MEASURING VERTICAL VELOCITIES WITH LOW FREQUENCY ADCP INSTRUMENTS. A CASE OF STUDY IN THE STRAIT OF GIBRALTAR

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1. Introduction

At present times, low frequency ADCP enjoys a widely extended use in oceanographic studies. However, its application is practically limited to analyse the components of the current velocity in the horizontal plane, disregarding the vertical component. Commonly, vertical component is only accounted for with the use of higher frequency systems [1], which have a smaller range and, therefore, may sample the whole water column, only in very shallow coastal waters. On the other hand, in some singular oceanographic regions characterised by strong currents affected by bottom topography, the velocity field may have a clear 3D structure and in this cases, vertical component can be no longer neglected. One of these regions is the Camarinal Sill region in the Strait of Gibraltar. The first reported values of vertical velocities in this area were published in [2], in this case authors used a 150 KHz ADCP. Later, these vertical velocities have been simulated by hydrodynamical numerical models and reproduced values resembles quite well the observations [3].

The objective of this contribution is to demonstrate that a low frequency (75 KHz) vessel mounted ADCP is able to measure meaningful vertical velocities in the Camarinal Sill region of the Strait of Gibraltar.

2. Results and Discussion

In the figure 1, it is shown the velocity field measured by a vessel mounted 75 KHz ADCP around Camarinal Sill, in the Strait of Gibraltar. Vectors are actually, the resultant of summing the horizontal component in the along-strait direction plus the vertical component. By the time of the measurements, an intense tidal current is flowing toward the Atlantic (to the left in the figure). This intense stratified flow interacts with the topography and as a result, large amplitude perturbations (internal waves) in the density field (100 m amplitude) are produced in the lee side of the sill. Consequently, current velocities matching these isopicnal displacements may take values as large as 1 m/s [2]. These observed values of vertical velocities have been checked using other independent instrumental sources as vertical sections of temperature (built on the base of XBTs launching) and echo-sounder EK500 data.

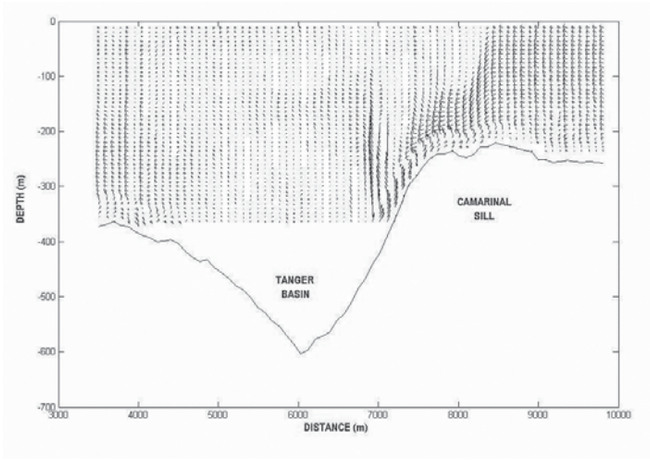

Fig. 1. Vertical section of current velocity in the along-strait direction, traversing Camarinal Sill.

3. Conclusions

In the region of Camarinal Sill in the Strait of Gibraltar low frequency 75 KHz ADCP is able to measure the 3D structure of the flows there. It is due to the fact that values of vertical velocities takes high values as large as 1 m/s. Comparison with vertical sections of temperature a echo-sounder EK500 traversing Camarinal Sill in the along-strait direction, simultaneous to the ADCP records confirm the reliability of the velocity fields.

4. References

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