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Oceanic coherent structures, and the behavior of marine ecosystems

Cristóbal López (1), Emilie Tew Kai (2), Vincent Rossi (3), Joel Sudre (4), Emilio Hernandez-Garcia (1), and Veronique Garcon (4)

(1) IFISC, CSIC-UIB, Spain (clopez@ifisc.uib-csic.es), (3) Universituy of New South Wales, Sydney 2052,AUSTRALIA, (2) IRD UR 109 THETIS, Centre de Recherche Halieutique, Sete, France., (4) LEGOS, Centre National de la Recherche Scientifique, Toulouse, France.

The turbulence in oceans forms a
complex network of structures that range in size
from the microscopic to thousands of kilometres across.
In particular, meso and submeso-scales structures (fronts, eddies,
filaments) that are on the scale of between 1 and 100
kilometers seem specially important for ocean life with all kinds of predator/prey
activity concentrated on them.
In this talk we focus on the role of oceanic
submesoscale structures on the behavior
of a top marine predator, the great frigatebird living in the Mozambique
channel. Using a Lagrangian dynamic concept, the finite-size Lyapunov
exponent (FSLE), we identified Lagrangian coherent structures
(LCSs) present in the surface flow in the channel.
By comparing seabird satellite positions with LCS locations, we demonstrate that
frigatebirds track precisely these structures in the Mozambique Channel,
providing the first evidence that a top predator is able to track
these FSLE ridges to locate food patches. After comparing bird
positions during long and short trips and different parts of these trips,
we propose several hypotheses to understand how frigatebirds can
follow these LCSs.