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Observations of anticyclonic and cyclonic Subthermocline Submesoscale Coherent Vortices: a case study in the Northwestern Mediterranean Sea

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The surface geostrophic turbulence is mainly constituted by strong surface intensified eddies formed by boundary current instability, whereas within the interior of the ocean smaller vortical structures appear to be prominent. They are called Submesoscale Coherent Vortices (SCVs) and are known to be long-lived features. They are particularly efficient in transporting tracers (like temperature, salinity, dissolved oxygen for instance) over long distances. Anticylonic SCVs have been commonly observed in several oceans since the late 70s and the discovery of the Meddies, but less is known about cyclonic SCVs, which were hypothesized to be less stable and therefore harder to observe.

Mooring data, cruises and in particular, regular deployments of gliders in the Northwestern Mediterranean Sea since 2007 revealed the presence of several anticyclonic and cyclonic SCVs. They are both characterized by small radius ($\sim$5-10km, about the internal radius of deformation of the area), velocity maxima at intermediate depth of $\sim$5-15cm/s, high Rossby numbers of 0.1-0.5 and local Potential Vorticity anomalies. In this study, we present a census and a dynamical description of the encountered SCVs, as well as a discussion on their formation process and role in the ocean circulation.