done and the results.
- To provide data and information to users in a timely fashion. At any time after data collection, a user should be able to access the highest quality, and most recent data available. Users will be able to distinguish "levels" of quality in the archives. Users will be able to utilize the data and easily combine them with data from other sources.
- To work with data collectors to improve the data acquisition systems and to return information to data collectors about the data they provide.
- To work with scientific organizations interested in surface data to provide products to a broader community.

4. Benefits to Member States

The GOSUD Project has an obvious international objective, but it is also intended that member states benefit at the national and regional level. In particular, member states benefit from GOSUD because:

- Member states can receive the most complete and timely data available to produce the most reliable and accurate operational products for human safety, environmental monitoring and protection, socio-economic applications and scientific knowledge for regional, national, and/or international use. The GOSUD will provide an integrated approach to developing surface data sets. The GOSUD Project is always seeking to add data flows from new instruments and new data sources to its data flows.
- Member states benefit from standardization of quality control procedures and the results of the various tests are carried out on the data. There is also standardization of data formats and processing methodologies to simplify data exchange nationally and internationally. The GOSUD Project will continue to develop improved quality control and standardization practices in cooperation with its participating science centres.
- Member states are able to receive regional and global data flow information and inventories enabling them to obtain the data of interest to them from the international data exchange organizations. The GOSUD Project will continue to improve and expand these sources of information on the availability of data.
- New state of the art methods and technologies in communications, software applications, quality control, and data management are under constant development and are available for transfer to member states.

The following are some examples of potential benefits of participation in the GOSUD Project by IOC member states.

- The GOSUD Project data management and quality control systems for underway data are written by experts in the collection and analysis of underway data. By distributing and implementing these procedures in the member states it will save development costs by sharing the workload of the software development and results in fully processed data of a much higher quality arriving at the national data centre much sooner than in the past.

- Because of the improved availability of underway ocean data in operational time frames oceanographic centres in some member states may decide to prepare and distribute maps for use by fishermen and other interests of surface conditions.
- Feedback of information on problems in the data to the operators of some ships of opportunity will enable these operators to correct problems.
- Present data show different sampling strategies, accuracies, errors in position, date-time, and variable values. There is expected to be a significant improvement in the quality of data due to standardized procedures carried out by data centres participating in the GOSUD Project.

It is expected that as the GOSUD Project moves forward and member state participation increases, more and varied benefits of this nature will be realized.

5. Governance

5.1 Parent Body

The parent body for the GOSUD Project is the Intergovernmental Oceanographic Data and Information Exchange, IODE, committee of IOC. At the XVI Session of the IODE it was recommended that the GOSUD begin a pilot project to handle surface salinity data. This plan has been expanded to consider other variables with the rationale given in section 2. Two meetings have been held to organize the project among countries with initial interest in the project.

5.2 Internal Organization

The GOSUD Project will be governed by a Steering Group composed of the major participants. It is responsible for the development and implementation of the Project. The Group oversees and directs the development of the Project and promotes and encourages participation in the GOSUD Project. The Group specifies, maintains, and distributes relevant documentation to IODE contacts and representatives of scientific programmes, and reports progress to the IODE.

5.3 Membership

This Project Plan only deals with managing the data collected by observing systems and some of the resulting products. It is important that the observing systems be represented on the Steering Group to ensure an efficient liaison between the data collectors and the data system.

The Project Plan draws on guidance of scientific groups to specify the time and space scales for measurements and for products. The Steering Group must have members with scientific interests in the data collected who can have direct impact on the observation strategies, the data system, and the products from the project. It is through their participation that the Project will ensure proper alignment with scientific goals and observing strategies to meet those goals.

There must also be members of the data management community on the Steering Group to contribute their expertise in managing the data.

5.4 Terms of Reference

The terms of reference in Annex 1 will be reviewed and updated as appropriate at meetings of parent bodies of the GOSUD Project at which it reports its activities.

6. Participation

There have been approximately 10 countries or organizations in member states of IOC who have participated in the planning meetings of the GOSUD Project. As the project moves into the implementation phase it is a goal to increase this participation. Member states that have not yet expressed interest in participation are encouraged to examine their data related activities and where appropriate to actively support the GOSUD Project. Expressions of interest should be directed to the chair or members of the Steering Group.

Initial intentions to contribute are varied. Some organizations will supply data. Others, such as data centres will provide data assembly, quality control, duplicates management and data system performance reports. Some agencies, such as those running national programmes, or data centers, will acquire data from national programmes and contribute these either to the real-time distribution system or to the GOSUD Project centres. Scientific organizations will provide a vital role carrying out scientifically based quality control to data sets and providing advice to how the data system should work.

The best progress will be realized in the future if contributions come from many member states. This contribution is vital to ensure that as much data as possible are contributed to the project. In addition, contributions of resources to the GOSUD Project will distribute the workload over participants such that the work can be completed in a timely manner, and the workload of individual participants is reduced to a level where it can be undertaken without compromising other activities.

As indicated above there are many areas where member states can make valuable contributions. These include the following activities.

- Within their own marine science communities Member states can encourage an increase in the number of observations transmitted to the project
- Participants can undertake quality control checks according to the GOSUD Project Quality Control Manual (to be prepared)
- Participants can include metadata and flags as agreed by the Project Steering Group
- Participants can improve mechanisms for timely submission of both near real time and delayed mode data
- Participants can encourage national research agencies to develop data and information products as part of the scientific quality assurance process and as a service to national and international users,
- Participants can actively acquire historical underway data that has not previously been exchanged,
- Participants can provide advice and assistance to the project in the areas of data management, quality control, communications, and product development
- Participants can provide software to be used by centres managing the GOSUD Project data and can be distributed to centres in member states.

All member states automatically play a part in the GOSUD Project through their normal IODE activities. To participate more actively in the Project, Member States can write to the IOC Secretariat, or to the Chairman of the GOSUD Steering Group outlining the areas in which they wish to contribute.

7. Data System Components

This section will describe the components and functions required to build a data system for the GOSUD Project. The first section provides an overall summary to show how all of the components fit together. Subsequent sections go into greater detail on the requirements of the subsystems. Some of the organizers of the GOSUD Project have already made tentative offers to meet certain functions. These will be mentioned in the appropriate sections. Other participants will be needed to meet the remaining functions.

7.1 The GOSUD Project Operations Summary

Figure 1 below shows a simplified version of the data and information flow within the project.

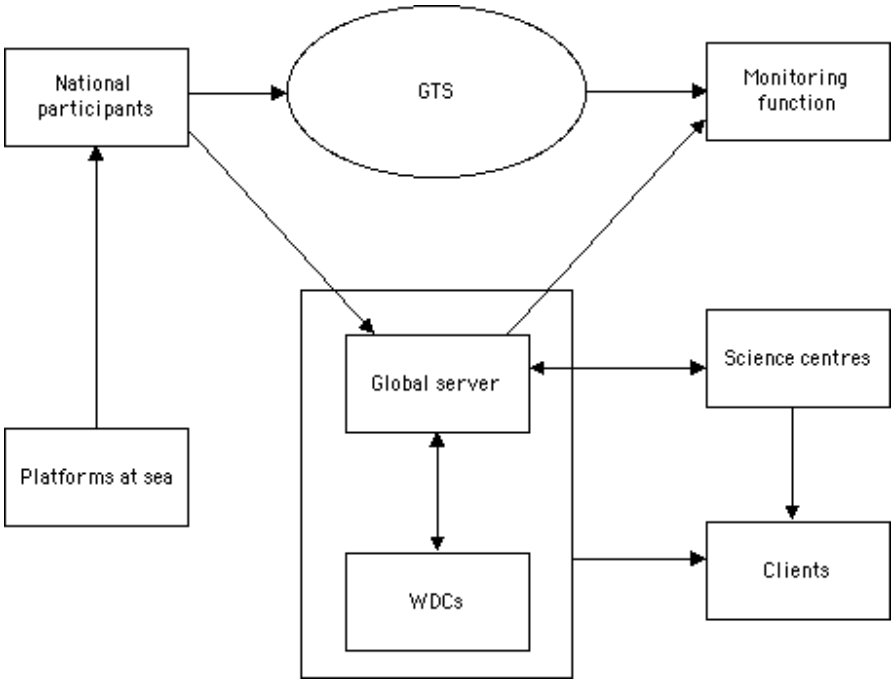


Figure 1: GOSUD Project Data Flow

Everything begins with the platforms at sea making routine, underway measurements. Participants will be encouraged to send the data ashore as quickly as possible. It is the desire of the GOSUD Project that these data be available as soon after collection as possible (hours to days) although meeting this target may be difficult for certain kinds of data. The data received in each country will pass through quality control procedures standardized for the project and carried out by each participant. It is expected that some of these procedures will be automated and sufficiently robust to remove the most serious errors in the data. After such procedures, participants will send the data immediately to a global data server set up for the Project. It is from this global server that GOSUD will provide users with data. GOSUD participants will also be encouraged to send the data to the GTS, either in the existing TRACKOB code form, or in BUFR since some potential users may still wish to use the GTS as a source of data.

The GOSUD Project does not intend to manage any data extracted from the GTS. Instead there will be a monitoring function carried out to compare data appearing on the GTS to data received at the global server. This function will occur routinely, and will identify differences between the two data streams. Where data are found to appear on the GTS but not on the global server, the originators will be contacted and encouraged to become part of the Project. Where data appear on the global server but not the GTS, originators will be encouraged to also make the data available to the GTS so that traditional GTS users will have access to the data from this distribution system.

The global server will be the central hub of the Project. Its job will be to act as the archive for such data, and to interface to the World Data Centers, WDCs, that also hold historical underway data. The global server will provide data and products to users, and will work in collaboration with Project participants to monitor the state of the data system. The global server will verify the integrity of the data being provided, and will reconcile early data received with the same data received at a later time and with more extensive quality assurance procedures having been developed.

The linkage between the global server and the WDCs will be very important. The two parties will share the long term archive responsibilities to ensure the ongoing safekeeping of the data. They will also share the responsibilities of providing data and products from the start of the GOSUD Project but also into the historical past holdings.

It is very important for the global server to collaborate with one or more science centres in defining, developing and disseminating scientific products from the Project. It is through these products that the Project will be known and some of its success measured.

7.1.1 Volunteered Activities

a. Canada and France have undertaken to draft the Project Plan
b. Canada and France are co-chairing the planning meetings.

7.2 Real-time data assembly

The GOSUD Project will deal with data only from collection programmes where the data have proven to be reliable measures of the environment. Stated another way, the GOSUD Project will wait for the experimentation phase to end before attempting to accommodate data from new instruments. As the experimentation phase nears its end, it will be important to the GOSUD Project to begin discussions with the scientific community in order to make the necessary plans and changes to accommodate the new types of data. This is one of the reasons that a strong scientific participation is needed in the Project.

The responsibilities of the national participants include the following.

- Each participant in the GOSUD Project will be responsible for handling the data from platforms managed by their national programmes.
- Use the Project sanctioned scientific data sampling recommendations in designing and implementing their nationally operated programmes.
- Use the Project materials providing guidance on installing and operating underway instrumentation (see Annex 2 for references) including collection of physical samples and calibration techniques.
- Use Project guidelines for the reporting of data and information in data transmissions.
- Strive to meet the targets for timely reporting of data to the GTS and global server.
- Carry out Project sanctioned quality control procedures exactly.
- Encourage full national participation in the Project.
- As new data types are added to the Project, collaborate with data providers and scientists to include the data into the Project.
- Use the Project sanctioned data format for all data transfers within the Project.
- Use the ship notification process to alert platforms when data have problems identified by the Project.

The GOSUD Project Steering Group has the responsibility to ensure the following.

- Clear explanations are available for justifying the space and time resolution for data collection that is recommended for the Project
- Project standards are based on scientific arguments and no on current data collection or instrumentation technologies.
- All reference material for the Project is prepared and readily available to current and potential participants.
- Reference material is updated as required and that procedures needed for new data types are produced in a timely way.
- Develop a process to notify platforms when problems are noticed in data returned from them.
- Contact ocean and atmospheric modelers for advice on how they now use or could use underway data reported in real-time.

- Approach IODE, and JCOMM to assist in training (data management and instrumentation installation and maintenance) data contributors and group participants.

7.2.1 Volunteered Activities

Canada
a. MEDS intends to coordinate real-time underway data collected in Canada
France
a. Coriolis intends to coordinate real-time underway data collected by France

7.3 Delayed mode data assembly

Since there is expected to be a variety of data types handled by the project, including temperature, salinity, pCO_2, fluorescence, etc.) a variety of techniques will be required to ensure that the highest possible quality data are reported in the quickest time. Some variables can be reported very rapidly, such as surface temperatures, while others may require some degree of analysis before being available.

It is expected that calibration of instrumentation will, from time to time, cause corrections to be applied to data already reported to the Project. As well, comparisons of underway data to other kinds of data may cause further corrections. All of these are part of the normal process of analyzing data and will be accommodated by the Project.

The responsibilities of the national participants include the following.
- Carry out quality control procedures exactly as defined by the Project.
- Undertake calibration procedures and make appropriate corrections to data in order to improve the quality of the data.
- Ensure that all required metadata is included when data are sent to the global server.
- Use the Project sanctioned data format for all data transfers within the Project.
- As new data types are added to the Project, collaborate with data providers and scientists to include the data into the Project.
- Use the ship notification process to alert platforms when data have problems identified by the Project.

The GOSUD Project Steering Group has the responsibility to ensure the following.
- Clearly written quality control procedures are readily available to current and potential Project participants.
- Reference material is updated as required and that procedures needed for new data types are produced in a timely way.

7.3.1 Volunteered Activities

Canada
a. MEDS intends to archive underway data collected in Canada.

France
a. IRD intends to coordinate all delayed mode underway data collected by France

7.4 Archives and Processing

The main archive activities of the Project will be carried out by the global server working in collaboration with appropriate WDCs. The exact nature of this collaboration is not currently defined and will be one of the first activities that must be agreed to. In addition, it is expected that each national participants will

archive data from their country. This provides a backup to the WDCs, ensures national data are readily available nationally, and provides the reference copy of the data if questions arise.

Generally, the global server will be the point of reference for all queries for data. When questions arise that cannot be settled by the global server, they will be referred back to the appropriate national centre for resolution.

The responsibilities of national participants include the following.
- Archive nationally collected data and metadata in a form that is fully compatible with global server archives.
- Respond to questions concerning data sent to the global server.
- Data merging, and version control of data will be the responsibility of contributors. This must be done according to Project rules.

The responsibilities of the global server include the following.
- Maintain a centralized, web available data server.
- Accept data from national centres and ensure the data are safely archived.
- Verify that data submitted to the server meet format and quality checking requirements.
- Ensure that archived data retain all agreed on metadata for the Project.
- Collaborate with WDCs to ensure the long term safekeeping of the data and information.
- Data merging, and version control will be the responsibility of contributors.
- Ensure that data contributors are permitted to manipulate their own data only.
- Ensure that rules governing deletions, changes, etc. to data are met by contributors before actions are taken in the archives.

The responsibilities of the WDCs include the following.
- Collaborate with the global server to ensure the long term safekeeping of the data and information.

The GOSUD Project Steering Group has the responsibility to ensure the following.
- Assign a Working Group to decide the format for data transfers within the Project and to clients. The format must be designed to allow for expansion to include new variables as data collection systems develop.
- Implement a unique identifier that will be retained at all times with the data.
- Establish rules for data merging and version control.
- Establish procedures for deleting data, how to document changes, etc. These rules will need to be enforced by the GDAC.

7.4.1 Volunteered Activities

France
a. Coriolis will undertake the global server functions

7.5 Quality Control

Procedures for checking data quality will be developed and standardized by the Project. These procedures will be used by all participants and monitoring of their uniform application will be required to ensure consistency within the Project. The procedures will be based on scientific principles and therefore will be developed in cooperation with science centres.

The responsibilities of national participants include the following.
- QC process will be distributed and carried out by data contributors.

The GOSUD Project Steering Group has the responsibility to ensure the following.

- Write a QC Manual that defines what it means to be part of the Project and to which everyone agrees. This Manual needs to address the full range of variables to be included by the Project. It will be prepared in consultation with appropriate scientific advice.
- We will develop a process to notify ships when problems are found in the data. We expect that this will be the responsibility of data contributors since they are the ones doing QC.
- We will request the JCOMMOPS Technical Coordinator to help track underway data collected and resolve problems.

The responsibilities of science centres include the following.

- Provide advice and expertise in defining sampling strategy and developing appropriate quality control procedures

7.5.1 Volunteered Activities

France

a. IRD will write the QC manual for SSS and will conduct sampling strategy studies for the three tropical oceans

7.6 Duplicates Management

It is inevitable that a data system will need to design a process for handling duplicates. In other projects, duplications arise by acquiring all of the data circulating on the GTS. The GOSUD Project avoids this issue by using the GTS only as a way to monitor data collected, not as a source of data. Still, because of reprocessing of older data, calibrations, or other quality control processes, the same data will arrive at the data system.

The GOSUD Project intends to attach a unique identifier to all of the data that it handles and as early as possible after data collection. This identifier will be a part of the data record and will be carried everywhere both within the data system and when delivered to clients. The attributes of this identifier is that it can be generated with no central authority having to coordinate it, but will be guaranteed to be unique. As data reach the GOSUD Project the presence of an identifier will be checked and where it does not exist, will be assigned if the data are known to be the first submission. If the identifier does exist, the data have already been seen by the data system. In this case a simple matching of identifiers will permit a comparison of version contents.

The responsibilities of national participants include the following.

- Carry out the assignment of data identifiers as early as possible in the data collection process.
- Verify that data received are new to the data system, before assigning a unique identifier.
- Ensure that identifiers are carried and preserved in all data exchanges.
- A standardized product showing the incidence and type of errors detected that is issued to data collectors.

The GOSUD Project Steering Group has the responsibility to ensure the following.

- Design and document the process of assigning unique identifiers to underway data such that these can be used to find exact and near duplications reliably.
- Coordinate the development of a standard product to show errors in data and notification of the platforms.

7.6.1 Volunteered Activities

a. The GOSUD working group on formats will be addressing the problem of specifying a unique identifier for the data

7.7 Data and Products

Users will be offered both the data collected by the project and various products derived from the data. There are three kinds of products that will be offered.

Science related products, most of which will come from the science centres collaborating with the Project, will derived from the observations and portray scientific information derived from them. These will include such things as maps of surface fields, for example, or products that provide an integrated analysis of data derived from GOSUD and other projects or data sources, such as satellites. In figure 2 we see some samples that are available now and may be produced and routinely given wide distribution by the project.

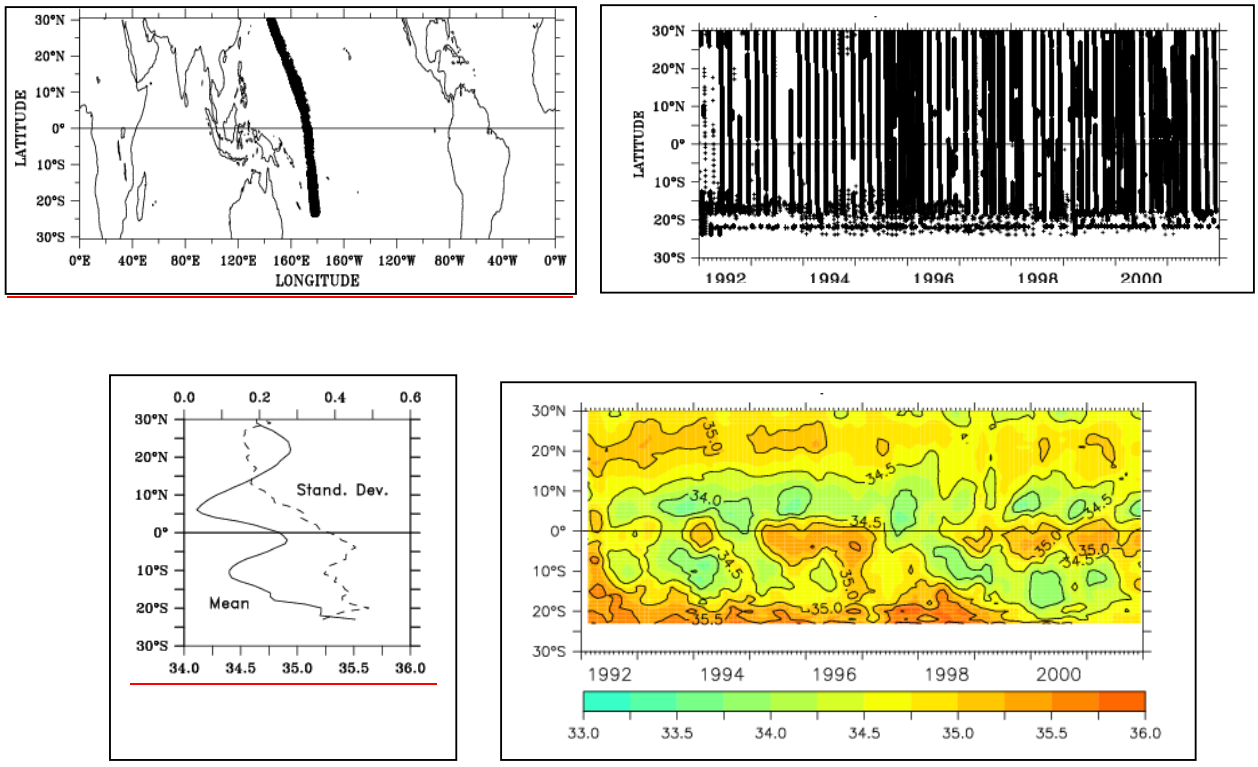


Figure 2. Example of four possible products derived from presently-existing underway SSS data collected between New Caledonia and Japan. *At top left: location of the ship track, (top right) latitude-time distribution of the measurements collected along the track during the 1992-2001 years, (bottom left) corresponding mean and standard deviation of SSS, (bottom, right) latitude-time variations of SSS evidencing the El Nino/La Nina signatures. (Courtesy T. Delcroix, IRD).*

Data related products are those that describe the characteristics of the data. This would include such things as distribution statistics, error rates detected, etc. Figure 3 illustrates one possible product.

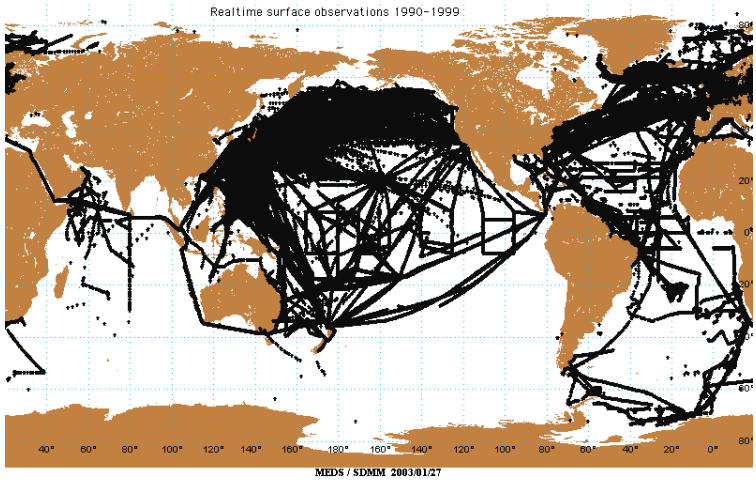


Figure 3: A map showing the locations of all real-time underway SST and SSS data from 1990 to 1999 which circulated in TRACKOB code form on the GTS.

Network related products will describe the state of the data system. It will report on such things as timeliness of reporting, for example.

The generation of these products will be coordinated by the Project Steering Group. Certain participants will be expected to be more likely to contribute one kind of product than another, but designation of having a certain product generated from a certain participant will not be proscribed. Some products that are useful to the Project are already generated and these groups will be approached to invite their participation.

The Project has the following guidelines for those issuing products.

- Products generated specifically for the Project should be labeled with a Project identifier.
- Products from all sources will be encouraged to begin with, and after some time, an evaluation process will take place.
- The Project will encourage scientific products to carry out analyses on 200 km by 10 day scales or at 100 km by 30 day scales.
- Each product should have a clear statement of what data contributed to the product. For example, if a surface salinity map is created, a statement of what is considered "surface" should accompany the product.
- Products that integrate data derived from this Project with data collected by other projects is encouraged.
- Products to show the complimentarity of data collected by this Project with data collected by other projects are encouraged.

The responsibilities of national participants include the following.

- Compile a list of publications that discuss analyses of data collected by the Project
- Create products as appropriate, most likely in the classes of data and network related.
- Ensure products meet the guidelines listed above.
- Contribute as appropriate to the GOSUD Project annual reports.

The GOSUD Project Steering Group has the responsibility to ensure the following.

- There is a review of products issued to determine the most effective ones and areas where products are missing.
- The GOSUD Project suite of products are represented at the upcoming review of the JCOMM Electronic Products Bulletin.
- Annual reports are issued to describe the state of progress of the Project in meeting its objectives.

- A Project website is created and has material such as the Project Plan, lists of participants, links to products, data and documentation, etc.
- Establish connections to other projects to investigate the degree of integration that can be achieved in providing data and products to clients.

The responsibilities of science centres include the following.
- Create products as appropriate, most likely in the class of science related.
- Ensure products meet the guidelines listed above.
- Contribute as appropriate to the GOSUD Project annual reports.

7.7.1 Volunteered Activities

France:
a. IFREMER has a project website. See http://www.ifremer.fr/sismer/program/gosud
b. IFREMER has set up project mailing lists
   General discussions: gosud@ifremer.fr
   DM and formats: gosud-format@ifremer.fr
c. IRD has a website to distribute delayed-mode underway data collected by France in the tropical Pacific. It intends to distribute French-managed data for the global ocean.

7.8 Monitoring and Feedback

A GTS monitoring facility will acquire data circulating on the GTS and compare with data found on the global server. The purpose of this facility is to identify potential participants for the Project, and to encourage participants to insert data onto the GTS for distribution.

The responsibilities of the GTS monitoring facility include the following.
- Establish a connection to the GTS and acquire all underway data reported in TRACKOB or BUFR code forms.
- Identify platforms reporting data on the GTS but which are not reporting data to the global server.
- Contact platforms reporting data solely to the GTS and seek their participation in the GOSUD Project.
- Identify platforms reporting data to the global server but which are not reporting data on the GTS.
- Contact platforms reporting data solely to the global server and encourage them to send data to the GTS as well.
- Produce regular reports of activities.

Other monitoring will be required within the Project to be sure the data system is performing up to its potential and meeting its goals. Some of this will be carried out yearly in the form of an annual report. In other cases, more frequent monitoring will be required.

The responsibilities of national participants include the following.
- Contribute as appropriate to the GOSUD Project annual reports.
- Carry out appropriate monitoring activities as decided by the Steering Group and can be accommodated.

The GOSUD Project Steering Group has the responsibility to ensure the following.
- Annual reports are issued to describe the state of progress of the Project in meeting its objectives.
- Establish a set of monitoring reports that are needed to ensure the GOSUD Project is meeting its goals and find participants to generate these reports.

The responsibilities of science centres include the following.
- Contribute as appropriate to the GOSUD Project annual reports.
- Carry out appropriate monitoring activities as decided by the Steering Group and can be accommodated.

7.8.1 Volunteered Activities

Canada

a. MEDS will undertake the GTS monitoring facility functions.

8. Cooperation with Other Programmes

There are a number of international programmes currently operating and in planning to collect data that will complement data collected by the GOSUD Project. This includes such programmes as the Global Temperature Salinity Profile Program, the Global Ocean Data and Rescue Project, and Argo. In this case, the surface data collected by the GOSUD Project will fill in surface details or variables that compliment the profile data of these projects. There are other programmes or experiments, such as CLIVAR and GODAE, where the collection of surface underway data may be an important component and the GOSUD Project can provide the data management infrastructure. There are satellite programmes under development to measure surface salinity from space. The along-track ship-derived salinity data managed by GOSUD will be of direct benefit in the calibration and evaluation of these sensors, which in turn will enable creation of basin-scale SSS fields obtained from optimally-combined in situ and satellite-derived data. Finally, such broad programmes as the Joint Commission on Oceanography and Marine Meteorology, the Global Ocean Observing System and the World Data Centre system require data systems to manage this kind of data.

8.1 WDC's and Other International Data Centers

The World Data Centre system of the WCRP and other international data centres, such as at ICES, are not governed by IODE, but they have strong connections with the organization and the projects supported by IODE. At present there is no organized management of underway data at the international level, hence the impetus for this Project. It is crucial for the GOSUD Project to develop a strong, working collaboration with these international data centres, so that the data they hold and the data acquired by the Project are unified in their treatment. It is certain that a client seeking data or information will not want to visit many agencies and find multiple copies and versions of the data.

8.2 JCOMM

The Joint Commission on Oceanography and Marine Meteorology (JCOMM) was formed from the joint IOC / WMO IGOSS programme and the WMO Commission on Marine Meteorology. JCOMM's responsibility is to foster improvements in the collection, processing and distribution of data collected at sea. The GOSUD Project is a product of IODE, but clearly has elements that are of direct interest to JCOMM. The GOSUD Project Steering Group and IODE will need to be sure there is close cooperation with JCOMM committees, especially since much of the underway data will be collected by platforms that are part of the Ship Observations Team Programme Area of JCOMM. Likewise, the management of the data system will have important links to make with the Data Management Programme Area of JCOMM.

8.3 GODAE - Argo – GTSPP

The Global Ocean Data Assimilation Experiment (GODAE) is an initiative to include real-time ocean observations into weather and climate prediction models. The Argo programme is a sub-programme of GODAE concerned with providing a global collection of temperature and salinity profiles on time and

space scales required by GODAE. The GTSPP is a joint IOC/WMO programme managing profile data collected by platforms at sea.

GODAE requires data both from profiles and from surface measurements. At the moment, surface SST data will be provided by satellites and in-situ platforms. Surface salinity data are very sparse and although both GTSPP and Argo have some near-surface measurement capability, there will still be a serious lack of surface salinity measurements. This is one area where the GOSUD Project will complement the profile measurements and provide more and better quality data to GODAE. Because the GOSUD Project is not restricted to temperature and salinity measurements, it can also contribute other surface measurements, such as chlorophyll, pCO_2, etc. as these variables are included in the GOSUD Project data stream.

In the longer term, the GOSUD Project is expected to contribute ideas in handling data collected in this mode of operation. It will contribute to the easier combination of ocean underway data with standard meteorological measurements that are now available. In addition it will provide valuable surface truth data for satellite systems measuring surface variables.

8.4 GOOS

The Global Ocean Observing System is responsible for the development of future ocean observing systems that will address issues including climate change and prediction, health of the oceans, marine living resources, the coastal zone, and ocean services. The Intergovernmental Committee for the Global Ocean Observing System (I-GOOS) co-ordinates member states efforts for establishing GOOS. The Joint Scientific and Technical Committee for GOOS (J-GOOS) is the body that supplies scientific and technical expertise to the development of the observing systems. The intention is that the data collection and management aspects of GOOS be built on the existing systems of JCOMM, IODE, GLOSS, DPCP, and others. Thus GOOS is a client for the GOSUD Project.

8.5 CLIVAR

The Climate Variability, CLIVAR, is a 15-year programme to study climate variability and predictability. It is the primary WCRP programme for the study of the role of the ocean in the coupled climate system. It can be regarded as a programme that builds on the knowledge gained through TOGA, WOCE, and the 1995 study of anthropogenic effects on climate change that was carried out by the Intergovernmental Panel on Climate Change.

CLIVAR anticipates that the IOC and WMO and their subsidiary bodies will work together to codify and monitor the standards for making, processing and archiving environmental observations for operational needs in the terrestrial, marine, and cryospheric environments. This will lead to the maintenance and continued growth of a reliable global climate record. CLIVAR also anticipates that IOC and WMO will institute and maintain an international infrastructure for encouraging, assisting and coordinating individual nations contributing to the deployment and maintenance of operational observing systems.

To serve CLIVAR's needs these data must be provided in a timely fashion. It is also important to ensure that as much data as possible that are collected by observing systems deployed for research purposes are inserted expeditiously into the operational data processing and archiving streams.

The GOSUD Project will be managing data that will be of direct importance to CLIVAR. As such, it will be in a strong position to fulfill the data system functions required by CLIVAR for these kinds of underway measurements. It will be important for the GOSUD Steering Group to contact CLIVAR to demonstrate the willingness to offer this function and to adjust its operations to better suit CLIVAR requirements.

References

The Sixth OOPC Session, Melbourne, Australia, 2-5 May 2001. GCOS Report No. 70, GOOS Report No. 113, WCRP Report No. 26/01.

IODE Steering Group for Underway Sea Surface Salinity Data Pilot Project. First Session Brest, France, 15-16 November 2001. Intergovernmental Oceanographic Commission, Reports of Meetings of Experts and Equivalent Bodies.

IODE Steering Group for Global Ocean Surface Underway Data Pilot Project (SG-GOSUD) Second Session Ottawa, Canada, 16-17 September 2002. Intergovernmental Oceanographic Commission, Reports of Meetings of Experts and Equivalent Bodies.

Annex 1: Terms of Reference of the GOSUD Steering Group

(i) Begin the development of the GOSUD Pilot Project and implementation following the principles described in the current draft.
(ii) Develop standards for the GOSUD Pilot Project including standards for metadata content, quality control and formats.
(iii) Meet annually at the expense of the participating countries to review the status of the implementation and further develop the GOSUD.
(iv) Actively promote the GOSUD and provide information to the users of GOSUD services, such as the planners of international science programmes.
(v) Provide scientific and technical guidance to GOSUD participants in the implementation and further development of the scientific and data management aspects of the project elements including:

a) real-time and delayed mode data acquisition
b) communications infrastructures
d) quality control procedures
e) global data servers
f) GOSUD information products

(vi) Prepare, maintain and distribute documentation relevant to operation of the project.
(vii) Report after each meeting and as otherwise necessary to keep all IODE and other contacts, as well as the representatives of the science programmes, informed on the status of implementation of the GOSUD.
(viii) Submit annual status reports on the GOSUD to the sessions of the Committee on IODE and other programmes as appropriate

The group will select a Chairman at its first session and will review the Chairmanship and group composition annually.

Annex 2: Reference Material of GOSUD

1. TSG Installation and Maintenance Guide
2. Recommendations on sampling strategies for underway salinity measurements.
3. ICES Guidelines on the collection of TSG data.