# The Use of FADs as a Tool to Observe Marine Currents

# La Utilización de los DCP como un Instrumento para Observar los CorrientesMarino

# Utilisation des DCP Comme outil D'observation des Courants Marins

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## ABSTRACT

In order to manage the FADS fleet in Guadeloupe, all FADS have been equipped with a GPS and a data transmission system. The data have been processed to provide information on the currents direction and indications of their intensity around the island. The methodology that has been applied is explained and discussed. An example of a map of the currents around Guadeloupe is presented. Examples are provided to establish the relevance of having the FADS fitted with GPS and processing the collected data. The goal is not only to limit losses but also to expand the knowledge on coastal currents and enable the fishermen to understand the impact this may have on the catches on FADS fishing of large pelagics. Using the FADS for supporting other oceanographic measurement tools would altogether promote environmental monitoring and share out the FADS costs among several users.

KEY WORDS: FAD, currents, Guadeloupe

## INTRODUCTION

GPS were fitted on the moored FADS buoys, in order to:

i) Organize a single monitoring of all the devices,
ii) Facilitate the recovery of the lost buoys, reduce the cost of new equipment, and identify why they got lost, and
iii) Use the FADS to secure a better knowledge of the currents.

This poster is showing the methodology applied to process the FADS position data and to show the kind of information of marine currents that can be secured from the GPS data.

## MATERIAL AND METHODS

A FAD is moored and because its rope is longer than its anchoring depth, the surface buoy shall move according to the currents inside its turning circle that circumscribes the cloud of dots representing the GPS positions.

### Direction of the Current

The centre of the turning circle and the FAD instantaneous position reveal the direction of the current (Figure 1). It can be fairly well assessed because with a precise knowledge of the relative position of the FAD and the turning centre of 30 m (GPS precision) and a distance of about 1000 m between the two points (anchoring and buoy position), an extremely accurate precision in the order of a degree can be secured. Between the dropping position of the FAD anchor and its actual position there may be a difference, according to the currents strength when it was dropped. To anchor positioning spot correctly, preliminary positioning tests of the FAD buoy may be necessary. The centre of the circle drawn around the GPS locations gives the precise location of the anchoring.

### Intensity of the Current

The recording of the GPS locations of the FAD surface buoy enables to have the recording of the currents changes (Figure 2). With the software « DCP » (Lebeau 2004), three specific FADS were designed, modelled. and submitted to increasing currents in order to compare their behaviour. (Figure 3). As a result, the stronger the current, the further the FAD's top will drift away from its anchoring spot. The curves giving the distance between the FAD's buoy and its turning circle, according to the strength of the current, are fairly similar for the three FADS. The distances between the buoy and the turning circle are equivalent for the same current speed (Figure 4). The distance may be used to characterize the currents as "strong, moderate, or low".

### Observations Made from FADS Fitted with GPS

To further the above methodology, a pilot was carried out in Guadeloupe and provided an image of the currents around the FADS. Therefore, it was possible to establish a ratio of currents by level of intensity around a FAD (Figure 5) or to compare the intensity of currents from one month to the other (Figure 6). From these data, a diagram of the currents is designed, for a given period, with arrows indicating the direction of the currents, their length being proportional to the currents frequency. At the bottom of each arrow the ratio of the current in the direction shown is indicated (Figure 7). A diagram of the currents has been made for each FAD, which gives a thorough image of the entire fleet around Guadeloupe, at a given time (Figure 8).

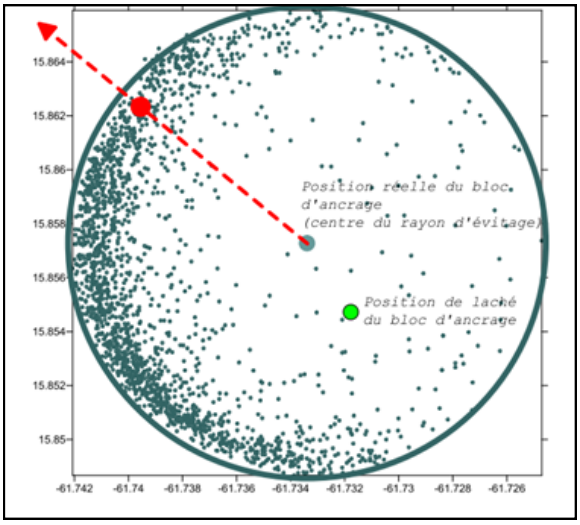


**Figure 1**. Assessment of current direction with the FAD anchor and buoy positions.

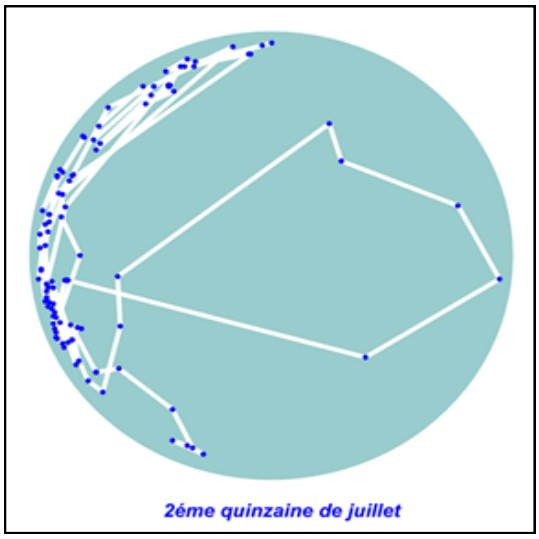


**Figure 2**. Position of the FAD buoy in relation with the current changes (one position each 6 hours).

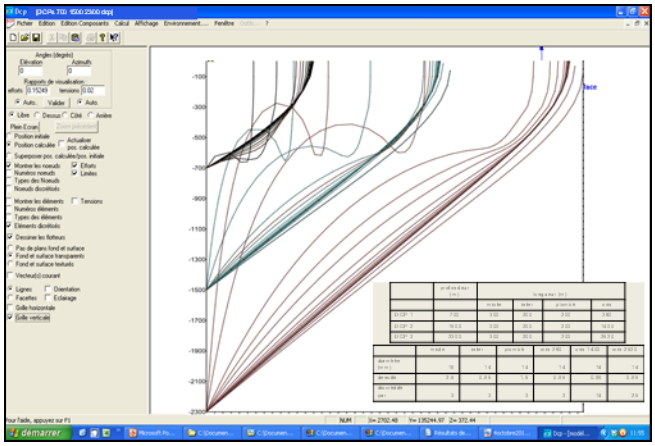

**Figure 3**. Simulation with the software « FAD » of three specific FADs at three different depths and submitted to increasing currents.

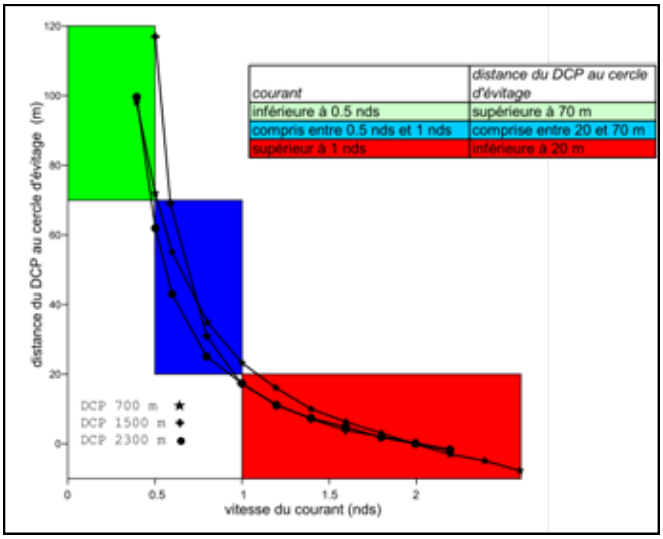


**Figure 4**. Distance of three FAD's buoy to their turning circle in relation with the currents speed.

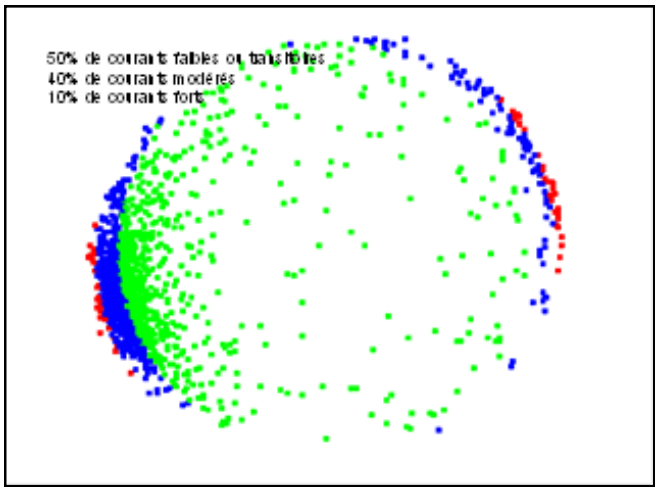


**Figure 5**. Ratio of currents by level of intensity, around one FAD

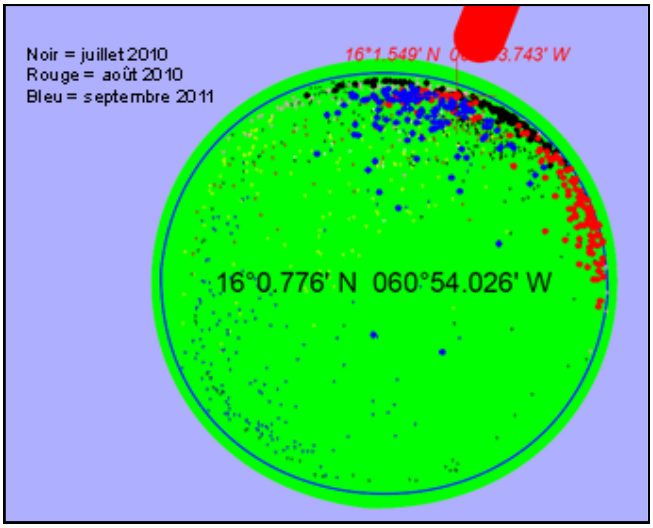


**Figure 6**. Location of a FAD from one month to the other.

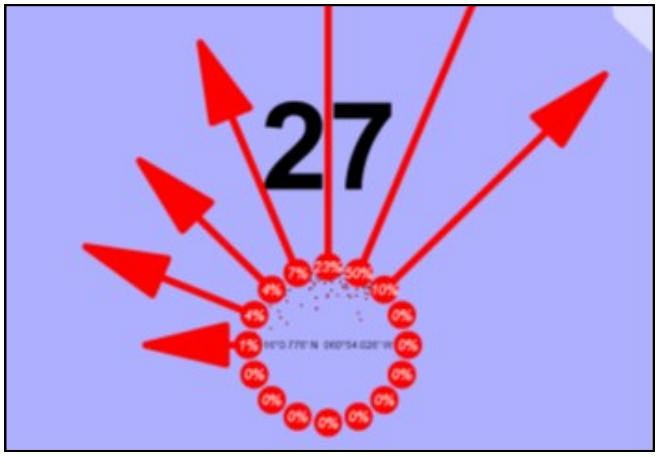


**Figure 7**. Description of a diagram of the currents designed for each FADs around Guadeloupe island.

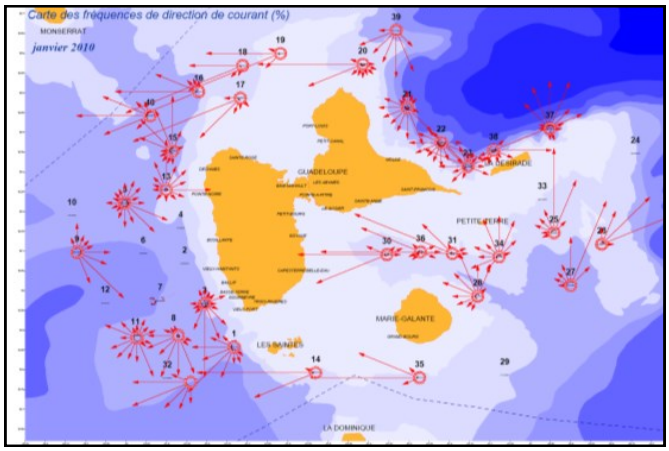


**Figure 8**. Map of the currents around Guadeloupe in January 2010.

## DISCUSSION

The FADS position may be fairly precise, but the direction its points out results from one or several currents at specific depths pulling on the rope. Currents of contrary directions, according to the depth, may be active but unseen.

The intensity of the currents is more difficult to assess. Contrary currents, at varying depths, could for example give a less straight line to the rope and therefore would tend to push the FADS towards its turning center, which would likely mean a current of lesser intensity. With the "DCP" software, currents of varying forms and intensity have been applied to a given FAD (Figure 9). The simulations show that theoretically the FADS may have varying positions, although the pulling on the buoy is of the same intensity. In practice, the data show an overall consistency (Figure 10) and also match the observations made by the fishermen using the same spot.

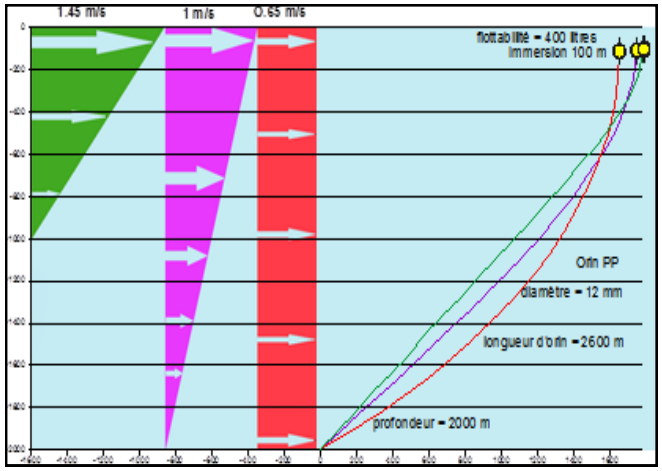


**Figure 9**. Behaviour of a FAD with three currents of varying forms and intensity.

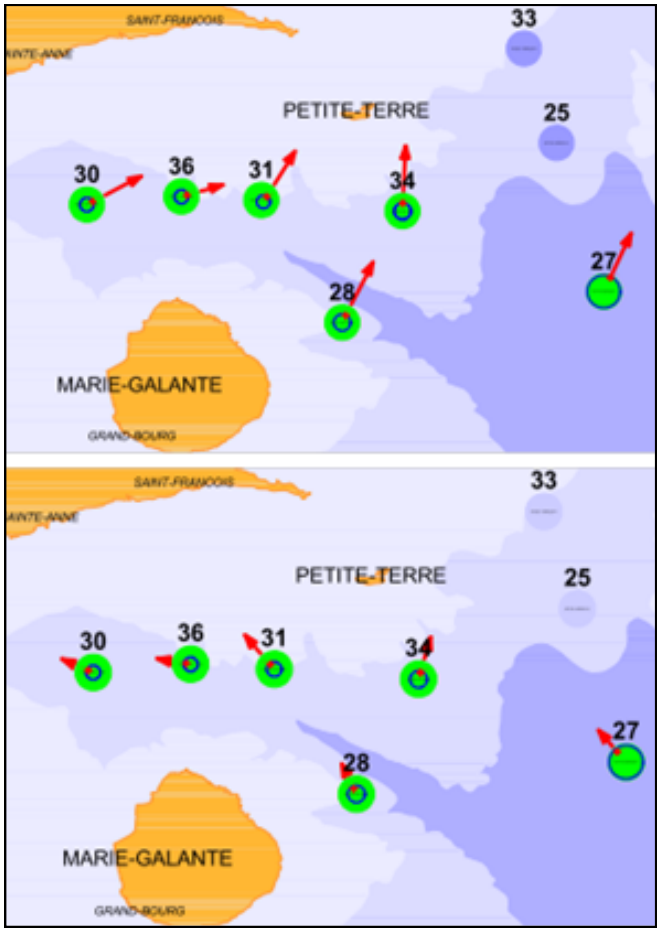


**Figure 10**. Intensity and direction of the currents on the south of Guadeloupe at different periods.

## CONCLUSIONS AND PERSPECTIVES

The processing of the data provided by the GPS fitted on the FADS buoys provide a general overview of the currents direction and an estimate of their intensity. Generalizing the equipment and centralizing the data on a single website would enable a single monitoring of all the devices and would provide information to be compared with the catches by fishermen. Fitting the FADs with sensors and transmission devices would help develop an operational oceanography and benefit the fishermen. The FADS cost would also be shared among the various users. Examples of this in Guadeloupe are shown underneath. (Figures 11 and 12).

**Figure 11**. FAD equipped with acoustic material to register earthquakes around Guadeloupe (OVSG).

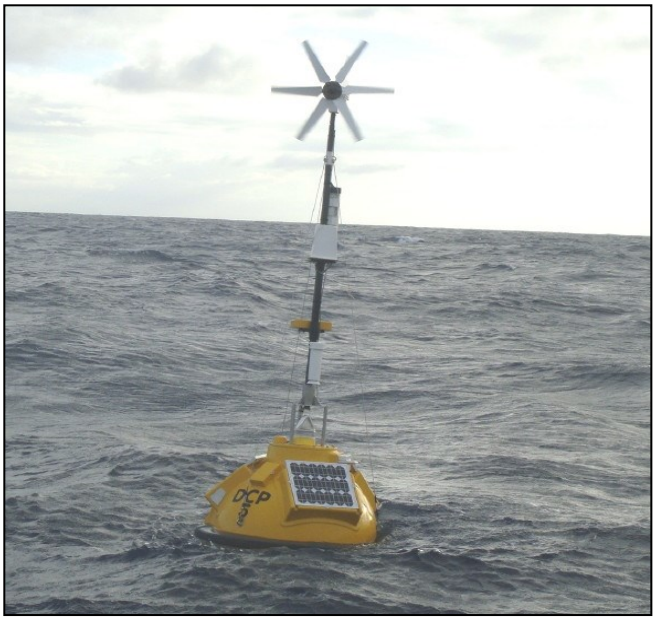

**Figure 12**. FAD equipped with a hydrophone to monitor marine mammals (UAG).

## ACKNOWLEDGEMENT

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