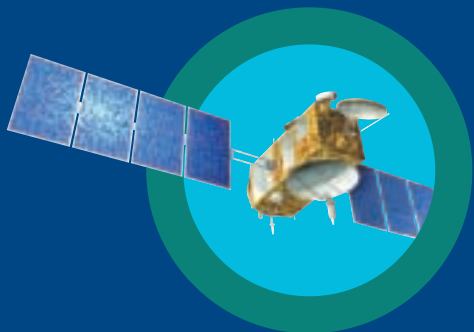


# MERCATOR working for operational oceanography

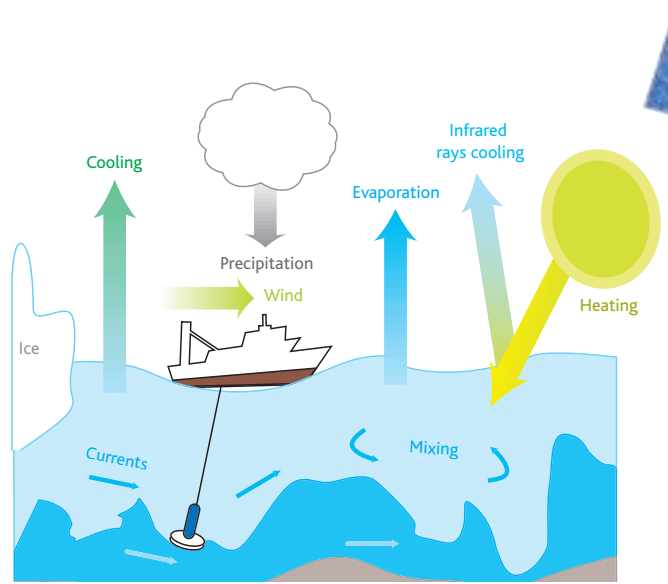


**blue** like our planet, with 70 per cent of ocean covering its surface. Earth's precious life-sustaining climate relies on a delicate balance between air, land, sea and the biosphere—a complex system whose inner workings we still do not fully understand.

**What we do know** is that the ocean plays a central role in shaping climate. So observing, understanding and predicting its variations are key priorities for protecting our planet. This is the main aim driving operational oceanography, which seeks to develop the capability to **describe and predict the ocean in four dimensions, anywhere and anytime.**

**France's MERCATOR project is rising to the challenge.** Six French organizations are teamed together on the project—CNES, CNRS, IFREMER, IRD, Météo France, and SHOM, supported by subsidiaries CERFACS and CLS.

The first tangible signs that we have entered a new era in oceanography are the MERCATOR ocean bulletins that are now finding uses in our daily lives.



### A new insight onto the Atlantic

Since the first MERCATOR bulletin went out on 17 January 2001, more than 800 new maps describing the North and Tropical Atlantic have helped scientists to track ocean from the coast of Brazil to France's north-west Brittany coast, from the sea surface to the ocean floor. The precious data in these bulletins are easily accessible on the MERCATOR website at

[www.mercator.com.fr](http://www.mercator.com.fr)

Today, easy access to information about ocean conditions is at our fingertips.

### MERCATOR working for the planet

... for science, seafarers, coastal protection, and climate research

MERCATOR routinely describes and forecasts changing ocean conditions by running predictive models that work on the same principle used successfully by meteorological models to forecast atmospheric conditions.

Initial project results have confirmed the huge possibilities of ocean forecasting. Operational oceanography has truly come of age.

“The Earth is blue like an orange”

Paul Eluart

## Operational products for all

Seafarers are naturally the first to appreciate the benefits of being able to predict the ocean's changing moods.

### Navy

Acoustic environment data to support strategic naval forces.



### Research

Real-time support for *in-situ* measurement during sea-experiments.



### Navigation

Optimized routing for shipping.



### Oil rig operations

Support for planning sea operations.



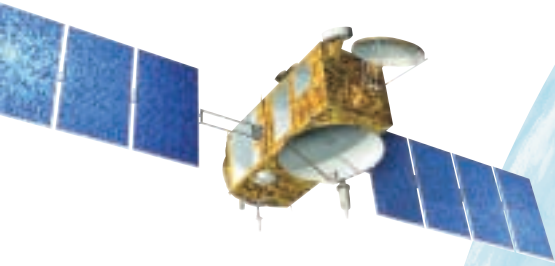
Sea surface topography  
25/04/2001

MERCATOR is also a superb tool for **scientists** trying to unlock the secrets of the ocean's underlying mechanisms.

And its range of applications is broadening all the time. Coupled with littoral and coastal models, MERCATOR makes it possible to obtain a reliable description of **local** ocean conditions; coupled with global atmospheric models, it allows us to forecast the weather at **seasonal** and **climatic** timescales.

# How the MERCATOR

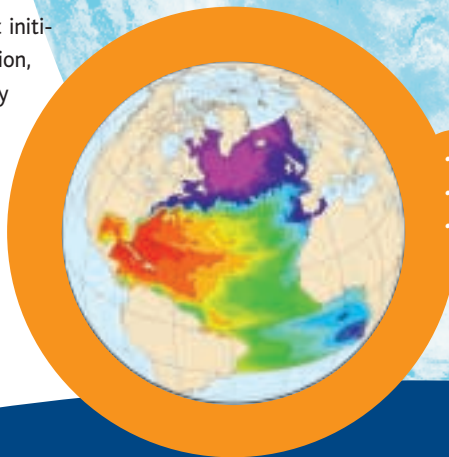
From the Atlantic...



## 2001

**First MERCATOR prototype**  
First "real-time routine" bulletin

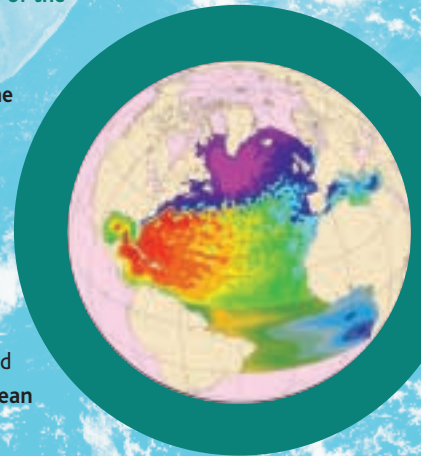
The first phase of the project initiated real-time data acquisition, yielding systematic weekly analyses and forecasts for the North and Tropical Atlantic. Resolution is  $1/3^\circ$ . All observation data covering oceans around the globe are acquired in real time. MERCATOR is up and running.



## 2002

**Second MERCATOR prototype**  
First "very-high-resolution" bulletin  
First low-resolution analyses of the global ocean

The second phase will refine model resolution, taking it to  $1/15^\circ$  (five to seven kilometres), and extend coverage to the Mediterranean. Routine low-resolution analyses of the global ocean will be produced by combining satellite altimetry and *in-situ* data and by running a first global ocean model.



- January 17: 1<sup>st</sup> MERCATOR bulletin
- Launch of Jason-1 satellite
- Launch of ENVISAT satellite

## Input data

Initial input data for the MERCATOR system are acquired from satellite-based and *in-situ* observations. Two dedicated gateways collect and validate these data before feeding them into MERCATOR: SSALTO/DUACS for altimetry data (from the Jason-1 and EnviSat satellites) and CORIOLIS for *in-situ* data. With MERCATOR, these two gateways form the backbone [foundation, basis for] of operational oceanography.

## Assimilation and modelling

Modelling and data assimilation form the basis of the analysis and prediction system, which employs the best numerical algorithms devised by the project's research team partners. The model's geographic coverage, horizontal grid resolution and assimilation techniques for integrating new observation data will continue to be enhanced through 2001 to 2003.

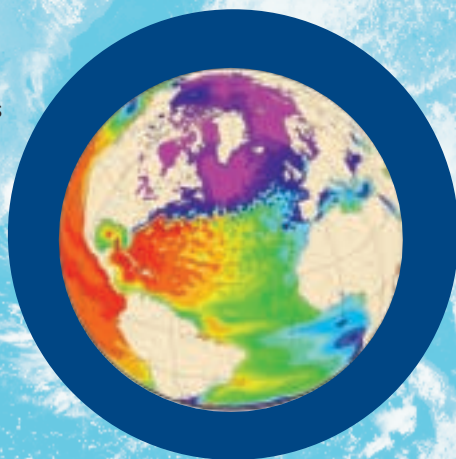
# OR system works

... to an operational forecasting system covering the global ocean

## 2003

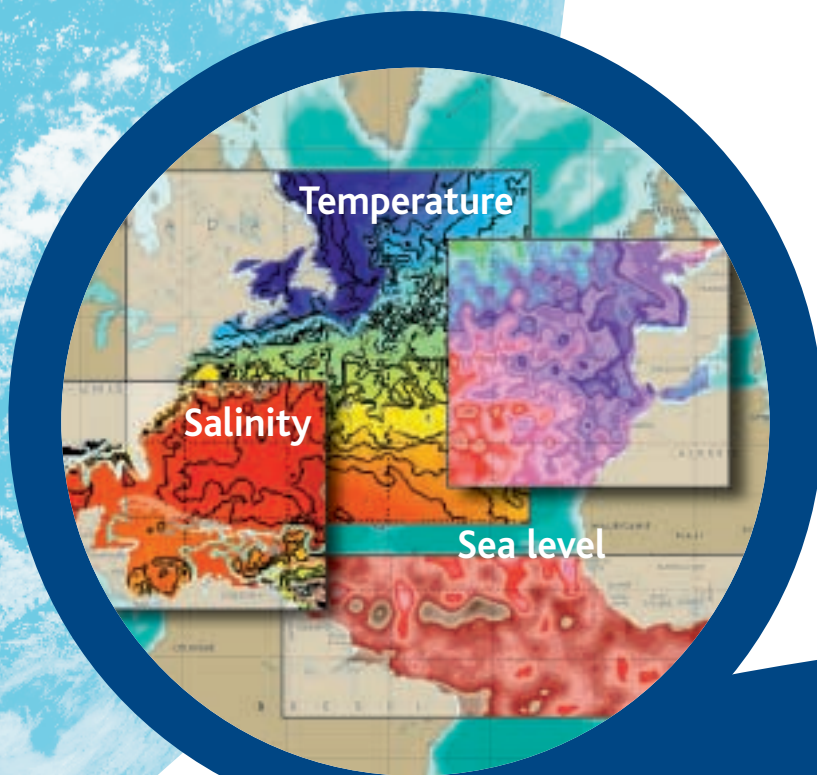
**Third MERCATOR prototype**  
First complete bulletin for GODAE

The third phase will enhance analysis and prediction capability by running a global ocean model at 1/4°. MERCATOR will deliver a complete bulletin and be ready for the start of the large-scale international GODAE experiment.



## 2005

**GODAE report**  
Consolidation of operational systems



## Validation

Scientific and technical validation guarantees the quality of MERCATOR products all along the processing chain.

## Products

MERCATOR bulletins comprise a set of products that can be accessed in real time on the project website at <http://www.mercator.com.fr>. These maps give a detailed picture of ocean conditions. Digital products suited for downstream applications can be ordered through a catalogue.

2003 will mark the **start of GODAE** (Global Ocean Data Assimilation Experiment), the first full-scale, international operational oceanography experiment of its kind. GODAE's objective is to demonstrate that the global ocean can be observed, modelled and predicted in three dimensions, in real time and on a routine basis.

Ten teams around the world are working on this experiment to set up the ocean forecasting systems that will be used routinely to map the ocean from top to bottom, in every dimension. **MERCATOR is France's contribution to this unprecedented initiative.**

National and international agencies are deploying ocean-observing networks in support of GODAE. Data acquired by these networks will be distributed to all GODAE data centers. **In France, the Jason-1 satellite altimetry programme and the Coriolis *in-situ* measurement programme are directly involved.**

Preparations for GODAE are already creating the structures to accommodate the truly operational oceanography systems of the future.

## Glossaire

**ARGO:** Array for Real-time Geostrophic Oceanography

**CERFACS:** Centre Européen de Recherche et de Formation Avancée en Calcul Scientifique  
(European Centre for Research and Advanced Training in Scientific Computation)

**CLS:** Collecte Localisation Satellites

**CNES:** Centre National d'Etudes Spatiales  
(French space agency)

**CNRS:** Centre National de la Recherche Scientifique  
(French national scientific research centre)

**DUACS:** Developing Use of Altimetry for Climate Studies

**ENVISAT:** ENVironmental SATellite

**GODAE:** Global Ocean Data Assimilation Experiment

**IFREMER:** Institut Français de Recherche et d'Exploitation de la MER  
(French institute of marine research and exploration)

**IRD:** Institut de Recherche pour le Développement  
(French development research institute)

**SHOM:** Service Hydrographique et Océanographique de la Marine  
(French Navy's hydrography & oceanography department)

**SSALTO:** Segment Sol multi-mission d'ALTimétrie, d'Orbitographie et de localisation précise  
(SSALTO multi-mission ground segment)

## MERCATOR contacts

Project manager  
**Pierre BAHUREL**

MERCATOR, GRGS/LEGOS/SHOM  
18 avenue Edouard Belin  
31401 Toulouse Cedex 4  
France

Phone: +33 5 61 33 29 14

Fax: +33 5 61 33 29 16

Email: Pierre.Bahurel@mercator.com.fr

<http://www.mercator.com.fr>

