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SAR detected river mixing and coastal wave/current difusion

Margarita Diez (1), Juan Jose Martinez-Benjamin (2), and Emil Sekula (2)

(1) Ports de la Generalitat, Vilanova i la Geltru, Barcelona, Spain, (2) UPC . Barcelona Tech. AV. DOCTOR MARAÑON, 44-50 08028 BARCELONA SPAIN

The Synthetic Aperture Radar SAR is an active radar which emits its energy in the centimetre frequencies. Due to the large orbital velocity of the satellite (7.5km s^{-1}) approximately,
the path of the antenna itself may be converted as a virtual antenna of a much larger size. The SAR instrument may also be installed on a plane, or on a helicopter. The SAR backscattering depends on the roughness of the small scale surface of the ocean. When the surface is rougher (mostly due to capillary waves in the surface) the intensity of the receiving signal is stronger due to Bragg resonant dispersion [1,2] and a white zone is observed in the image when the surface is
very rough. Rivers and tensioactive slicks and spills are well detected as dark areas in the ocean surface. An image selection of SAR images in order to identify coastal river plumes or oil spills of more than 1000 ERS-1/2 and RADARSAT Synthetic Aperture Radar SAR images for the test site in the NW Mediterranean seawere clasified and stored by [2,3,7] during the “Clean Seas” International project and the “Marine pollution and surface dynamics in the NW Mediterranean Sea” European Spatial Agency ESA project AO-ID C1P.2240.
A geometry of gray scale ranges and boundaries of spatial dynamic surface features may contain new helpful information about the turbulent structure at different distances from the coast. Already we used multi-fractal analysis techniques to investigate man-made oil spills [3-5] We apply these techniques to the analysis of ocean surface multi-fractal features (eddies, mushroom-like currents, etc.) to understand the scale to scale transport and coastal effects. (Redondo et al. 1998)(Diez et al. 2008) [4,7].

The effect of bathymetry and local currents are important in describing the ocean surface behavior. In the NW Mediterranean the maximum eddy size agrees remarkably well with the limit imposed by the local Rossby deformation radius using the usual thermocline induced stratification, the distribution of eddies and oil spills also mark the topology of the mixing [5-9].

A series of experimental measurements of the Lagrangian characteristics of the surface currents near Barcelona and Vilanova were performed during several years for different wind and wave conditions. The seasonal influence on the water recirculation and the influence of local conditions is apparent when the formation of a local thermocline also forces strong Langmuir circulations.

Understanding the dispersion of very large freshwater discharge from the Rhone and the Ebro into the Mediterranean Sea and its impact on the biology and biogeochemistry of western Mediterranean. Because of the lack of tides and prevalence of strong wind forcing by the Mistral and Tramontana winds, the discharge of the rivers forms a classical example of a wind powered ROFI. The Fractal analysis indicates a river induced anisotropy anomalous surface mixing [6,7]

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