

Implementation of a new methodology for *in situ* measurement of vertical velocities using data from the 2019 FUMSECK cruise

Vertical velocities knowledge is essential to study fine-scale physical processes in the surface layers of the ocean and to understand biological production mechanisms. However, these vertical velocities are often neglected due to mainly two reasons: their order of magnitude ($\text{mm}\cdot\text{s}^{-1}$) lower than the one of the horizontal velocities ($\text{cm}\cdot\text{s}^{-1}$), and the challenge of this *in situ* measurement. The FUMSECK cruise, which took place in spring 2019, in the gulf of Genoa, collected *in situ* measurements of vertical velocities using various instruments, including Acoustic Doppler Current Profilers (ADCP). The analysis of these data, object of this report, required the elaboration of an original processing chain, first developed for the data of the 5th beam of a Sentinel V (ADCP next generation), then generalized to other types of acoustic recording of vertical velocities. We obtain vertical velocity estimates of the order of $\text{mm}\cdot\text{s}^{-1}$, as expected, and we show the accuracy of these measurements for all datasets. Finally, the complementary use of satellite data (sea surface temperature, chlorophyll concentration, altimetric currents), together with the continuous *in situ* physical and biological measurements, result in a three-dimensional view of fine-scale dynamics. Therefore, the promising results of this innovative study open up the possibility of generalizing *in situ* vertical velocity measurements in the ocean.

Key words: vertical velocities; FUMSECK cruise; fine-scale processes; ADCP.