

Predictability and Ensemble Forecasting with Lorenz-96 systems

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Training Course 2024

- Part 1: The L96 model, chaos, error growth, ensemble forecast experiments (with a perfect model)
- Part 2: How to experiment with L96 using scilab, proposed activities
- Part 3: An imperfect forecast model and the representation of model uncertainties
- **Part 4:** Proposed activities with an imperfect model

Representing model uncertainties

- Select system T5 as truth
- Select an analysis error stdev of 0.02
- Run 20-member ensemble experiments for 45 cases
 - ▶ without a model uncertainty representation (stdev stoch forcing = 0)
 - ▶ with a model uncertainty representation (stdev stoch forcing = 0.01 and lag-1 autocorrelation = 0.46)
- Does the stochastic parametrisation of the fast scales have an impact on probabilistic skill?
- Does the reliability of the two sets of ensemble forecasts differ?

Representing model uncertainty in a small ensemble

- Repeat the previous activity with a 2-member ensemble
- Use 90 start dates
- Look at the CRPS. Would you conclude that model uncertainties should be represented?
- Now look at the fair CRPS. Are the results now consistent with the earlier 20-member experiments?

Same model error but larger initial uncertainty

- Return to the 20-member ensemble and 45 cases
- Set the analysis error stdev to 0.1
- Also set the initial perturbation stdev to 0.1
- Run two experiments with and without representation of model uncertainty
- Compare the fair CRPS. How big is the impact of the model uncertainty representation compared to the earlier case with more accurate initial conditions?

Do details of the stochastic scheme matter?

In the first examples in this part, a specific configuration for the representation of model uncertainty was provided (stdev of stoch forcing = 0.01 and lag-1 autocorrelation = 0.46).

What happens if you change the settings?

- Decrease or increase the stochastic forcing amplitude
- Decrease or increase the temporal correlation