EFFECTS OF STOCHASTIC WIND FORCING UNCERTAINTY ON PREDICTABILITY OF REGIONAL OCEAN MODELS

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Non-linear barotropic model of wind-driven circulation with nonlinear bottom friction is applied to understand prediction error induced by non-Gaussian wind uncertainty. This simple model describes a generic system with many degrees of freedom. For the case of not intrinsically chaotic system but randomized by external noise, the main efforts were devoted to study nontrivial collective behavior of finite-amplitude perturbations of different scales, and to understand how such perturbations affect model predictability. The decay of predictability (i.e. the growth of prediction error) is found to be rather power than exponential for small (up to 5 days) and intermediate times (up to 20-25 days) and not exponential for larger times. Actually it is a sequence of exponents with varying rates. The variance, skewness and kurtosis of IPT (a measure of model prediction skill) can obey bifurcations with the growth of prediction tolerance that is identified as a phase transition in model predictability. The nonlinear stage of prediction error evolution is characterized by non-Gaussian statistics of IPT, which is close to Weibullian one. The model predictability can be enhanced by adding a weak white Gaussian noise to initial conditions.