Multifractal analysis of a 1/54° physical-biogeochemical numerical model of the North Atlantic Ocean

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Multifractal analysis techniques are used to analyze the statistical properties of surface fields generated by a coupled physical-biogeochemical model of the North Atlantic Ocean. The numerical model was run at a 1/54° resolution during one year. We show that, over wide areas, temperature and chlorophyll concentration fields have the multiplicative cascade structure predicted by phenomenological models of turbulence. However, a fine analysis shows that this is not verified along the boundaries or in the zones that are strongly influenced by boundary conditions, such as in the West part of the Gulf Stream. Finally, we show with numerical simulations that this multifractal intermittency of tracer concentrations may be responsible for an important bias (20%) in the nonlinear terms involved in the calculation of biogeochemical fluxes.