High resolution geophysical survey performed at submarine slope area in Jubarte Field, Espírito Santo Basin

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Abstract

The article presents partial result of high resolution geophysical survey, performed to provide information to support the design of marine installations, by the Engineering group of Petrobras.

The study area is located in Jubarte Field, Espírito Santo Basin and the survey comprised the acquisition of bathymetric data, sub-bottom profile (SBP) and sonar data. CTD's profile were also performed in order to obtain sound velocity propagation in sea water and thus correct the depth values obtained from bathymetry. Only the sonar and SBP data will be discussed in this article.

The acquired data was processed and interpreted. The result consists of a map of submarine local features. The main features identified are presented in this article. A better characterization of the sea bottom features and sediments will be completed after the acquisition of sediments samples, which will be performed in a next phase of the survey.

Introduction

Before the installation of submarine structures on sea floor, it is mandatory to perform geophysical survey in order to characterize it and thus avoid risk areas.

The data discussed in this article represent an area of about 110 km^2, with water depth variations from 70 m to 1270 m, situated in part of the submarine slope of Jubarte Field, Espírito Santos Basin (Figure 1). However, the whole survey comprises a larger area and encompasses the platform and coastal shallow water.

The survey purpose is to provide sea bottom geophysical information to support the development of Jubarte gas and oil field that involve the installations of pipelines and other submarine structures.

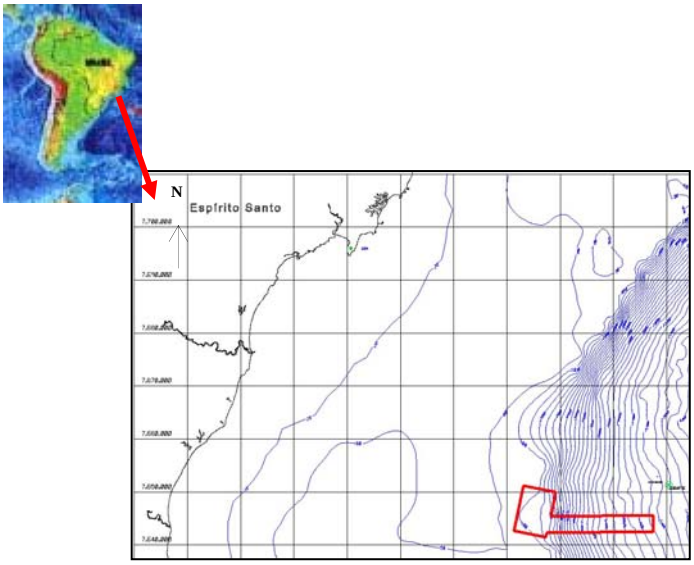

Figure 1: Localization of survey area

Methodology

The geophysical investigation was started by bathymetric data acquisition in order to get information about water depth variations. Then, it was performed the sonar and SBP survey.

The bathymetric data were acquired with a Simrad EA-500 system. The sonar and SBP profiles records were acquired with a Datasonic SIS3000 deep tow system. The sonar and SBP operating frequencies are 100 kHz and 3,5 kHz, respectively. The survey comprised 33 lines spaced by 500m.

The sonar data were processed using Isis Sonar© software and after it was generated a mosaic of the sea floor textures and reflection patterns. Finally, a data interpretation was performed and the results will be discussed afterward.

Results

The slope area is characterized by several different features, which are described in relation to its texture and reflection patterns. Prior experiences in sonar interpretation permit associate these features to different types of sediment (Fish & Car, 1991, Ayres Neto & Aguiar, 1993). The sediment classification will be proved in another phase of the survey, that involves sea bottom sampling.

Figure 2 shows an example of SBP high resolution; a partial filled submarine channel and thin stratified layers can be recognized. The channel was also identified in bathymetric registers. Another example is the identification of a block (possibly a carbonate mound) visible in SBP and in sonar data (figures 3 and 4).

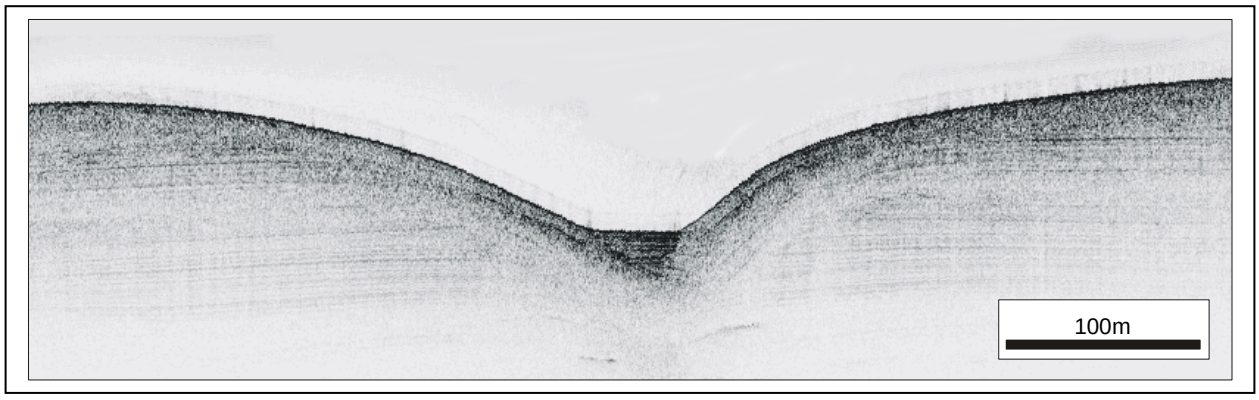

Figure 2: SBP register. Discordance can be seen by thin stratification layer and a filled paleo-channel (water depth: 400 m)

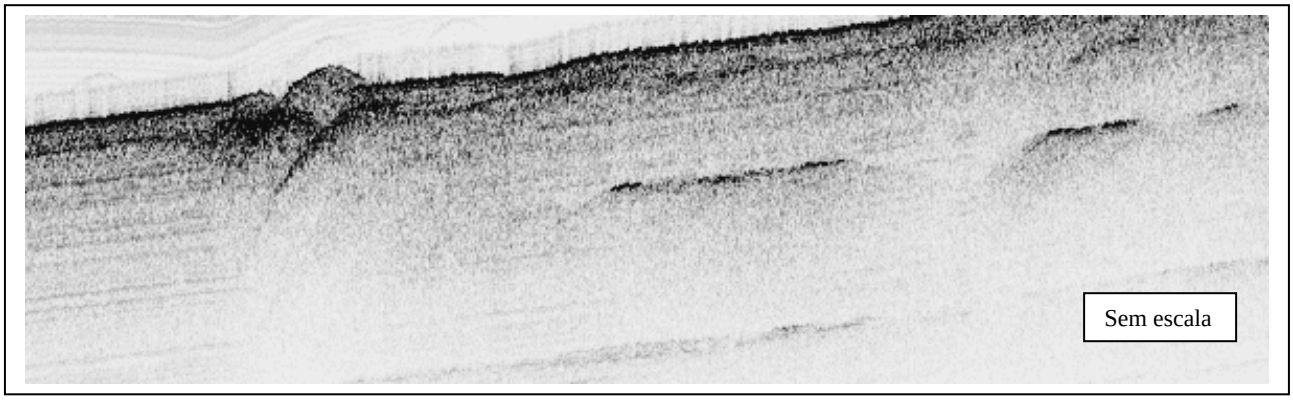

Figure 3: SBP register. A mound, possible carbonate composition and discontinuous strong reflections layers (water depth: 700 m).

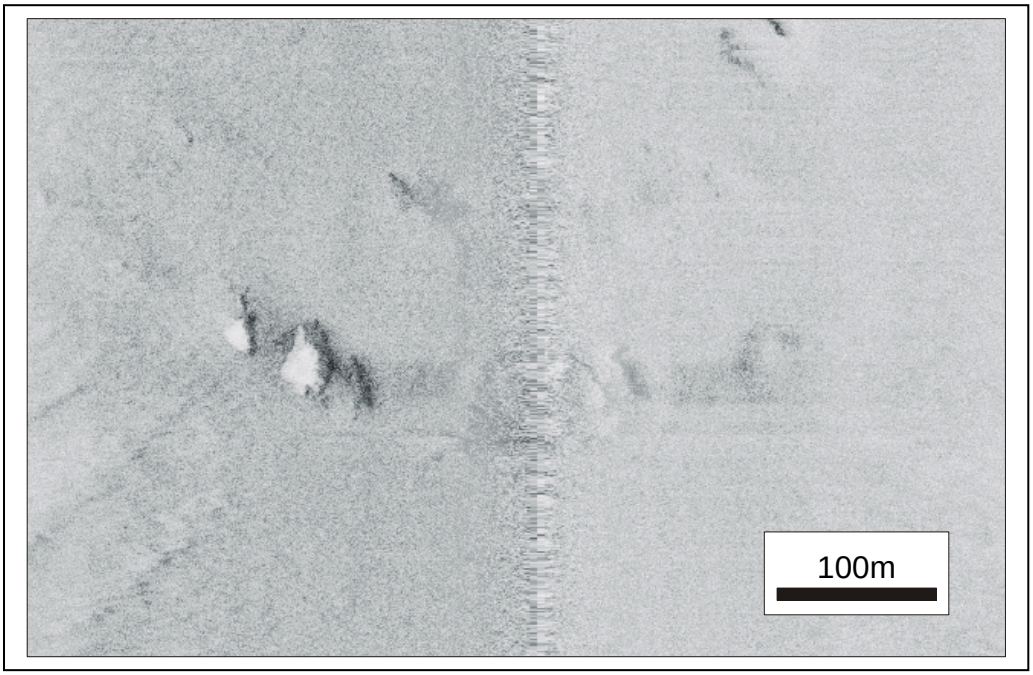

Figure 4: Sonar register. Mounds, possible carbonate composition, associated to previous figure (water depth: 750 m)

Undulated structures similar to sandwaves occur in restricted area, as show in figure 5.

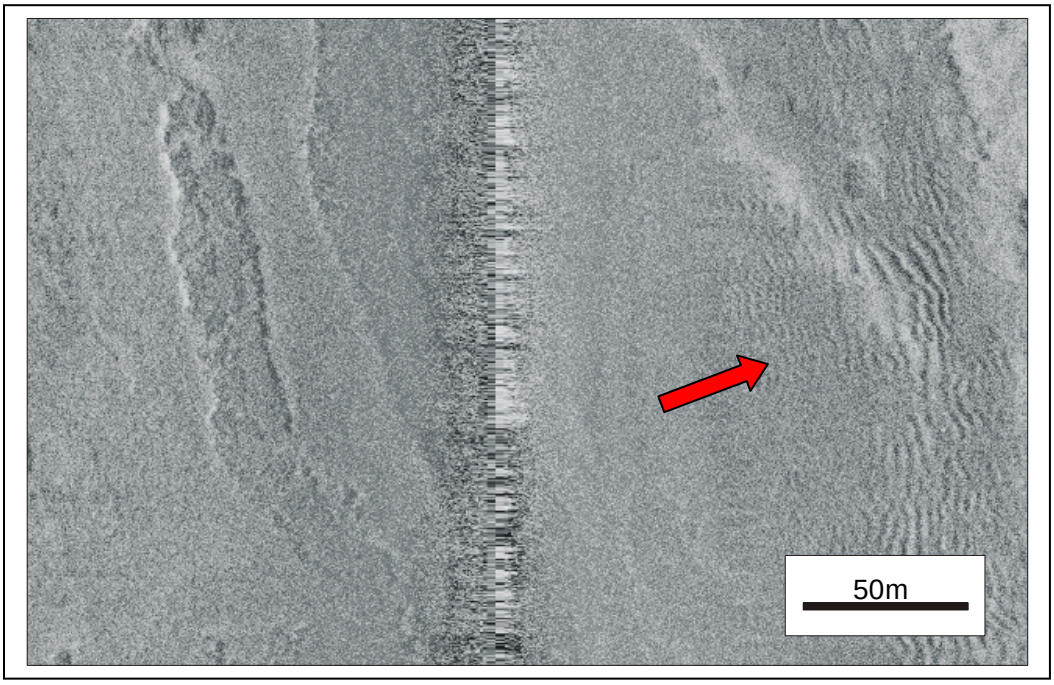

Figure 5: Sonar register. The structures similar to sandwave are shown in the right side (water depth: 100 m)

A distinctive pattern was identified in the area. It consists of semi-circular feature, as displayed in figure 6. A detail of the feature, that may be associated to carbonate, is shown in figure 7.

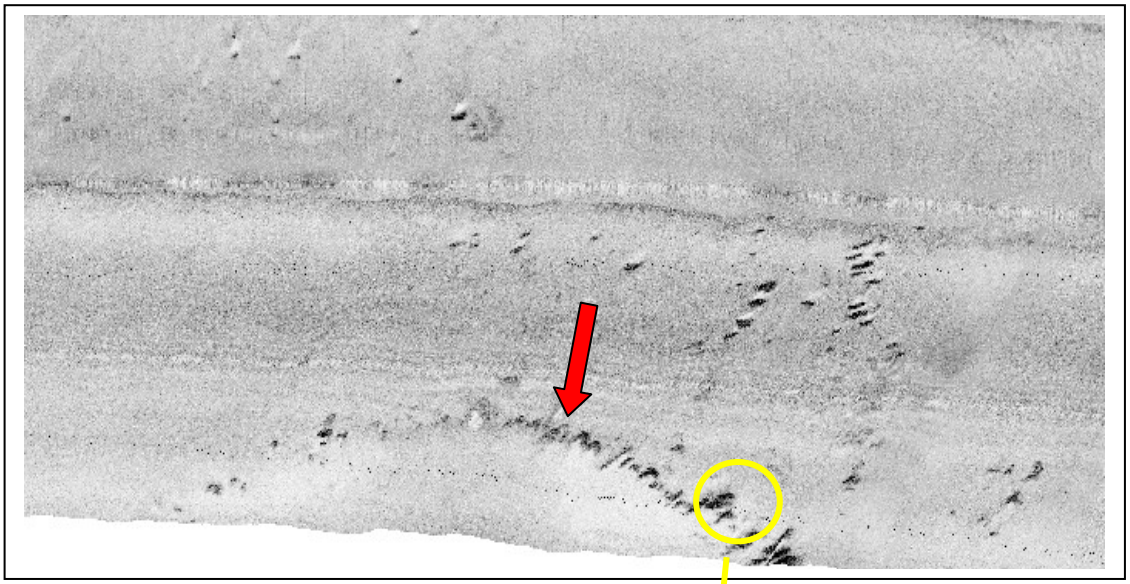

Figure 6: Sonar register. Semi-circular structure (water depth: 750 m)

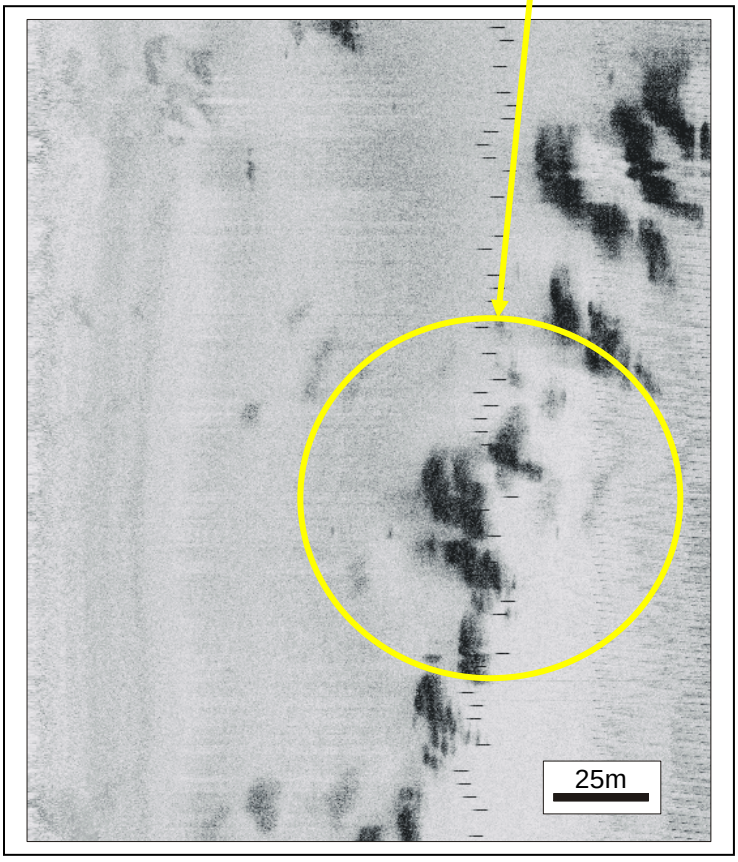

Figure 7: Sonar register. Detail of the semi-circular structure.

The widespread pattern has low reflection pattern, as displayed in the left side of the figure 7 and can be associated to mud sediments.

Conclusions

These studies are important to submarine Engineering because the geophysical survey reveals several features, which permitted the characterization of marine floor sediments, i.e., their area distribution and underneath structures.

The results were analyzed in order to previously define inappropriate areas to the installations of submarine structures (for example pipelines, platform pile). These inadequate areas are exemplified in some features presented. They will be better detailed in a future geophysical and geotechnical survey.

Acknowledgments

We would like to PETROBRAS to permit the publication of this paper.

References

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