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Singularity Analysis: a powerful image processing tool in remote sensing of the oceans

A. Turiel (1,2), M. Umbert (1,2), N. Hoareau (1,2), J. Ballabrera-Poy (2,3), M. Portabella (2,3)

(1) Institute for Marine Sciences (ICM), CSIC. Barcelona, Spain (turiel@icm.csic.es), (2) SMOS Barcelona Expert Center (SMOS-BEC). Barcelona, Spain, (3) Marine Tecnology Unit (UTM), CSIC. Barcelona, Spain

The study of fully developed turbulence has given rise to the development of new methods to describe real data of scalars submitted to the action of a turbulent flow. The application of this brand of methodologies (known as Microcanonical Multifractal Formalism, MMF) on remote sensing ocean maps open new ways to exploit those data for oceanographic purposes. The main technique in MMF is that of Singularity Analysis (SA). By means of SA a singularity exponents is assigned to each point of a given image. The singularity exponent of a given point is a dimensionless measure of the regularity or irregularity of the scalar at that point. Singularity exponents arrange in singularity lines, which accurately track the flow streamlines from any scalar, as we have verified with remote sensing and simulated data.

Applications of SA include quality assessment of different products, the estimation of surface velocities, the development of fusion techniques for different types of scalars, comparison with measures of ocean mixing, and improvement in assimilation schemes.