Submesoscale blocking of Chl by HF Radar LCSs

Ismael Hernández-Carrasco (SOCIB) A. Orfila (IMEDEA); E. Reyes (SOCIB)

The Ibiza channel is one of the major sites in relation to water circulation in the Western Mediterranean basin. While the large scale dynamics is well described by geostrophy, the small scale processes and their relevance in this region are still poorly understood. A preliminary study using the average of FSLE from HF Radar surface currents shows the apparition of Richardson regimen at pair particle separation of 8 km, scales not well resolved by altimetric data. This confirms that relative dispersion, at surface, is controlled locally by submesoscale structures and not only by larger and slower mesoscale structures. To study the influence of local dynamics on the accumulation or dispersion of chlorophyll in the Ibiza Channel we have used high-resolution satellite-derived Chlorophyll-a data from MODIS/Aqua and GLOBCOLOUR products. We have found that Lagrangian Coherent Structures (LCSs) deduced from HF Radar measurements strongly organize the surface distribution of Chl in coastal regions. For instance, in autumn, high values of Chl-a concentration are accumulated at the southwest of Ibiza Island, due to the blocking effect of nutrient rich waters coming from the Atlantic Ocean by a quasi-permanent coherent structure that acts as barrier. Similar relationship between these LCSs and Chl distributions have been found over the year. These barriers prevent Chl-a from traveling towards northern regions of the Western Mediterranean Sea. Thus, such LCSs deduced from HF Radar are a major mechanism for the transport and dispersion of rich coastal waters, impacting physical and biological connectivity over large scales. These results are of great importance as they allow us to infer spatial distribution of relevant ocean variables (Chl-a, SST, salinity) by using hourly HF Radar surface currents. Furthermore these Radar LCSs could be an important tool to localize zones of convergence and divergence for plastic debris accumulation or jellyfish aggregations.