

# M3 COASTAL LAGRANGIAN DRIFTER: COST EFFECTIVE, ROBUST, PRECISE AND USER FRIENDLY

Gabriel Navarro<sup>64</sup>, Raúl García<sup>65</sup>, Dana DeShetler<sup>66</sup>, José Alberto Ortega<sup>67</sup>, Javier Ruiz<sup>68</sup>

## Abstract

This paper presents the design of the coastal drifter and the communications protocols included in the PCT/ES2012/070432. These drifters are handy, robust and incorporate the latest advances of positioning and communication technologies. The communications are fully integrated in the electronics device and the autonomy could be more than three months. Drifters enable a precise determination of water currents, from channel flows in estuaries to the large streams of open ocean. Finally, LDManager is a user-friendly web interface to handle your data and configure your drifters.

**Keywords** - lagrangian drifter, coastal applications, user-friendly software

Figure 1 displays the exploded view of the drifter. The lagrangian device has been made of special UV-proof polyethylene rotomolded consists of two parts, the floater and the cap. The dimensions are 70 cm length and 22 cm diameter. The lower cylindrical cavity encloses the heaviest elements of the drifter, i.e. the battery packs and the ballast. Its length allows the center of gravity of the buoy to be further below from the flotation line than in some other the drifters in the market.

The electronic device is located inside the conical cavity. This shape provides flotation to the drifter and stability against horizontal efforts like wind drag. Several electronics circuits that include a GPRS/GSM module, a GPS module and an ARM processor compose the electronic device. Table 1 presents the technical specifications of the electronic device. The GPS and GSM/GPRS antennas are included in the upper cylindrical cavity, keeping them at the top part of the floater, where coverage is maximum. A SIM card is needed for the GPRS/GSM module to work. The device periodically sends commands to a server. These commands contain the position and velocity of the drifter generated by the GPS module. New roaming international tariffs allow the cost-effective transmission of position data. Working under normal conditions, i.e. 10 and 60 minutes of sampling and transmission interval respectively, the cost of the one data transmission is less than 0.05 € in Europe, USA and Canada, making these drifters highly competitive.

LDManager is a user-friendly web interface to handle the position data sent by drifters and to configure the devices assigned to one user. Sampling and transmission intervals parameters are modifiable for each drifter. The autonomy of a device ranges between 2 and 100 days, depending on the values set for these intervals and the number of mounted battery packs.

Finally, the trajectory of objects at the ocean surface results from the combined action of wind and currents. Depending on the research interest, there are three standard commercial drogues: Pila, that has been designed to be shackled directly in the coastal drifter to follow the first layer of water; Satis, designed to provide a strong seize of drifter to the water. It will suffice for most of your research needs and Firma, designed for the most exigent experiments under international standards.

Actually, these drifters have been used by Salvamento Marítimo placed at Tarifa (Spain) and Univeristy of Cadiz to validate surface currents obtained from HF radars located in the vicinity of the Strait of Gibraltar. Moreover, some experiments in the estuary of Guadalquivir have been performed in the context of regional research project to estimate the relationship between the dynamics and the turbidity plume.

**Figure 2. Main screen of LD Manager.** ►

Technical specifications of the electronic device.	
GSM	Quad-Band GSM 850/900/1800/1900 MHz
GPRS	Multi-slot class 12
GPS	Receiver 16 channel, L1 1575.42MHz Accuracy position 5 m Hot start <3.5 sec Warm start = 33 sec Cols start = 34 sec
Proccesor	ARM Core
Memory	400KB (RAM) and 1.2 MB (Flash)
Battery	Lithium polymer (LiPo) Capacity = 6150mAh Nominal = 3.7V
Antennas	GSM: 0 DBi GPS: Active 27 DBi
Charging conditions	DC 4.2V 2A max (positive polarity)

**Table 1. Technical specifications of the electronic devices.**

