

# Float of the month

October 2009

## **Long-lived Argo float reveals energetic subsurface currents and eddies in the Western Mediterranean**

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The Argo float of the month has two WMO ID numbers, 6900279 and 6900453. It belongs to the Istituto Nazionale di Oceanografia e Geofisica Sperimentale (OGS) and was deployed in the Catalan Sea (41°N45', 3°E49', in the NW Mediterranean Sea) on 30 June 2004 as part of the MFSTEP project sponsored by the 5<sup>th</sup> Framework Programme of the European Commission. It was programmed to drift at 350 m depth and to measure temperature and salinity profiles every 5 days (50 days) from 700 m (2000 m) to the surface (Poulain et al., 2007).

The float moved to the southwest with the Catalan Current until it reached more or less 40°N and veered to the east following the northern continental slope of the Balearic Islands (Mallorca and Menorca, see Fig. 1). Upon reaching 5°E in April 2005, it showed unusual rapid meridional displacements, going back and forth between approximately 40°N, 5°E and 41°N, 4°E. Subsequently, it drifted westward and stranded on the eastern coast of Mallorca Island on 8 Oct 2005 after a total of 83 cycles.

After recovery and refurbishing, the float was redeployed south of Mallorca at 38°N59', 3°E05'(Fig. 2) on 5 July 2006 and was assigned a new WMO number. After a first fast displacement, it moved slowly between Mallorca and Ibiza Islands (eventually touching the bottom at some cycles), turned cyclonically around Ibiza and proceeded to the southwest and reached the Alboran Sea at the beginning of 2008. Then it was caught by the Algerian Current and moved eastward until 3°E and was entrained offshore in a cyclonic eddy. In September 2008, it was again near the continental slope south of Ibiza Island (near 38°N, 1°E) and then moved southward to reach the African shelf where it got stuck for 2 months (Nov-Dec 2008). It finally escaped in early 2009 and moved fast towards the east following the African slope and was trapped by another large scale (200 km diameter) cyclonic eddy extending between 4-8°E and 37-39°N. The float stayed in that recirculation feature between April and August 2009. At the time of writing this note (September 2009) the float is still operational after 231 cycles.

This long-lived float, deployed twice in the Western Mediterranean, revealed energetic subsurface currents and eddies. Indeed, speeds calculated from the displacements of the float near 350 m depth over 4-5 days (Fig. 3) can be as large as 30 cm/s. This maximal swift current was found during the back-and-forth meridional movement of the float northwest of

the Balearic Islands, in correspondence to a cyclonic strong cold-core eddy detected in satellite data (sea surface temperature and sea level height). This value of 30 cm/s is, to our knowledge, the absolute maximum speed observed by Argo floats near 350 m depth in the entire Mediterranean Sea over the last decade. It is compatible with the speeds derived from satellite altimetry and simulated by numerical models. Subsurface speeds near the continental slopes of Spain (including the Balearic Islands) and Africa (in the Algerian Current and related instability eddies) are bounded by 15 cm/s.

## References

Poulain, P.-M., R. Barbanti, J. Font, A. Cruzado, C. Millot, I. Gertman, A. Griffa, A. Molcard, V. Rupolo, S. Le Bras, and L. Petit de la Villeon (2007) MedArgo: a drifting profiler program in the Mediterranean Sea. *Ocean Sci.*, 3, 379-395.

## Acknowledgements

Thanks to J. Tintore, A. Pascuale, S. Ruiz, N. Pinardi, J. Nilson and M. Menna for interesting discussions on the fast currents observed by floats in the Western Mediterranean and for the comparisons with satellite data and numerical simulations.

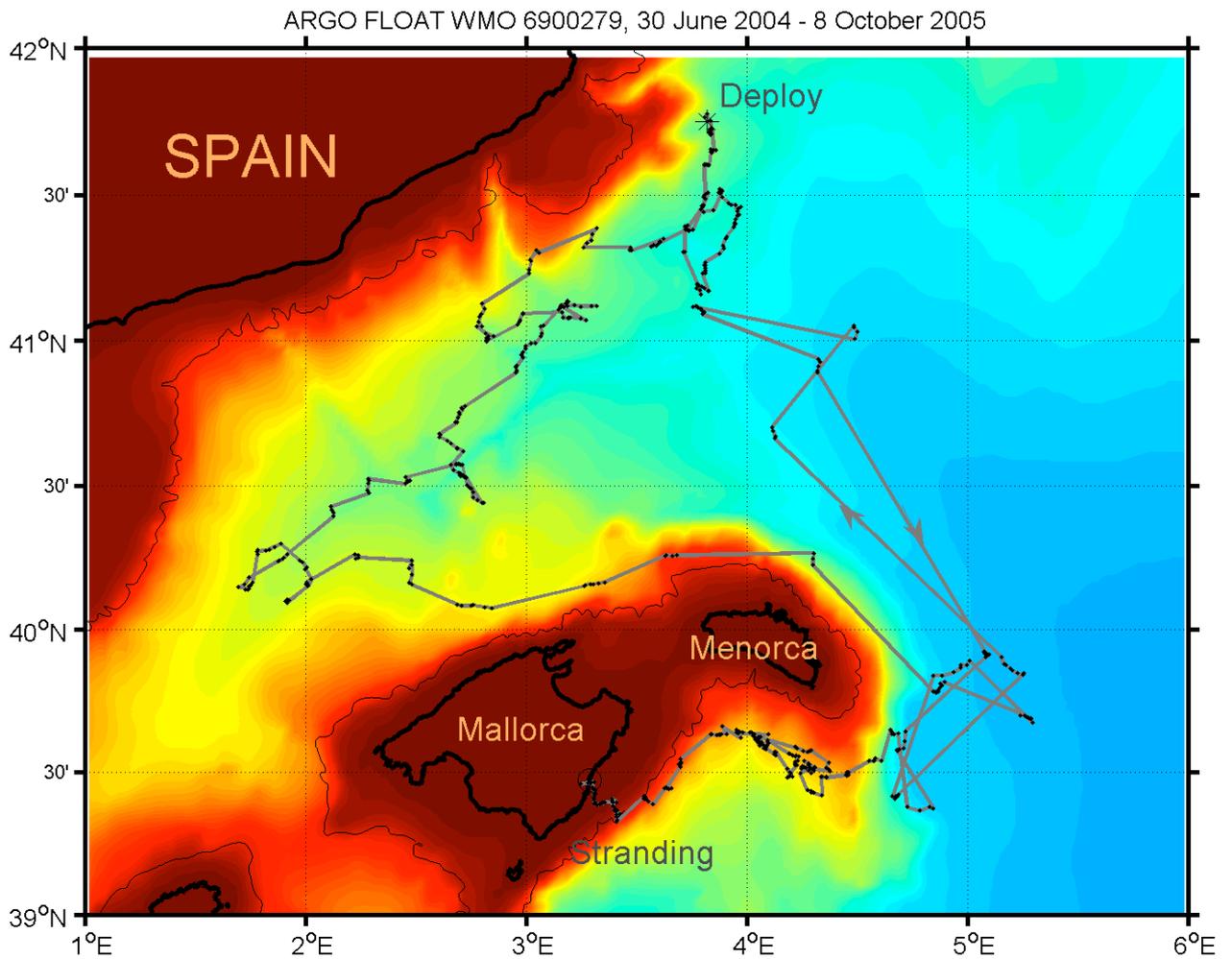


Fig. 1. Trajectory of float WMO 6900279. Black dots are the Argos positions. Deployment and stranding (or last fix) positions are denoted with star and open circle symbols, respectively. Bathymetry is color-coded and the 400-m depth isobath is overlaid.

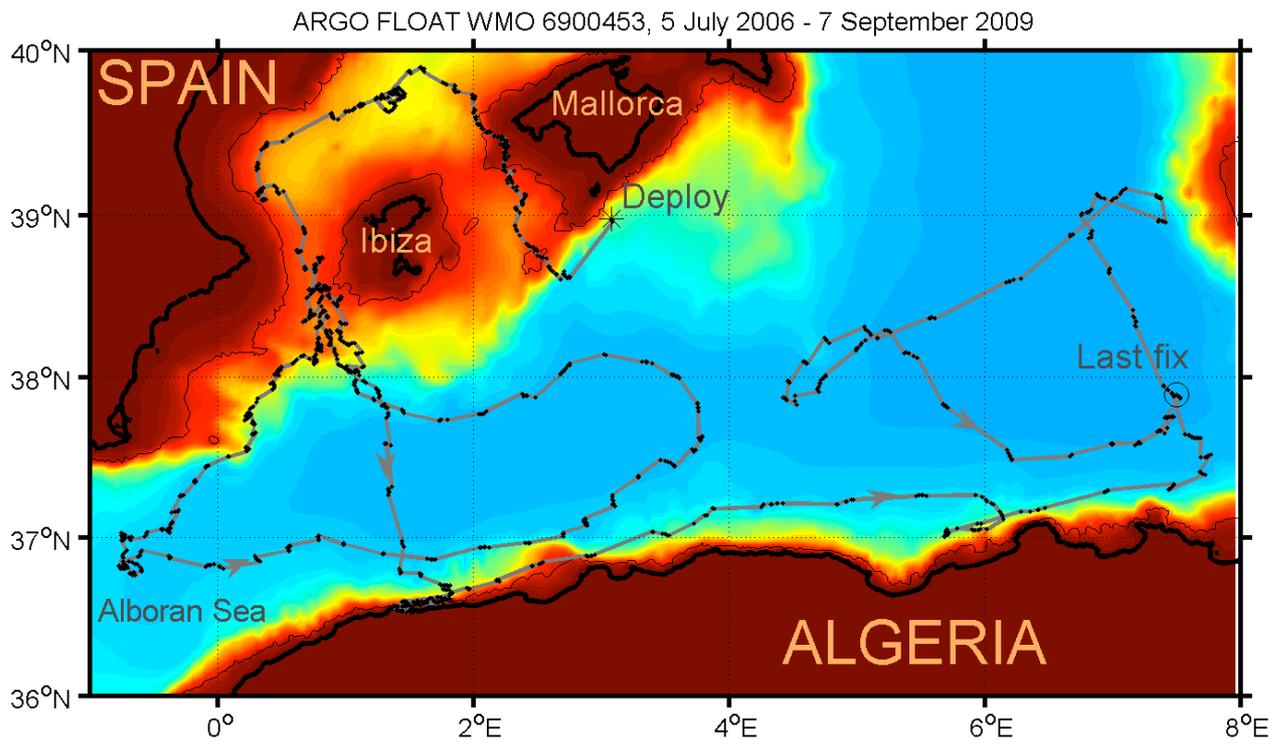


Fig. 2. Same as Fig. 1 but for float WMO 6900453.

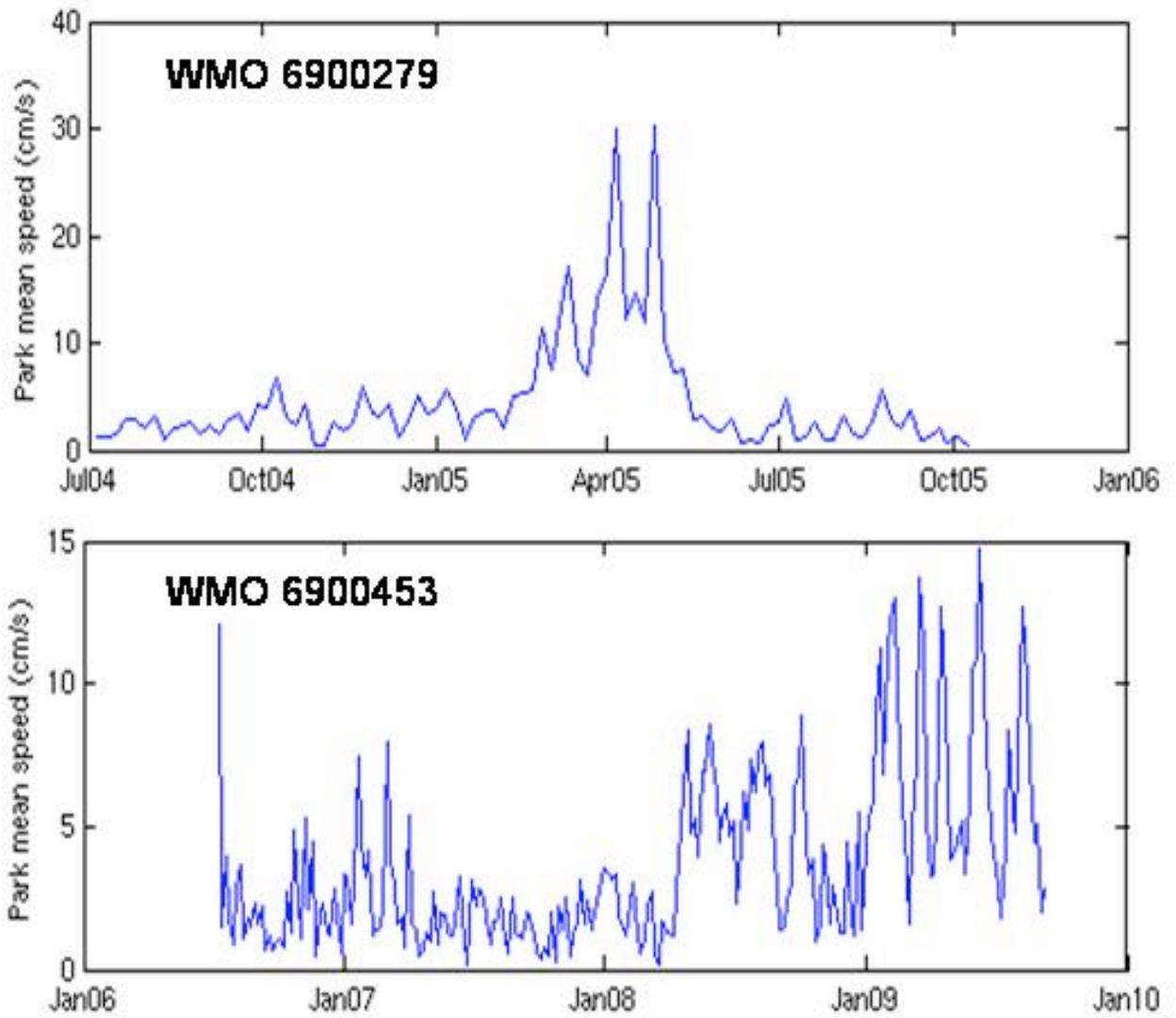


Fig. 3. Speed at 350-m depth versus time for floats WMO 6900279 (top) and WMO 6900453 (bottom).