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Estimating chlorophyll and sea surface temperature patterns from altimetry data

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In chlorophyll and temperature patterns taken from satellite pictures one can easily recognise convoluted filaments typical of tracers advected by chaotic systems. By identifying the surface of the sea with a phase space, one can formally use the geostrophic velocity field derived from altimetric maps as the definition of a two dimensional, time dependent dynamical system. Then, it is possible to show that the filaments observed are related to unstable manifolds of hyperbolic points. Here we use a technique, the Finite Size Lyapunov Exponents (FSLEs), that allows to locate manifolds of hyperbolic points, using altimetry anomalies (TOPEX/POSEIDON). We then compare with patterns observed in satellite pictures of chorophyll and see surface temperature. The method then allows to understand which features of the observed patterns are determined by pure advection, the deviations depending on the tracer active dynamics.