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# Multifractal analysis of SAR of the ocean surface, currents, eddy structure, oil sliks and diffusivity analysis

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The use of Synthetic Aperture Radar (SAR) to investigate the ocean surface provides a wealth of useful information. Here we will discuss some recent fractal and multifractal techniques used to identify oil spills and the dynamic state of the sea regarding turbulent diffusion. The main objectives is to be able to parametrize mixing at the Rossby Deformation Radius and aid in the pollutant dispersion prediction, both in emergency accidental releases and on a day to day operational basis. Results aim to identify different SAR signatures and at the same time provide calibrations for the different local configurations that allow to predict the behaviour of different tracers and tensioactives in the sea surface diffused by means of a Generalized Richardson's Law [1-3]. The diffusion of oil spills and slicks in the ocean (Figure 1) have been also investigated using the same multifractal techniques developed by [1, 3]. Different cases are studied analyzing mixedness, and multifractality [2].

2. Results and Discussion Experimental and Geophysical observations are investigated with multiscale fractal techniques in order to extract relevant information on the spectral characteristics of mixing and diffusive events. Both density and tracer marked oil spills and slicks are investigated in detail using third order structure function analysis that indicates strong inverse cascades towards the large scales producing spectral variations [4]. The different local mixing processes are compared by mapping their different multifractal scaling. Several uses of this new technique are proposed [5-8]

taking advantage of Zipf's Law, both for anthropogenic oil spills and other features, it is possible to predict the likely probability of oil spills and also distinguish the type of SAR signal and the time since a tensioactive was released in the ocean.

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