users to overlay data from several sources and to implement new products, such as ocean surface velocity fields derived from SST maps. From a technical point of view, SAIDIN will provide flexible file name conventions, image formats and database server dependency. Next things to do is to migrate physical system to a virtual one to have a more robust service in case of crash.

REFERENCES

[1] B. Domenico, J. Caron, E. Davis, R. Kambic, and S. Nativi, "Thematic Real-time Environmental Distributed Data Services (THREDDS): Incorporating Real-time Environmental Data and Interactive Analysis Tools Into NSDL," Journal of Digital Information, vol. 2, pp. 11 587–11 601,2002.

[2] F. Monaldo, "Primer on the Estimation of Sea Surface Temperature Using TeraScan Processing of NOAA AVHRR Satellite Data," 1997, version 2.0 S1R-96M-03. The Johns Hopkins University Applied Physics Laboratory.

[3] E. P. McClain,W. G. Pichel, and C. C.Walton, "Comparative performance of AVHRR-based multichannel sea surface temperature," Journal of Geophysical Research, vol. 90, pp. 11 587–11 601, 1985.

APLICATION OF REMOTE SENGING TECHNIQUES TO THE STUDY OF INTERNAL WAVES IN THE STRAIT OF GIBRALTAR

Águeda Vázquez[1], Gabriel Navarro[2], Susana Flecha[2] y Miguel Bruno[3]

(1) Departamento de Física Aplicada II, Grupo de Oceanografía, ETSI, Universidad de Málaga, Complejo Tecnológico-Campus Teatinos, 29071-Málaga, Spain.

(2) Instituto de Ciencias Marinas de Andalucía, CSIC, Av. República Saharaui s/n, 11510-Puerto Real (Cádiz), Spain.

(3) Departamento de Física Aplicada, Facultad de Ciencias del Mar y Ambientales, Universidad de Cádiz, Av. República Saharaui s/n, 11510-Puerto Real (Cádiz), Spain.

Abstract. The generation and propagation of internal waves is one of the most interesting oceanographic processes in the Strait of Gibraltar. In this paper, radar (ASAR) and ocean colour images (MODIS y MERIS) have been used in order to characterize this phenomenon. The processing of instantaneous colour images has allowed the analysis of the relationship between physical processes of the internal waves and the biological implications. During internal waves generation, MODIS and MERIS images show a chlorophyll maximum structures in the coastal areas of Camarinal Sill. When these waves are located in Alborán Sea, the colour images illustrate the presence of chlorophyll maximum associated to the waves front. The results seem to indicate that a suction of coastal water take place during the internal waves generation and this rich chlorophyll water entry in Alborán Sea travelling joint to the internal waves.

Keywords internal waves, Gibraltar Strait, ASAR images, Ocean Colour images.

I. INTRODUCTION

The high amplitude and short period internal waves are generated at the western side of Camarinal Sill during maximum tidal outflow (toward Atlantic Ocean) when the flows reach 1 m s-1 (Vázquez et al., 2008). These remain there until the flow weakens. And then, the internal waves propagate towards the Mediterranean Sea. The internal waves produce a sea surface signal of roughness bands, named boiling water, (Bruno et al., 2002) which are detected from ASAR (Advanced Synthetic Aperture Radar) images.

The mixing processes associated to the internal waves are able to produce a recirculation of the Mediterranean Water nutrients towards Alborán Sea and, consequently, to increase the phytoplankton populations inside de Atlantic Jet (Macías et al., 2008). The main objective of this work is to characterize the waves processes and its biological implications in the study area using instantaneous radar and ocean colour images.

II. MATERIAL Y METHODS

In order to achieve the objective of this study, three tools have been used:

- Instantaneous ASAR and ocean colour images (MODIS and MERIS) to characterize the generation and propagation of the internal waves processes in the Strait of Gibraltar.
- Tidal velocity prediction in Camarinal Sill to identify the state of the internal waves.
- CTD data obtained from GIBRALTAR 08 Cruise on board of R/V Sarmiento de Gamboa to confirm the remote sensing information.

III. RESULTS

Generation

In the ASAR image of 2nd of June of 2008 (Fig. 1a) the roughness features confirm the generation of the internal waves in the Strait of Gibraltar. The tidal velocity prediction (Fig. 1b) shows that this image was captured during maximum outflow with a current intensity greater than 1 m s-1, when hydraulics conditions are favourable for the generation. On other hand, in MERIS and MODIS images (Fig. 1c), it can be seen an increase of surface chlorophyll in coastal area of Camarinal Sill. This chlorophyll maximum structure travels eastward according to the propagation of the internal waves toward Alborán Sea.

Propagation

In the ASAR image corresponding to 1st of October of 2008 (Fig. 2a) can be detected waves train propagating in Alborán Sea. The tidal velocity prediction in Camarinal Sill (Fig. 2b) confirms that the internal waves have been approximately one cycle late in coming to Alborán Sea from its generation in Camarinal Sill. In MERIS image (Fig. 2c), high chlorophyll values associated to waves train extracted of SAR image can be seen. In the CTD transect carried out 30 of September of 2008, a waves train in Alborán Sea was recorded. The isothermals and isohalines rise, joint to an increase of chlorophyll values (as colour images show) characterize the arrival of the internal waves in station 5 (Fig. 2d).

IV. CONCLUSSIONS

The combined analysis of images and in situ data reveal advection of North and South coastal water to the centre channel of the Gibraltar Strait and its entrance to Alborán Sea. This coastal water with higher chlorophyll concentration is incorporated to the Mediterranean Sea associated to the arrival of the internal waves train to this area.