Oceanic coherent structures, and the behavior of marine ecosystems

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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.