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Comparison of several strategies for specifying initial conditions for ensemble prediction.

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The definition of initial conditions for ensemble prediction is still an open question. Most of the efforts have so far focused on "dynamically constrained" approaches, such as breeding or singular vectors (SV). In those approaches, perturbations that have grown (breeding) or will grow (SV) rapidly are added to a control forecast. The basic idea is that forecasts emanating from these perturbations will span the dynamical modes which influence most the predictability of the flow. More recently new methods such as the Ensemble Kalman Filter (EnKF) or the Ensemble Transform Kalman Filter (ETKF) have been developed. The use of the EnKF does not produce dynamically constrained perturbed initial conditions. It is rather designed at producing a random sample from the probability distribution for the true state at the analysis time. Up to now, the relative merits of dynamically constrained versus unconstrained methods are still unclear. Using the Lorenz 63 and the Lorenz 95 model we have compared, in a perfect model framework, ensemble-forecast characteristics produced from bred, SV, EnKF and ETKF ensembles. We generate analogs to current implementations of the different techniques and evaluate the forecasts using Brier skill score and its decomposition, rank histograms, reliability diagram and R.O.C curves. Results show little difference between the different methods, with a sligth advantage for EnKF.