Predictability and Ensemble Forecasting with Lorenz-96 systems

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Training Course 2023

- 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

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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?

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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?

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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?

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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

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