Probabilistic estimate of the uncertainty due to physical forcings in phytoplankton models

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For decades the marine ecological models have sustained progressive developments and been subjected to an increasing degree of complexity in their processes, forcings and parameterization. In parallel, the validation techniques have evolved from visual to statistical comparisons, allowing fair estimates of the bias and correlations between model results and reference data. Still, it is difficult to estimate in advance what will be the uncertainty attached to any model prediction because of the complexity of the ecological models and the non linearity of their response to a change. Also, it is not trivial to determine the uncertainty of the model response due to one specific forcing. The uncertainty in an ecological model response is somewhat linked to the model sensitivity to a perturbation. Since the non-linear model responses to a perturbation may vary in wide ranges of possibilities, we chose to base our assessment on the probability theory, i.e. a "light" Monte-Carlo experiment. It consists in a reduced number of randomly-perturbated simulations where knowledge of the system allows narrowing the range of perturbations. The Belgian continental shelf (BCS; 51-52N and 2.5-3.5E; surface: 3600 km2) is a well-mixed and nutrient-enriched area where chlorophyll *a* spring bloom intensity and spatial distribution show interannual variations. These variations mainly depend on the river loads, the Atlantic water penetration through the English Channel, and the wind-driven advection. In this study, the uncertainty on modelled chlorophyll *a* prediction in the BCS is studied as a response to random wind perturbations. Statistical and probabilistic quantification of the results is being presented. That led to a better understanding of the model prediction capability.