

Vortices, Streaks and Fronts in Ocean/Atmosphere interfaces

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Remote sensing by electromagnetic wave (IR, visible, UV, radar) technology, both in active and passive methods (Synthetic Aperture Radar (SAR), Spectra/ Wavelet, etc...) provide better discrimination and higher resolution in complex geophysical flows. In the ocean surface, and even more so, in the coastal zone, where turbulent flow is generated in the ocean surface either by waves, wind or/and local currents. The conditions are non-homogeneous, and in the presence of a pollutant the SAR detects many interesting topological features [1, 2]. New techniques are used for the analysis, of Images provided by the ESA ERS1/2, ASAR, ENVISAT, RADARSAT and other Canadian and Russian Satellites. We shall concentrate and provide statistics, as well as describing some events detected by several satellites and with additional cruise observations and measurements [3] in the North-west Mediterranean Sea area between 1996 and 2012 as well as in other European Coastal regions. The structure of the flows are presented and used to parametrize mixing at their relevant scales. The PDF of the basic instabilities are different if they are analysed at scales smaller, or greater than the Rossby Deformation Radius scale. RL. The Results show the ability to identify different SAR signatures and provide calibrations for the different configurations of vortices, (round or elliptical), fronts, spirals, Langmuir cells, oil spills and tensioactive slicks are all relevant and eventually allow some predictions of the self-similar structure of the environmental rotating/stratified turbulence. Such complex coastal field-dependent behavior is strongly influenced by stratification and rotation of the turbulence [2]; non homogeneous, and non local spectra are observed only in the range smaller than the local RL. The measures of diffusivity from buoy or tracer experiments are used to calibrate the behavior of different tracers and pollutants. Using different polarization and intensity levels from satellite imagery, we may distinguish between natural and man-made sea surface features due to their distinct self-similar and fractal appearance as a function of spill parameters [4], environmental conditions and history of both oil release and coupled Atmosphere-Ocean interface weather conditions. [1] Redondo, J.; Matulka, A.M.; Carrillo, J. (2010) Vortex decay in stratified flows. *Topic Problems of Fluid Mech.* 2010. Praga, AS.127-130. [2] Castilla R., Redondo J.M., Gamez P.J. and Babiano A. (2007), *Non Linear Processes in Geophysics*, 14, (2007) 139-151. [3] Sekula E., Redondo J. M. (2008) *The structure of turbulent Jets, Vortices and Boundary layer.*, *Il Nuovo Cimento*, 31, 893-907. [4] Redondo J.M. and Platonov A. (2009) *Environmental Research Letters*.