GlobCurrent User Consultation Meeting: An Oil & Gas Operator’s needs

TOTAL

Agenda

- Ocean Currents for design and operations
- Hindcast
- Forecast
- Challenge!

Way for improvement!

TOTAL

Ocean Currents: Influence on design

A few examples…

Example: Angola - Block 17 - Girassol FPSO

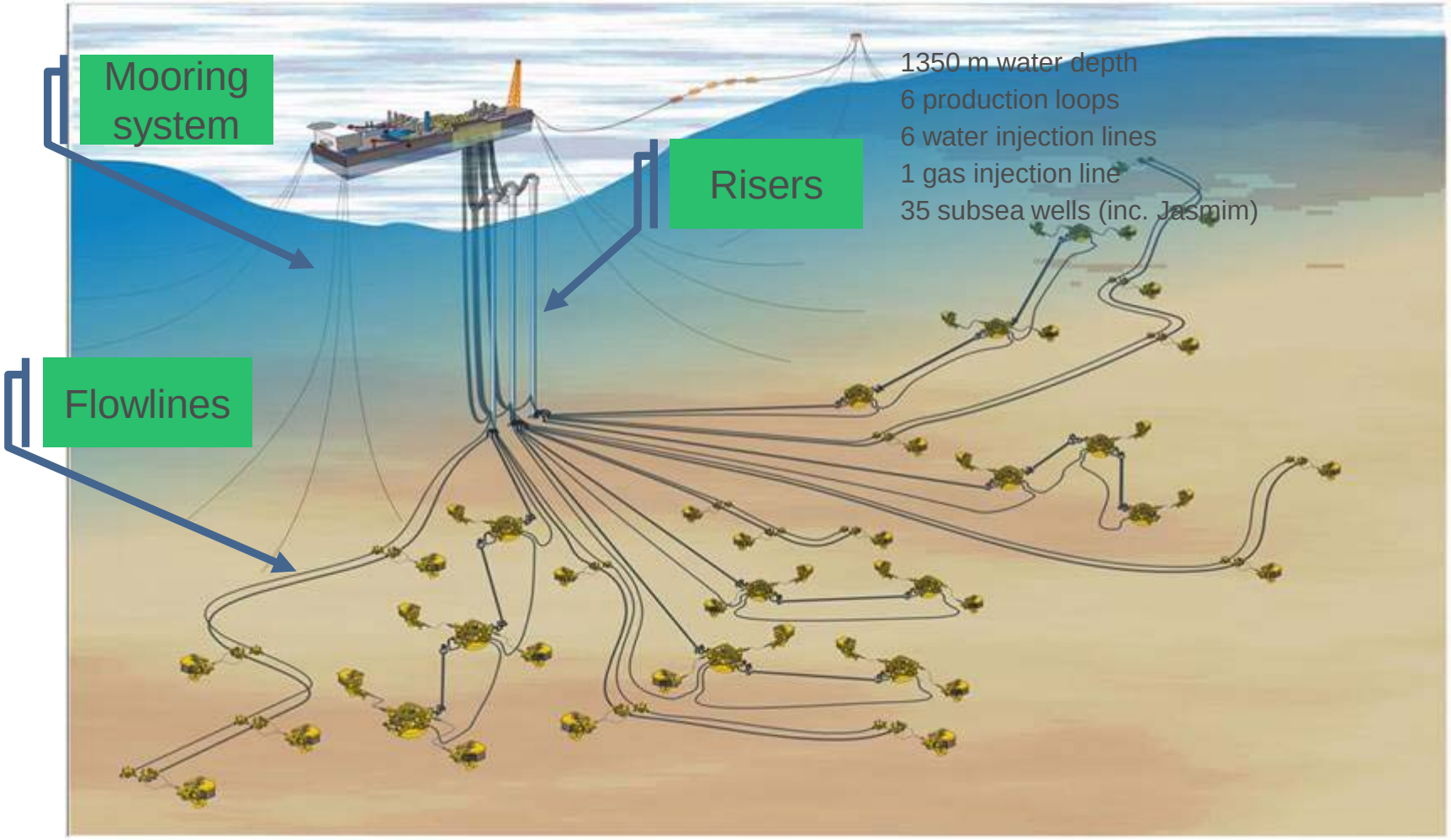
(Floating Production Storage and Offloading platform)

In Production since December 2001

… 5 of them offshore Angola & Nigeria,
and more to come!

TOTAL

Design
Angola - Block 17 - Girassol : Subsea Lay-out



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Design:
Fixed platform & offloading buoys: boat landing

- **Structural design to sustain loads created by crew boats under extreme current conditions**

TOTAL

Design:
Vortex Induced Vibrations at Pipeline freespans

Induced vibrations ➔ fatigue

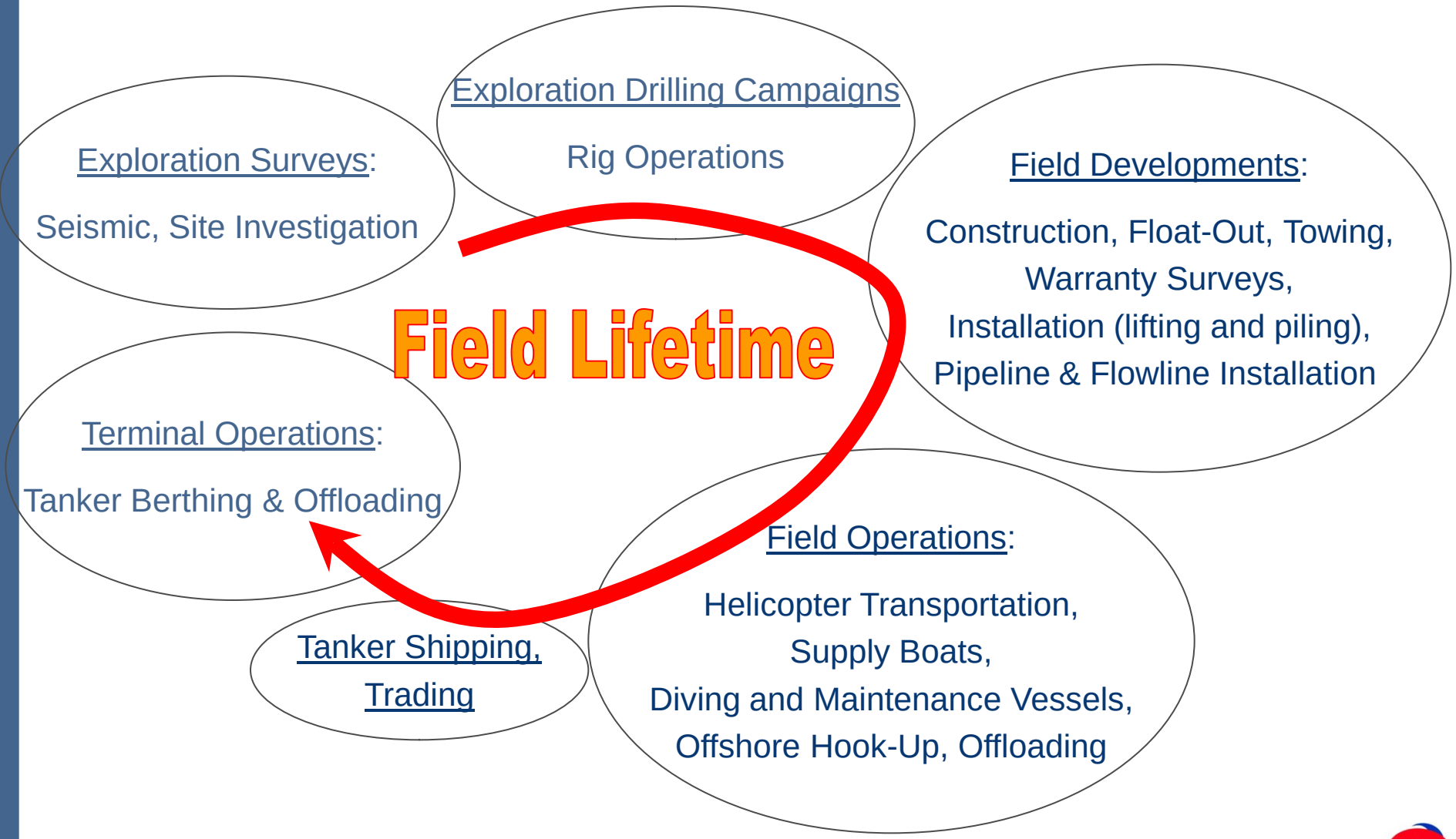
Current

TOTAL

Ocean Currents: Influence on operations

A few examples…

Wide Variety of Offshore Operations for the O&G Industry



Operations: 3D seismic acquisition

1990

100 m

3 km

2 streamers
traction : 5 tonnes

1998

700 m

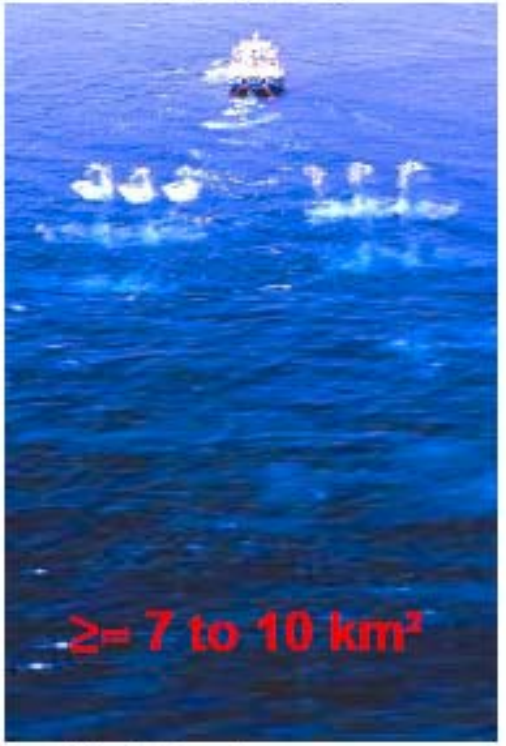
4.5 - 6 km

6 - 8 streamers
traction : 35 tonnes

2001

1 000 m

6 - 8 km



10-12 streamers
traction : 110 tonnes

TOTAL

Operations: Seismic Surveys

- **Knowledge of <u>surface currents</u> is compulsory for:**
  - Gun position control
  - Tail buoy and network positioning
  - Streamer control (horizontal and vertical)
  - 3D seismic coverage (reducing infill acquisition can lead to a 30% saving of the whole program)
- **Knowledge of <u>sea bottom currents</u> is necessary to:**
  - Program AUV (Autonomous Underwater Vehicle) seismic operation (deep water operations).

- **Cost of a site survey vessel is ~50 000 US/day**
- **Cost of a 3D seismic vessel is >>200 000 US/day**

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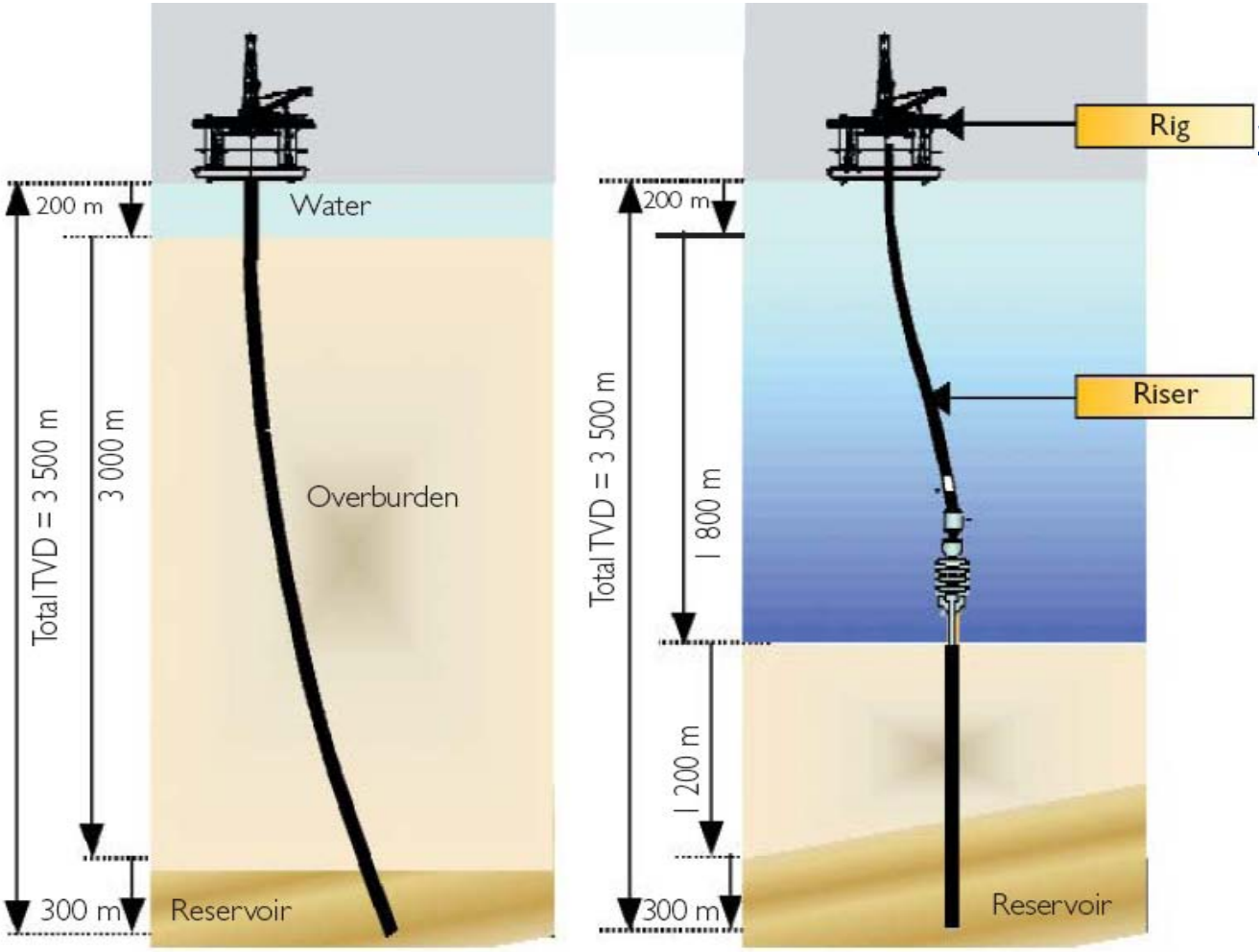
Operations: Drilling Rig Operations



Dynamic Positioning of the Rig, submitted to wind, waves, surface current (risk = loss of position control ➔ exceed riser tolerances)

Riser (~"oil conductor pipe") submitted to deepwater currents that may cause extreme loads and vibrations induced by vortices (VIV) (risk = failure by over-loading or premature fatigue ➔ delay of operations (i.e. cost) or oil pollution)

Operations: Transportation & Towing

Floating-Production-Storage-Offloading Platform (FPSO), towed from Korea to West Africa

Tension-Leg-Platform hull, transported from Singapore to Gulf of Mexico

Vessel+cargo stability depends on wind & surface current static load and dynamic response to the waves ➔ risk of capsizing & loss of life + cargo.

Gain of time and fuel if the route is optimised thanks to the knowledge of surface currents

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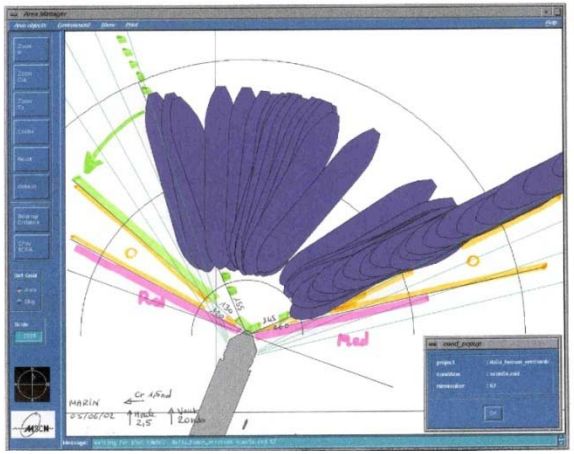
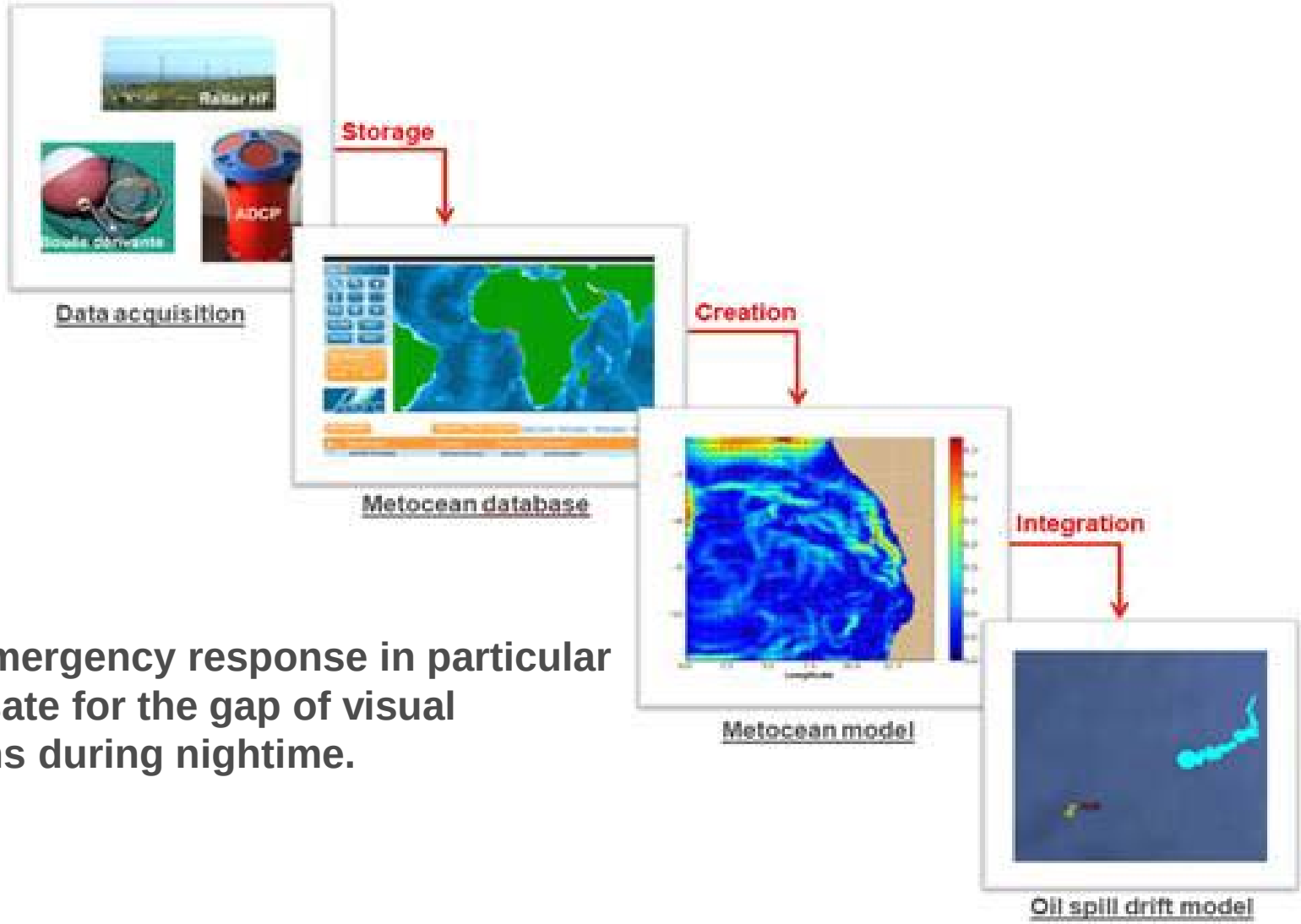
Operations: Tandem Offloading

Tandem Offloading operations are very sensitive to sudden changes of surface current or wind direction.

➔ Risk of tanker impact, loss of containment.



A particular case: support to emergency response to an oil spill



To support emergency response in particular to compensate for the gap of visual observations during nightime.

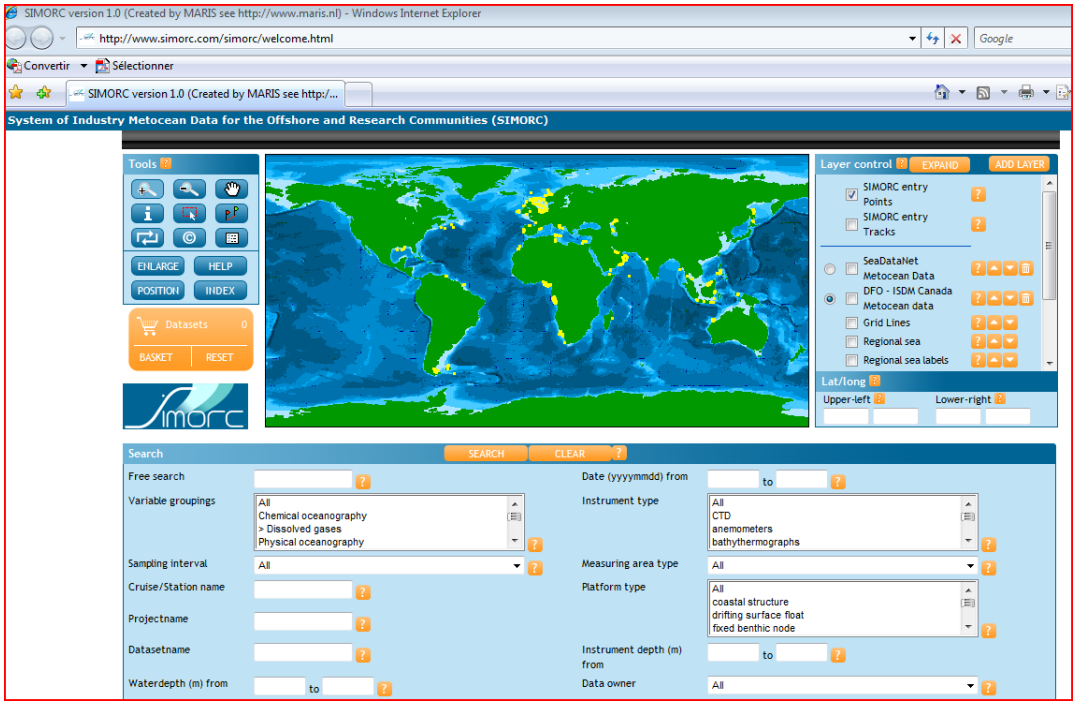
Hindcast

Hindcast current data

- **To answer most of our needs during design phases**
  - 3D
  - High time and space resolutions: as a minimum, 1 hour – 1/16° or better in particular in shallow water
  - Long time series > 5 years
  - Previously validated by in-situ and satellite data

- **In-situ database: www.simorc.com**

  please register and use it!



Forecast

Forecast current data

- **Same as for design: To answer most of our needs during operations**
  - 3D
  - High time and space resolutions: as a minimum, 1 hour – 1/16° or better in particular in shallow water
  - Previously calibrated / « trained » on historical in-situ and satellite data
  - Making the best possible use of in-situ real-time metocean data!

- **In-situ real-time metocean data:**
  - Metocean stations onboard offshore platforms
  - Drifters
  - HF radars
  - Etc.

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Monitoring, in-situ observations

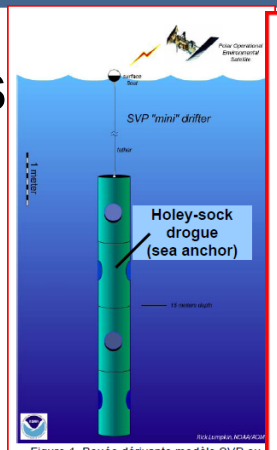


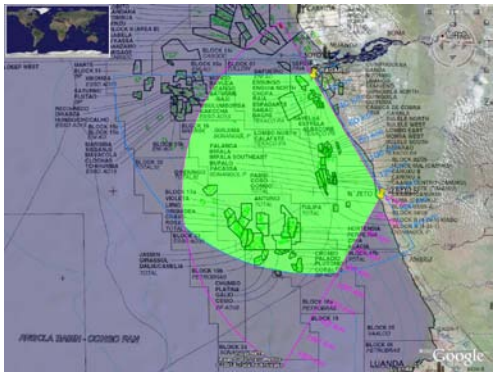
Figure 1. Bouée dérivante modèle SVP ou WOCE. Version initiale


nouveau modèle *MAR-GE/T* fabriqué pour CLS

- **Drifters, deployable when a spill occurs**

- **Real-time monitoring of currents throughout the water column**

- **Monitoring coastal currents with HF radars (e.g. Congo river)**



- **Making better use of metocean stations onboard offshore platforms**
  - Objective: use of in-situ data into numerical models, for validation, calibration or assimilation.

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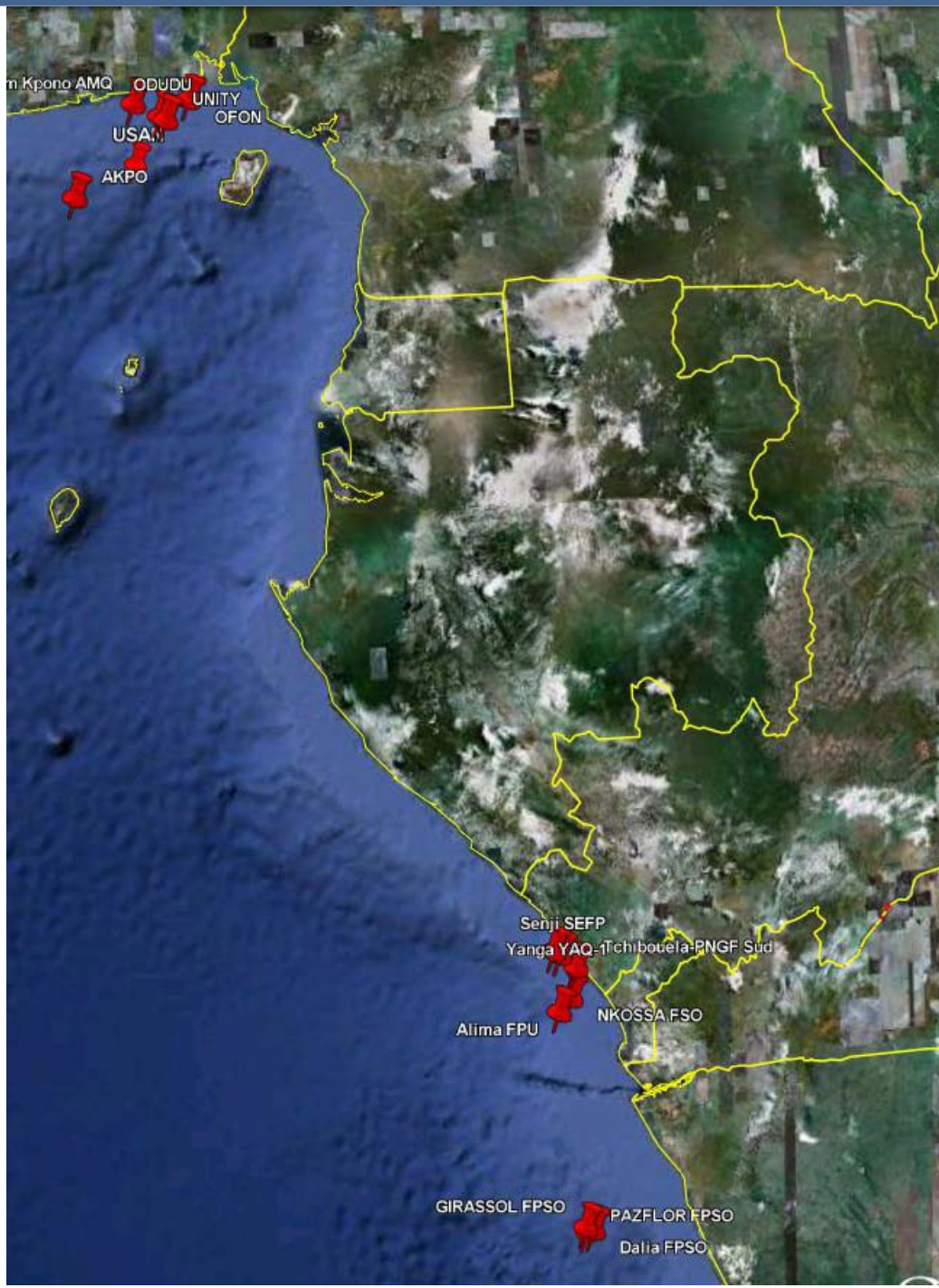
Current state of progress

- **Started in September 2010**
- **15 « metocean » platforms in the Gulf of Guinea (for Total)**
- **4 are « already available remotely in real-time »:**
  - 4 weather stations
  - 1 ocean buoy (Wave buoy + ADCP)
- **10 platforms should be available in October 2012:**
  - 10 weather stations
  - 3-4 ocean stations
- **In progress: Transfer to Meteo France and to the GTS**



A challenge!

Challenge!

- Make the best possible use of the O&G industry historical and real-time metocean measurements.
- 3D, high time and space resolutions
- Deepwater and shallow water – high resolution bathymetry
- Using satellite & in-situ observations for assimilation / calibration / comparison
- One model cannot be perfect ➔ ensemble modelling or pool of models? And an least, indicate confidence interval or reliability index for the modelled data.

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Thank you for your attention!

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