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Plankton blooms severely impact coastal regions. We model this ecology as informed by hyperspectral remote sensing instruments mounted on ocean-observing satellites. Flow fields are inferred from satellite imagery by inverse problem techniques. We analyze transport in resulting vector fields by Finite-Time Lyapunov Exponents, revealing pseudo-barriers in the flow. Global modeling methods for the population dynamic reaction diffusion advection systems will also be discussed. (Received June 24, 2011)