SHOM
L'océan à la carte

MINISTÈRE
DE LA DÉFENSE

Liberté • Égalité • Fraternité
RÉPUBLIQUE FRANÇAISE

GAP 2014 & PHYSINDIEN 2014

"...much more than nautical charts...".

GAP 2014 & PHYSINDIEN 2014

2 sea-trials *from March to May*
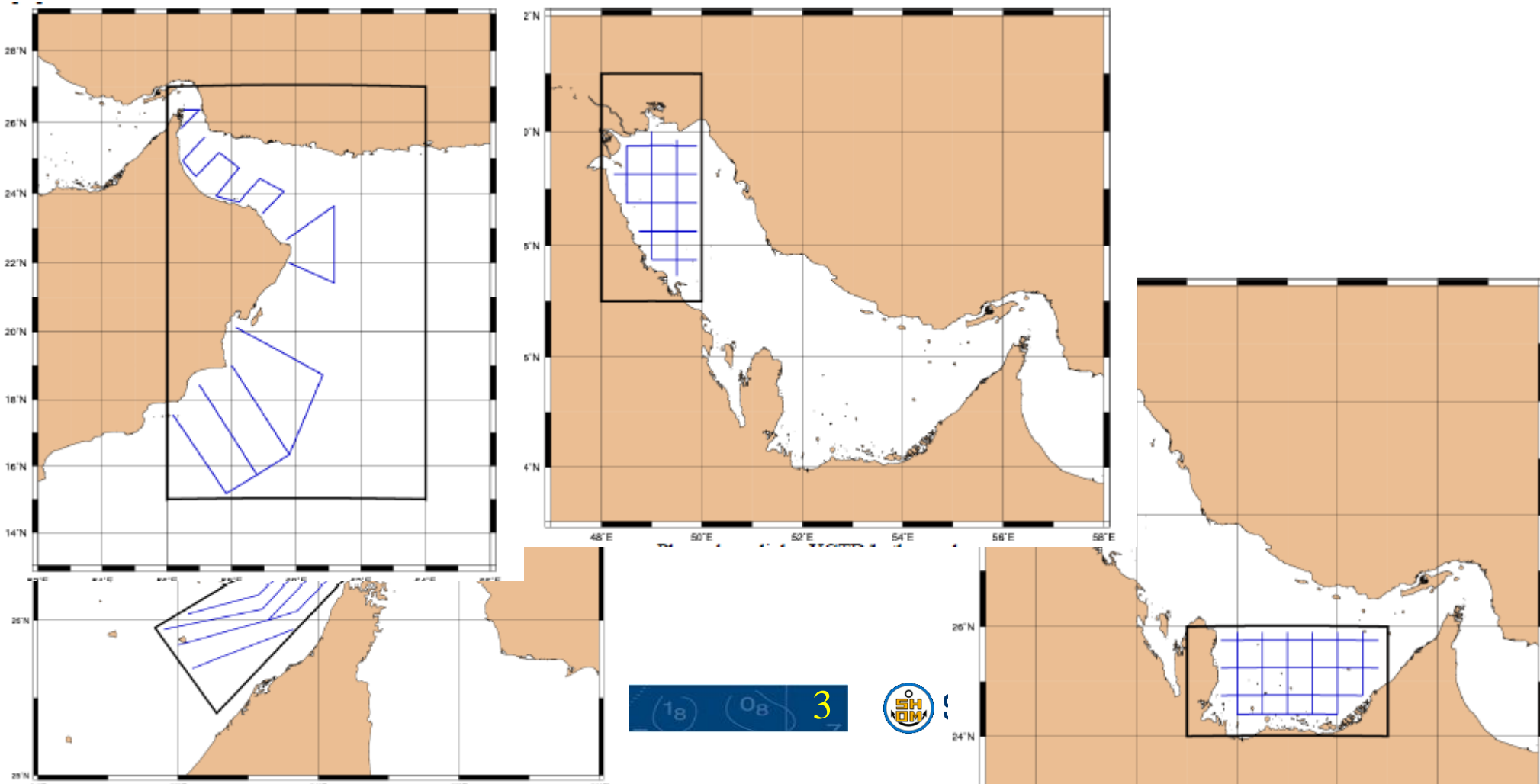
PHYSINDIEN'14 :
- **Oceanographic sea-trial**
- **2 legs :**
  - **Leg 1: March - Arabian sea – Gulf of Oman - Strait of Hormuz**
  - **Leg 2: May - the Gulf**

GAP'14 :
Hydrographic sea-trial – *April / May* – the Gulf

GAP 2014 & PHYSINDIEN 2014

UNCLOS Marine Scientific Request prepared in June 2013
Sent in July 2013 through diplomatic channels to:
Iraq, Iran, Koweit, KSA,Qatar, Sultanate of Oman, UAE

Surveys by hydrographic and oceanographic vessel
Beautemps-Beaupré

Scientific equipments

GAP 2014 & PHYSINDIEN 2014

➢ Description of the instrumentation

| Type of data collected	Acquisition type	Systems
Bathymetry	Along shiptrack	Multibeam and singlebeam echo sounders
Geophysical measurements	Along shiptrack or on land	Sea gravimeter Portable land gravimeter Magnetometer
Sedimentology	Along shiptrack or station	Sub-bottom profiler Sediment sampling device Divers
Current measurements	Along shiptrack or moorings	ADCP 38 and 150 kHz Current profiler

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➢ Description of the instrumentation

Type of data collected	Acquisition type	Systems
Tide	Moorings	Pressure tide gauges
Hydrology	Along shiptrack or on land	Expandable bathytermographs Sound velocity profiler Hull mounted celerimeter Thermosalinometer CTD-LADCP probe
Weather measurements	Along shiptrack or on land	Onboard weather station Weather station to measure atmospheric pression
Geodesy	On land	Topography

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GAP-2014 - Objectives

Bathymetry for safety of navigation

**Main assets : Multibeam echo sounders / side-scan sonars**
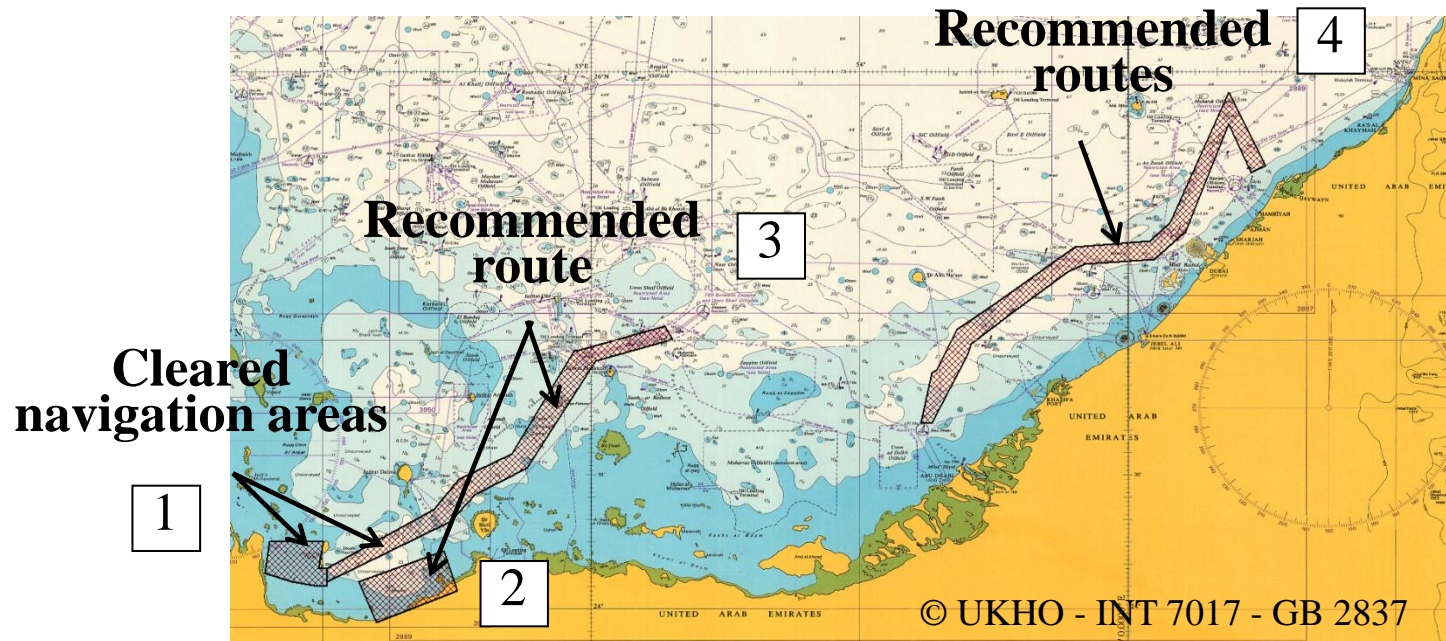
GAP-2014 - Deliverables

➢ *Cruise report to UAE within 6 months after the end of the sea-trial*
➢ *Processed hydro-oceanographic data on numerical storage devices*
  ➢ *Raw / Intermediate processed data immediately at the end of the sea trial*
  ➢ *Processed data not later than one year after the sea-trial*

➢ Relevant maritime safety information for publication into Notice to mariners to the primary charting authority designated by UAE (UKHO?)

© UKHO - INT 7017 - GB 2837

PHYSINDIEN 2014 - Objectives
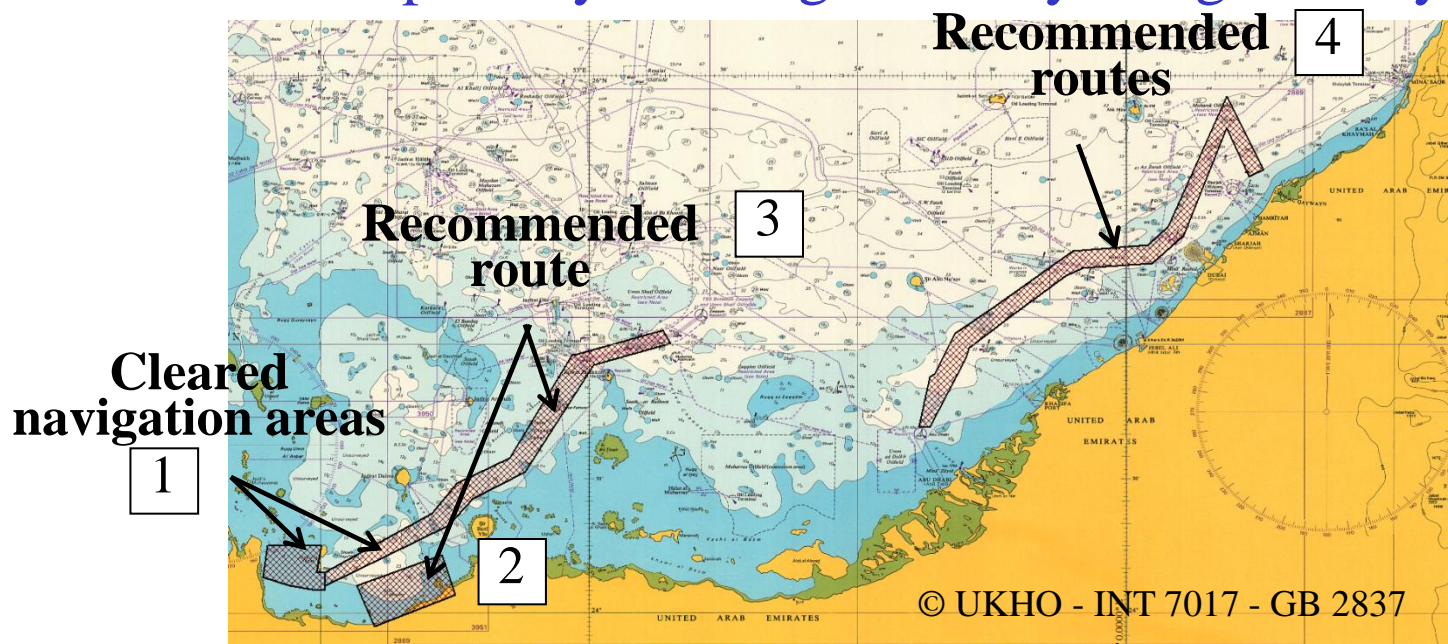
Ocean modelling, development and *validation* ***of an oceanographic forecasting system for the NW Indian ocean***
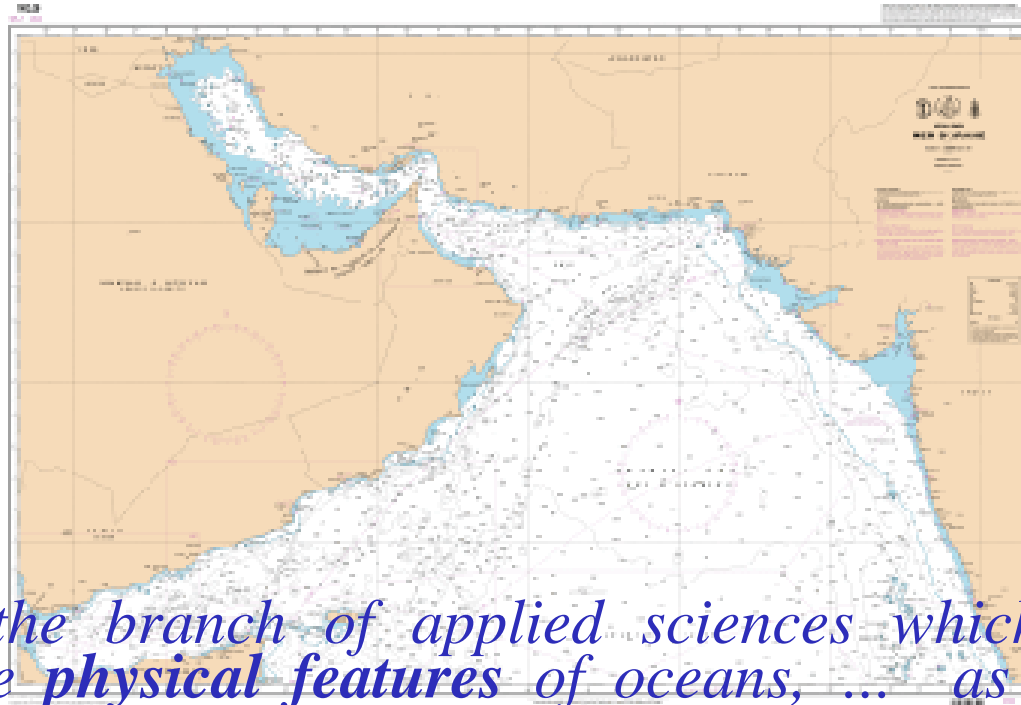
"**Hydrography** *is the branch of applied sciences which deals with the ...description of the* **physical features** *of oceans, ... as well as with the* **prediction of their change** *over time, ...in support of all other marine activities, including* **economic development, security and defence, scientific research, and environmental protection**".

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On going developments on the Indian ocean forecasting model

The HYCOM choice

HYbrid Coordinate Ocean Model

HYCOM is developed by an important international consortium :

- ✓ USA : NRL, RSMAS (Miami), COAPS (Tallahassee), NOAA,

- ✓ Europe : NERSC (Norway), DMI (Denmark), IH (Portugal), SHOM.
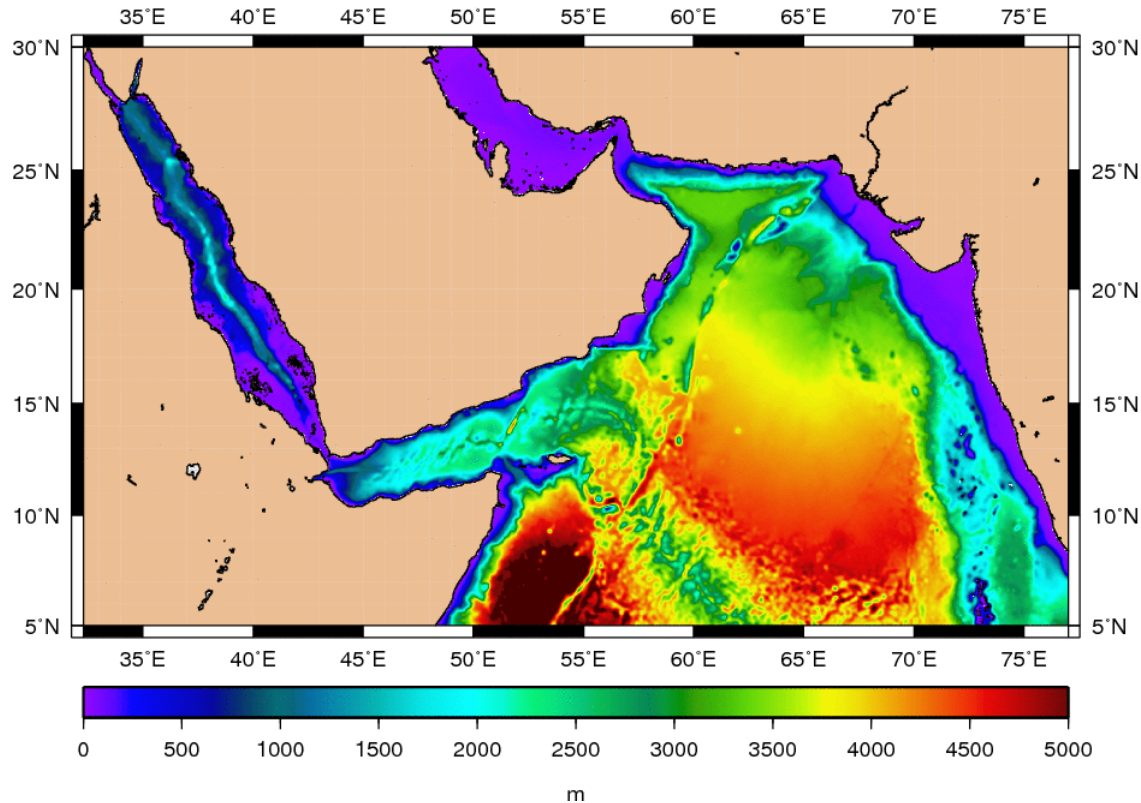
HYCOM is particularly adapted to :

- ✓ strong bathymetric gradients,

- ✓ strong density gradients.

HY COM

HYbrid
Coordinate
Ocean Model

On going developments on the Indian ocean forecasting model

Horizontal resolution: **5 km**   Vertical resolution: **40 layers**

Bathymetry (GEBCO and a few SHOM data)

Instantaneous outputs

For each parameter, user can choose the temporal frequency and the area of the output

PHYSINDIEN 2014 - Objectives

Ocean processes :

✓ Mesoscale (~10 km) circulation,

✓ Mixing layer dynamics,

✓ Deep outflows and surface inflows (Red Sea and the Gulf),

✓ Up wellings,

✓ High density water formation (the Gulf),

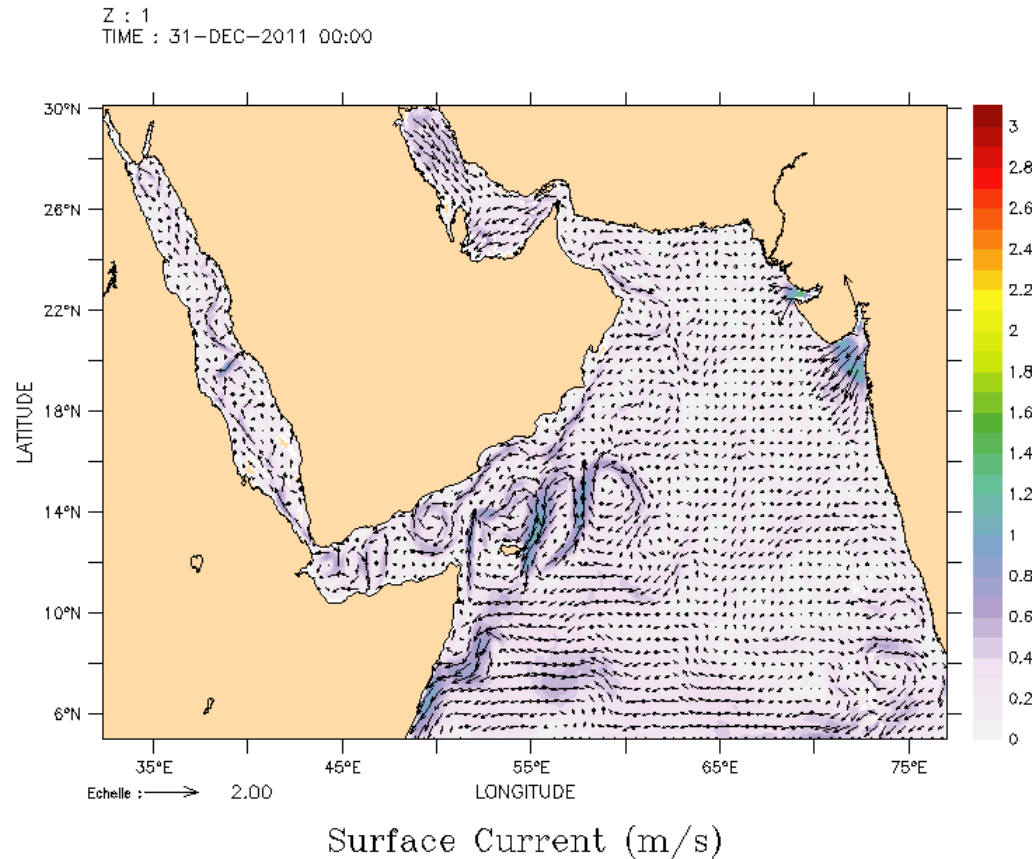✓ Thermal fronts.
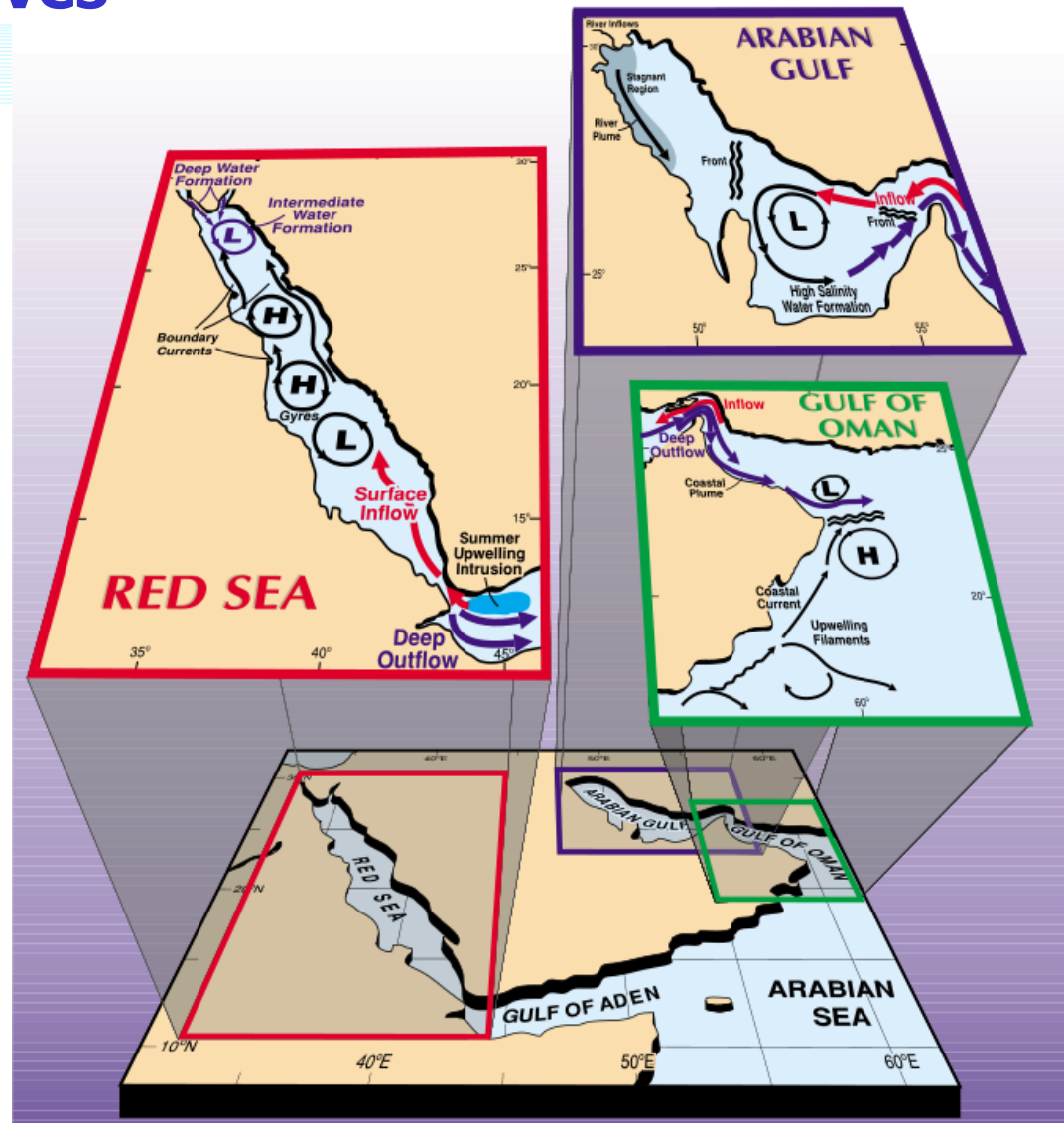
Arabian Marginal Seas and Gulfs - Report 1999

First outputs of the Indian ocean forecasting model

Sea surface temperature temporal evolution (a picture / day)

Sea Surface Temperature (deg C)
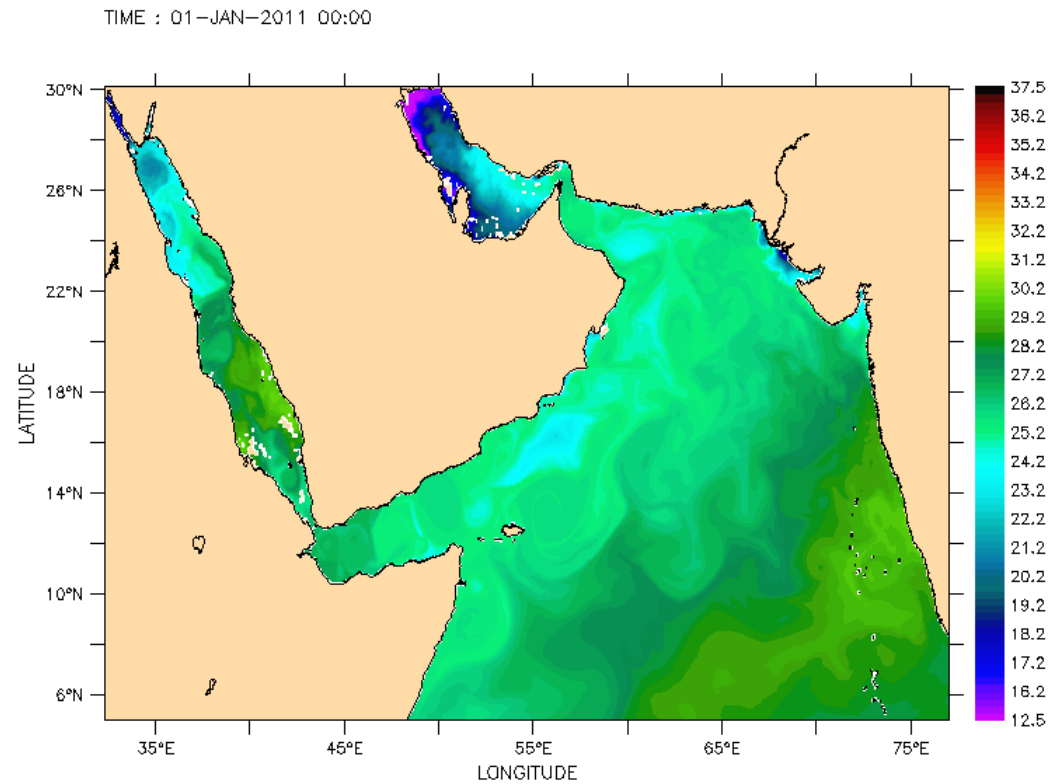
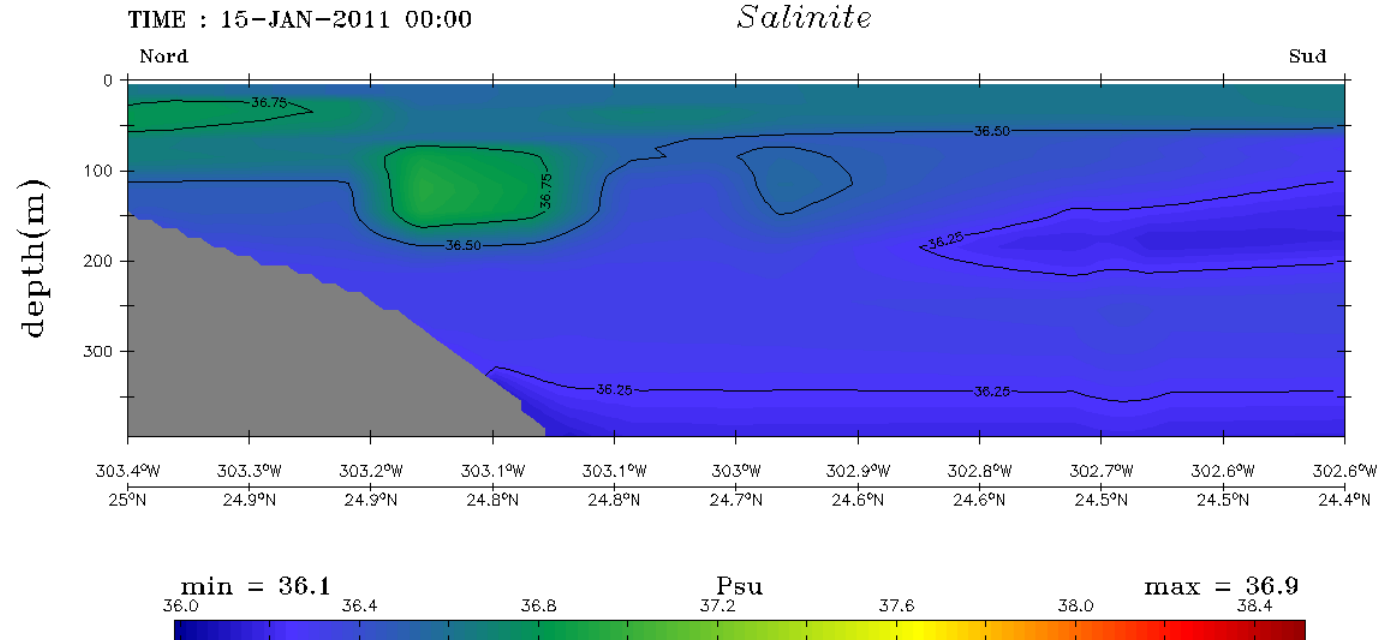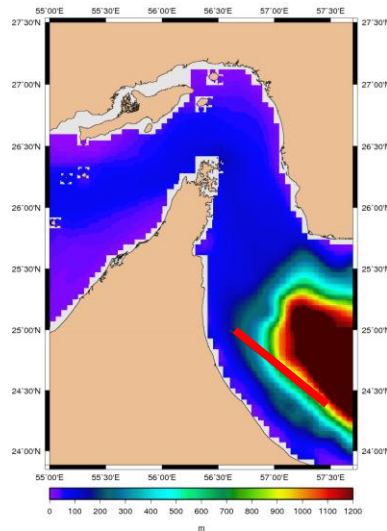## First outputs of the Indian ocean forecasting model

Sea surface current temporal evolution (a picture / day)

First outputs of the Indian ocean forecasting model
The Gulf water outflow

Salinity temporal evolution (a picture / day) along a vertical section in the Oman Gulf from the 2011/01/15 to the 2011/12/11
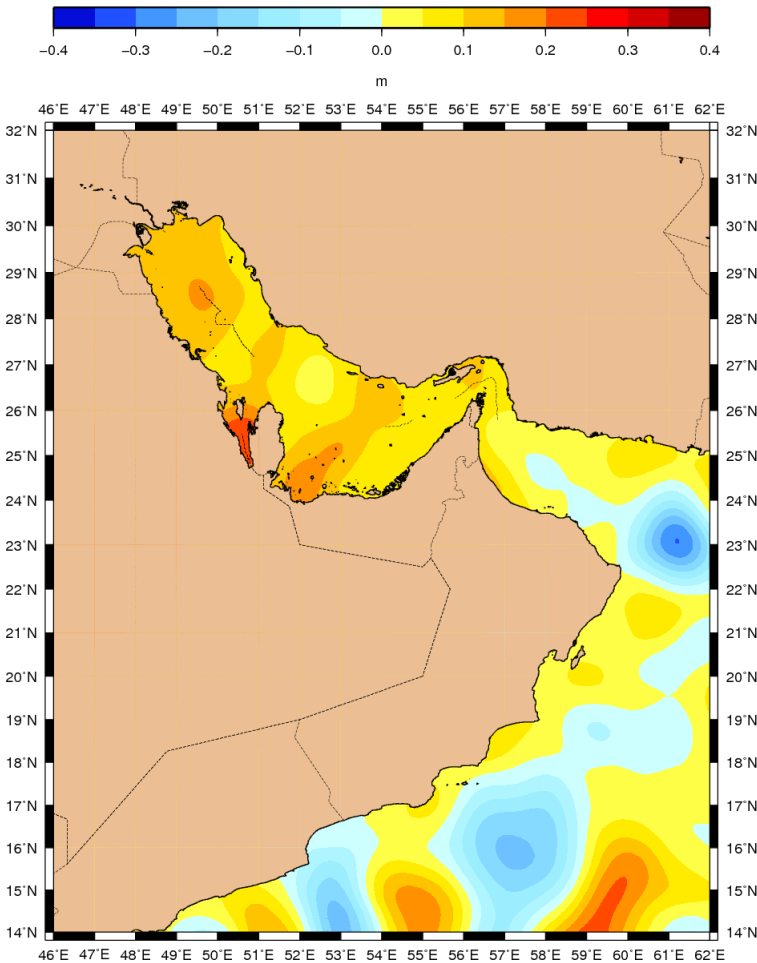
Model validation

To validate and improve the Indian ocean forecasting model, assessment and analysis based on a direct comparison between model outputs and field observations are required
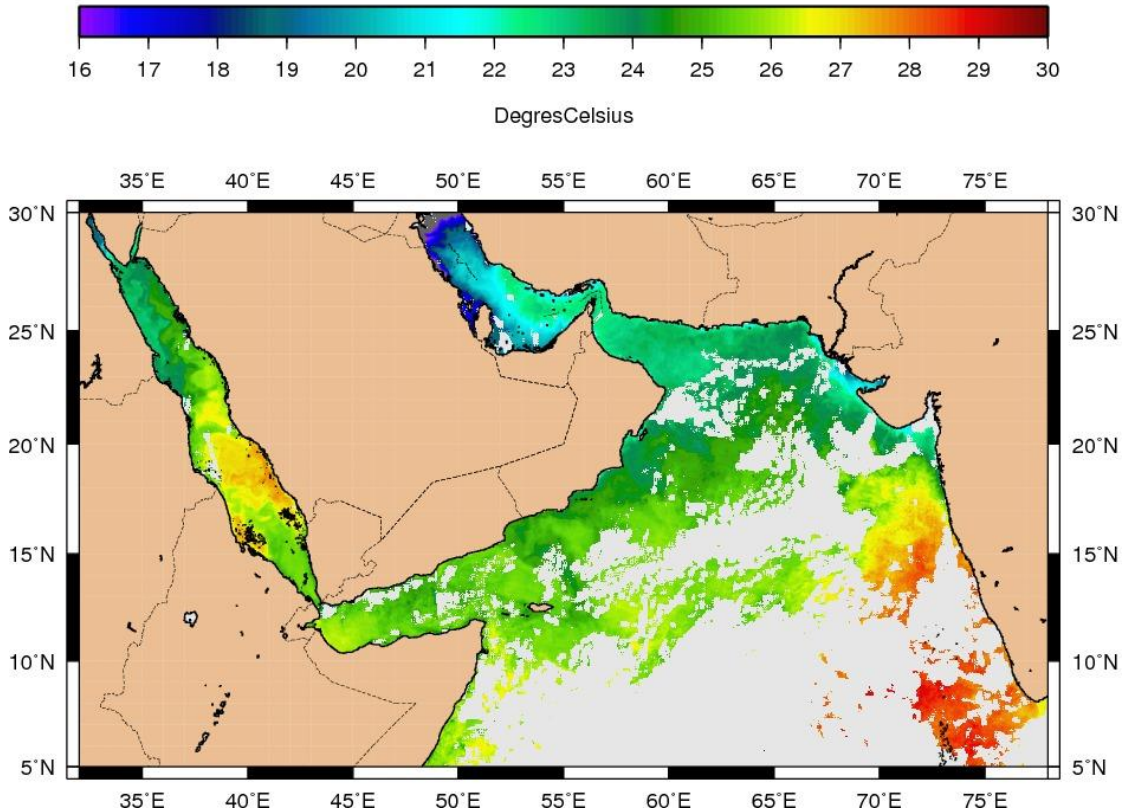
This validation is made using :

✓ satellite data ⟶ surface data

✓ in-situ data ⟶ data over the whole water column
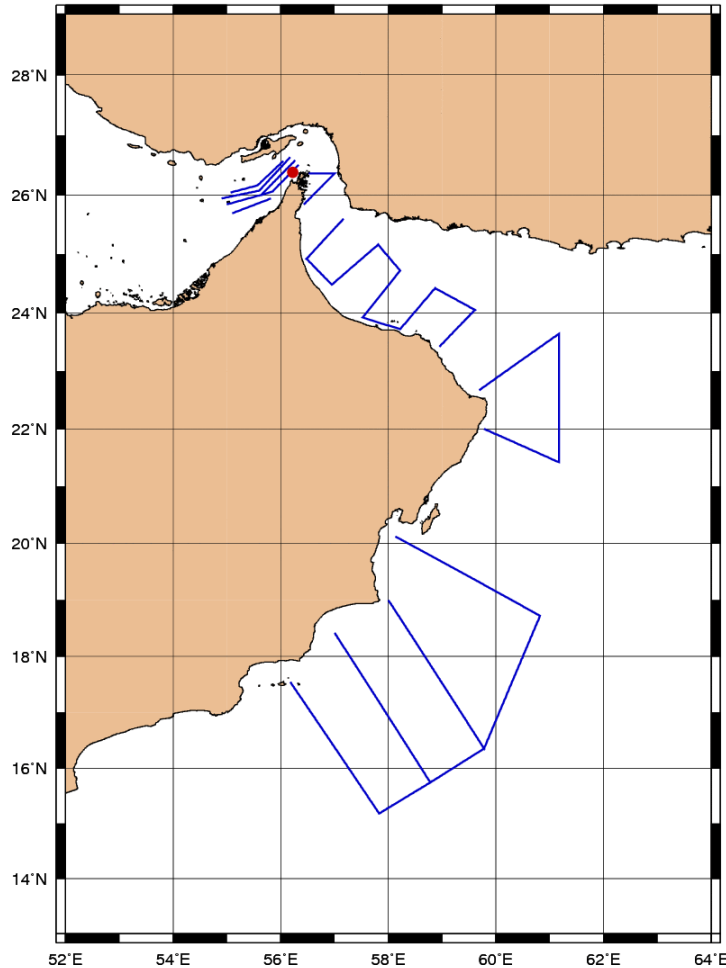
Model validation – Satellite data

Sea level anomaly 131115

SST OSI–SAF METOP02 du 2014/01/17 00:00 TU

Model validation – In-situ data
Research oceanic cruises

March 2013 programme of work:

→ To carry out current and hydrology measurements along the Oman coast, in the Oman gulf and in the Strait of Hormuz to study mesoscale dynamics and the Gulf water outflow

Model validation – In-situ data

Research oceanic cruises

The cruise consists of a network of measurements using various sensors :

- ✓ Current: ADCP (Acoustic Doppler Current Profiler)

  - Vessel Mounted-ADCP (150 kHz and **38 kHz**),
  - Lower-ADCP (300 kHz),
  - **ADCP mooring (470 kHz),** 056°13,5' E ; 26°22,8' N
  - **Drifting buoys**.

- ✓ Hydrological: CTD (Conductivity Temperature Depth)

  - Expandable CTD (XCTD),
  - Thermosalinometer,
  - Lowered CTD,
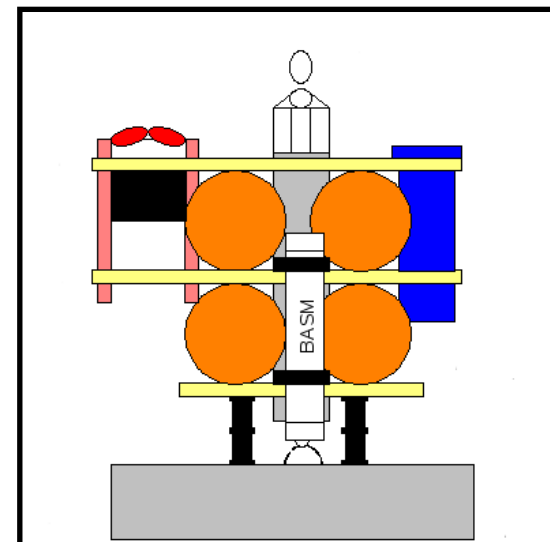 - **Towfish CTD (Seasoar).**

Model validation – In-situ data

Research oceanic cruises

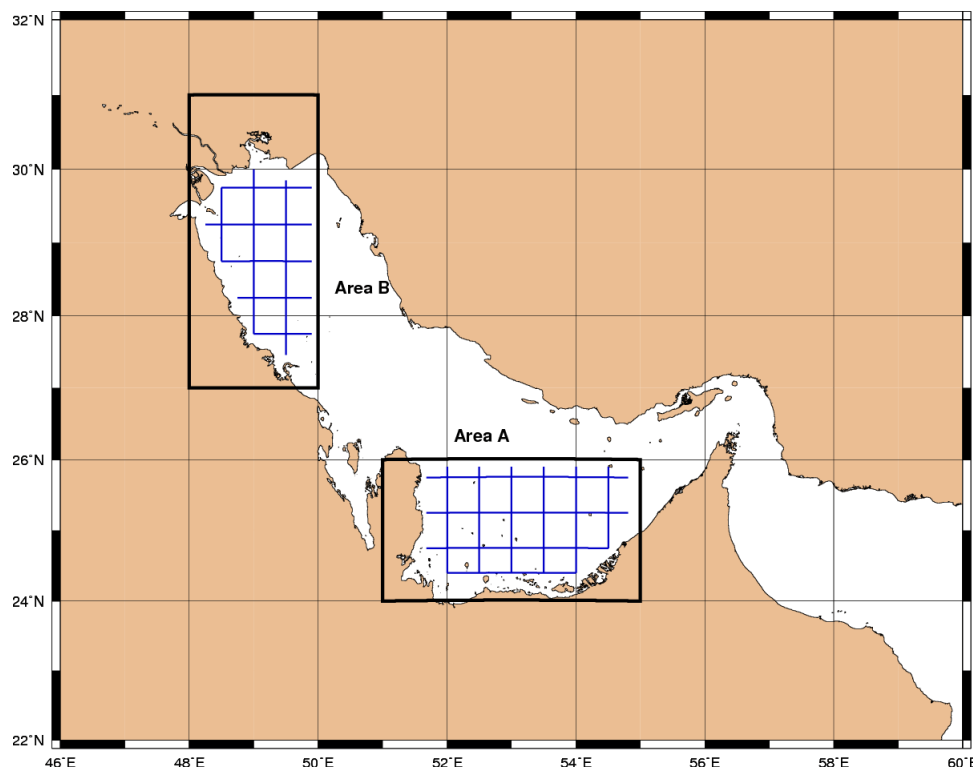Towfish CTD (Seasoar)

Drifting buoy

Sketch of the ADCP mooring

Model validation – In-situ data
Research oceanic cruises

May 2013 programme of work:

→ To carry out current and hydrology measurements in the Gulf to study mixing layer dynamics and dense water formation

Model validation – In-situ data
Research oceanic cruises

The cruise consists of a network of measurements using various sensors :

✓ Current : ADCP (Acoustic Doppler Current Profiler)
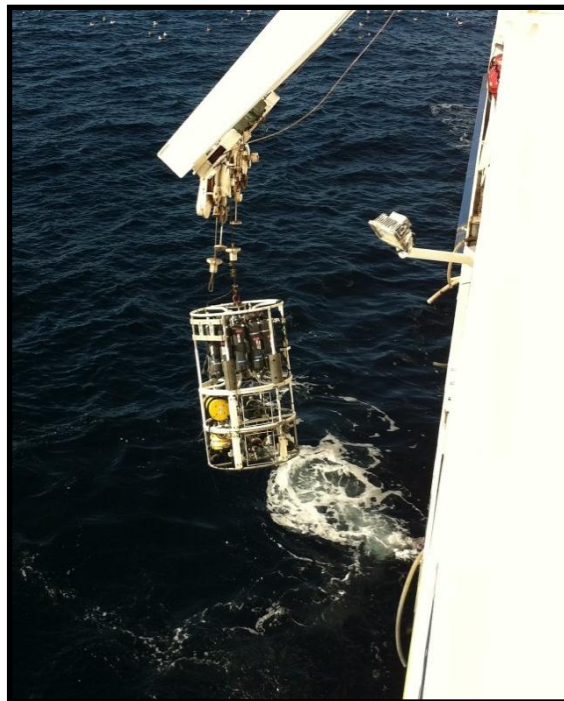
- Vessel Mounted-ADCP (150 kHz),
- Lower-ADCP (300 kHz).

✓ Hydrological : CTD (Conductivity Temperature Depth)

- Expandable CTD (XCTD),
- Thermosalinometer,
- Lowered CTD (2 kinds : the usual one and a « mini » probe for very shallow waters).

Model validation – In-situ data
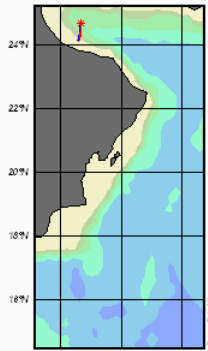## Research oceanic cruises

VM-ADCP (150 kHz)
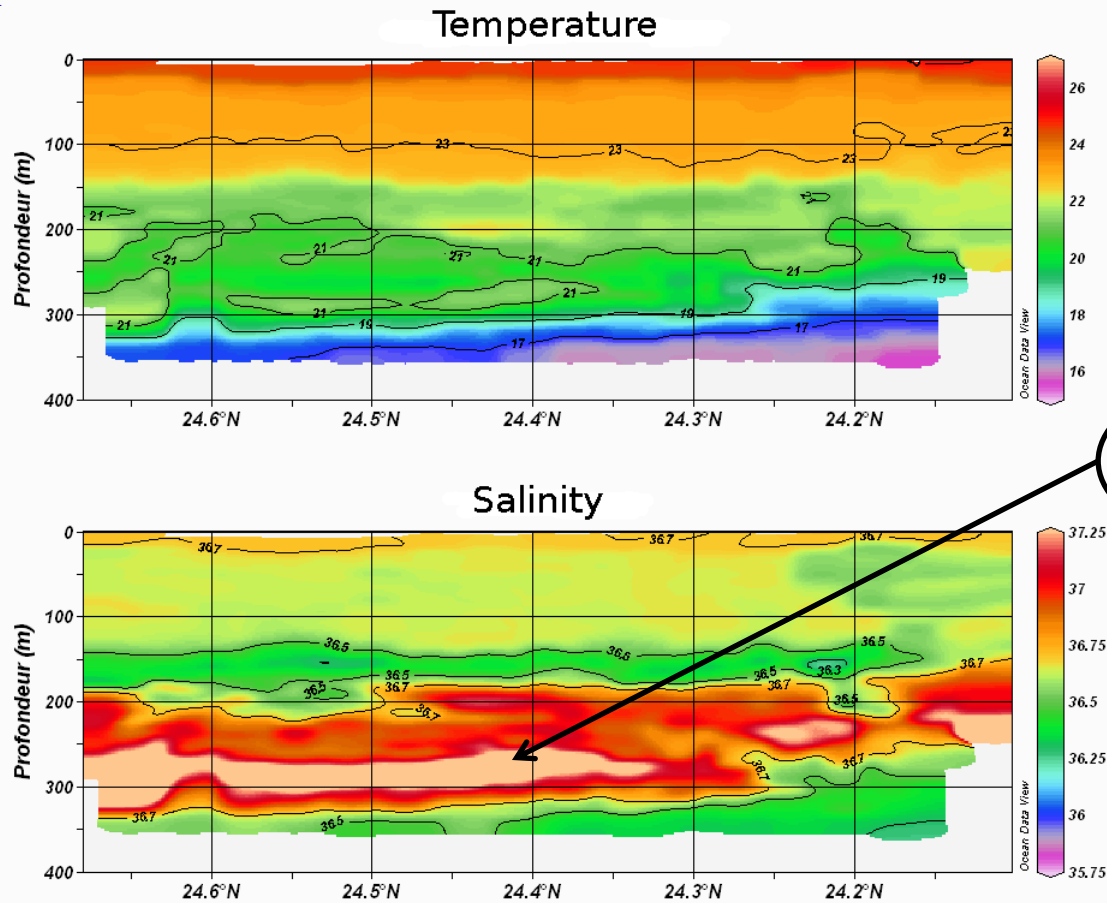
L-CTD
L-ADCP

X-CTD

Model validation – In-situ data
Research oceanic cruises

Example of seasoar section

Gulf water (maximum of salinity)

PHYSINDIEN 2014 - Deliverables

Cruise report (~ 1 year after the cruise)

- Measurement framework,
- Measurement area,
- Measurement conditions,
- Sensors, configuration (parameters set-ups),
- Issues.

Data

- Raw data (immediately after the cruise, on request),
- Processed data (~ 1 year after the cruise),
- Pictures (immediately after the cruise).

Salalah:	4-7 March
Muscat:	19-20 March
Abu Dhabi:	26-28 March
Doha:	13-15 April
Bahrain:	28-30 April
Abu Dhabi:	12-15 May
Muscat:	29 May-1 June

REQUEST FOR CONSENT FOR MARINE SCIENTIFIC RESEARCH
IN WATERS UNDER THE JURISDICTION OF

Date : 2013 July 1ˢᵗ

1   General.

1.1   Cruise name.

The cruise name is PHYSINDIEN2014

1.2   Sponsoring institution.

Name: Service Hydrographique et Océanographique de la Marine (SHOM)
Address : Service Hydrographique et Océanographique de la Marine (SHOM) – 13 rue du Chatellier
CS 92803 – 29228 BREST cedex 2 – France
Director : Ingénieur général de l'armement Bruno FRACHON

1.3   Scientist in charge of the project.

Name : Dr Stéphanie LOUAZEL
Address : SHOM/DOPS/HOM/REC, 13 rue du Chatellier CS 92803 29228 BREST cedex 2 – France
Director : Ingénieur général de l'armement Bruno FRACHON
Phone: (+33) 2 98 22 10 14   **Mail :** stephanie.louazel@shom.fr
Fax : +33) 2 98 22 18 64

1.4   French scientist in charge of conducting the work at sea.

Name : Dr Jean-Claude LE GAC
Address : BRCM de Brest – GOA – CC61 – 29240 Brest cedex 9 – France
Director : Ingénieur en chef de l'armement Jean-Claude LE GAC
Phone: (+33) 2 98 14 05 49   **Mail:** jean-claude.le.gac@shom.fr
Fax : (+33) 2 98 14 05 46

Questions?

www.shom.fr

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