Case Study 1: Current meter location study

Summary

In Brazil's Espírito Santo Basin, legislation requires O & G companies to monitor currents through the use of ADCP. This ADCP should located so as to measure the strongest dynamic features, here the Brazil Current. In this example, EO technologies improved the characterization of mesoscale oceanographic features including the Brazil Current. EO can capture imagery over a broad geographic area as well as revisit the same areas at reliable intervals for frequent repeat captures. As this study shows, the combination of several EO products can lead to a very well documented study resulting in the optimal placement of the ADCP.

Issues & Needs

In order to obtain a drilling permit in Brazilian waters, the monitoring of ocean currents and features is mandatory. Such monitoring is also the first step in obtaining reliable in situ data that forms the basis of equipment design criteria. Satellite data is the only way to map the currents within the region and thus be able to best position the ADCP.

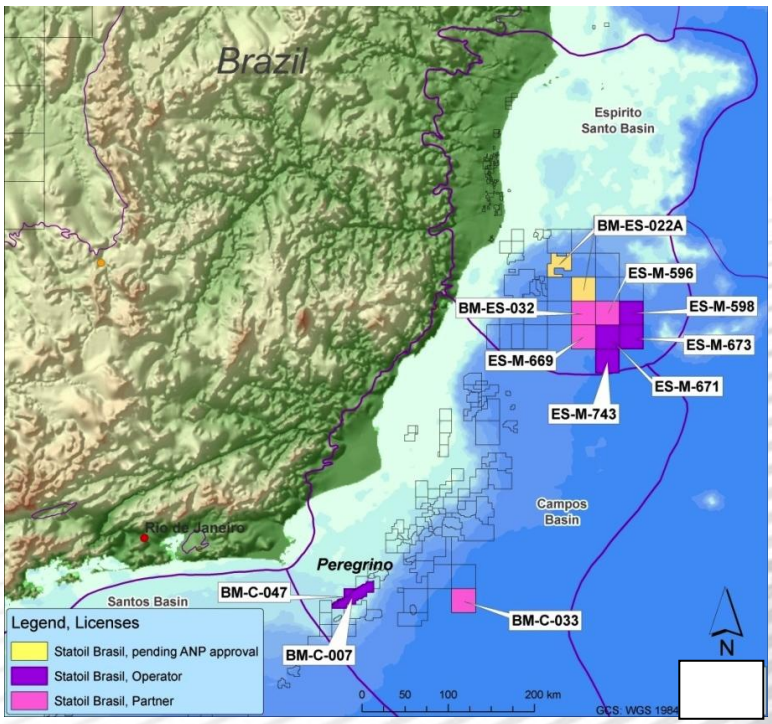

Figure 1: ES-M-598, ES-M-671, ES-M-673, ES-M-743 Blocks. Espírito Santo Basin

Solution

The EO technology proves to be of a great help in studying the local oceanic phenomena such as currents and eddies. These can be characterized thanks to satellite products which provide a full description of the feature (Frequency, area impacted…). In this particular case, two EO products were chosen:

- **Altimetry**

The multisatellite altimetry technique combines altimetry data from multiple satellites to create daily maps of the ocean dynamic topography each satellite, is one of the tools of interest for monitoring ocean circulation, especially in dynamic region such a Espirito Santo basin.

The analysis of two years of data of absolute dynamic topography and geostrophic current, over the period from 01/01/2009 to 31/12/2010 allowed to observe that the Brazil Current, flows southwest, with a meandering pattern, behaving as a train of waves of vorticity permeating the centers of successive high and low pressure, as shown by CALADO (2006), which refers to the positioning of the centers of high and low pressure.

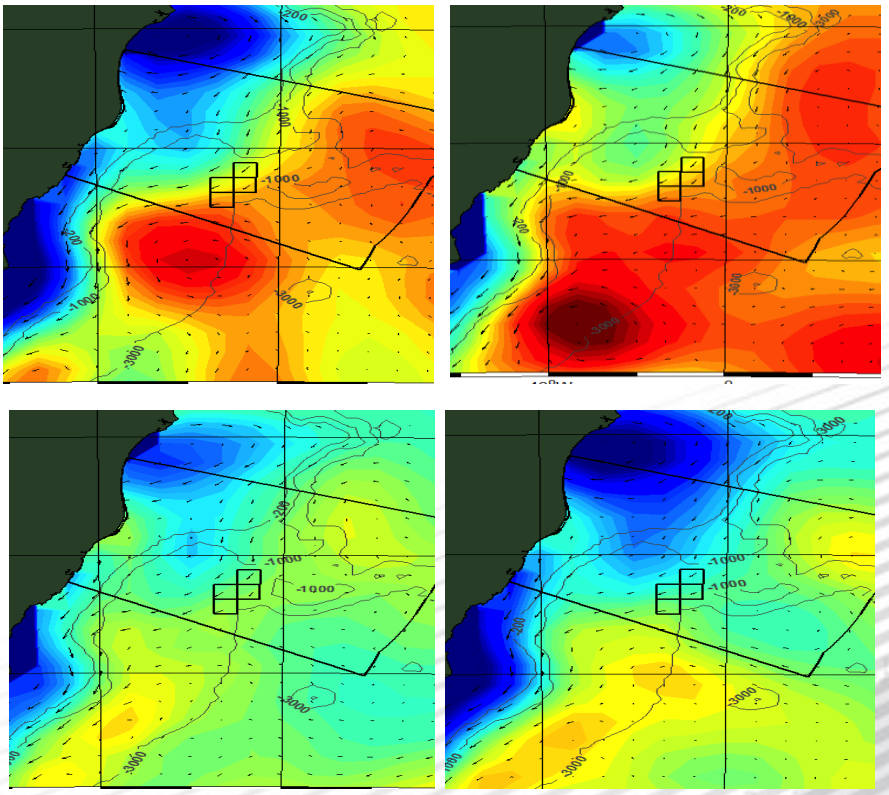

Figure 2: Climatological dynamic topography and geostrophic current for four seasons. The gray lines represent isobaths 200m, 1,000 m and 3,000 m, and the highlighted area in the Espirito Santo Basin. Figure generated from AVISO data.

- **Sea Surface Temperature**

Sea surface temperature (SST) is the temperature of the ocean near the surface. Knowing the temperature of this part of the ocean is absolutely essential for many reasons. For oceanographers, meteorologists and climatologists, it is one of the signs/results of the exchange of energy between the ocean and the atmosphere.

The region of Espírito Santo Basin shows higher temperatures in the northeastern portion and lower temperatures in the southwest portion, with a gradient of about 1° C (Figure 3). This fact may be associated with the positioning of the centers of positive and negative relative vorticity, corresponding to the Abrolhos and Vitoria eddies.

To assist in evaluating the structure of the Vitoria Eddy a climatological and seasonal variability of sea surface temperature (SST) analysis from satellite data provided by NCOF (National Center for Ocean Forecast) was performed. The analysis was conducted for the period of two years of data, the same range of altimetry data used.

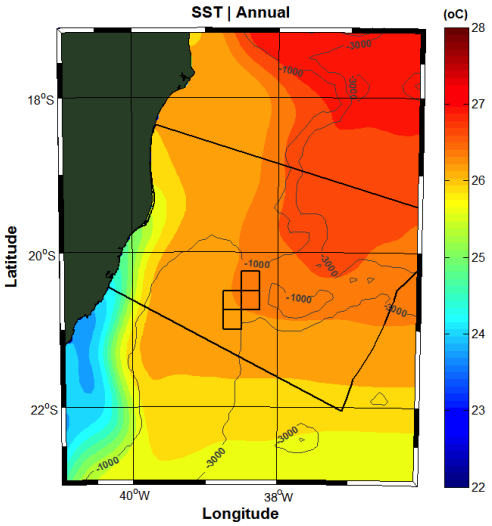

Figure 3: Climatology of Sea Surface Temperature for the entire period analyzed. The gray lines represent isobaths of 1,000 m and 3,000 m, and the highlighted area in the Espirito Santo Basin. Figure generated with OSTIA data.

Results & Perspective

A characterization study of ocean mesoscale circulation was thus performed at Espirito Santos Basin (Figure 1). The main goal of the study is to support the definition of the best locations for installing the ADCP.

Two principal dynamic features were identified and located:

- the Brazil current
- the Vitoria eddy

These two features should be monitored through the use of an ADCP in order to get reliable current measurements that reflect the strongest currents found in the region.

Related Info

CLS has over 25 years of experience in delivering data and services to customers all over the world. With a staff of 470, in France and abroad, CLS offers services in environmental monitoring, maritime security, and management of marine resources to a broad range of professionals including government, industry and the scientific community, and maintains an operational center with expert support 24/7. Since 2001, CLS has developed services for the oil & gas industry based on its built-in expertise on data collection, radar imagery or numerical modelling. For the EO4OG Project, CLS leads a consortium composed of METEO GROUP and NERSC. Tullow Oil kindly supports the team as a consultant.

Contact: Dr. Marc Lucas, mlucas@cls.fr