SPECIAL PROJECT PROGRESS REPORT

Reporting year	2022
Project Title:	Flow-dependence of the intrinsic predictability limit and its relevance to forecast busts
Computer Project Account:	spdecrai
Principal Investigator(s):	Prof. George Craig
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Name of ECMWF scientist(s) collaborating to the project (if applicable)	
Start date of the project:	2022
Expected end date:	2024

Computer resources allocated/used for the current year and the previous one

		Previous year		**Current year**	
		Allocated	Used	Allocated	Used
High Performance Computing Facility	(units)			30M	302k
Data storage capacity	(Gbytes)				

Summary of project objectives

Recent numerical experiments suggest that, on average, the accuracy of medium-range weather forecasts in the midlatitudes has not yet reached the intrinsic predictability limit proposed by Lorenz (1969), and further improvements in skill and lead time are possible. However, there is substantial case-to-case variability in error growth, and it is possible that some of the poorest forecasts may already be impacted by the intrinsic limit. To test this hypothesis, we propose to examine the sensitivity of forecast uncertainty growth to the magnitude of initial condition uncertainty for a large number of cases. These experiments will use a relatively low resolution of the ICON model with a stochastic convection scheme to represent small-scale variability. A selected case study will then be examined in detail using global convection-permitting simulations, where the rapid, small-scale error growth processes are represented as accurately as possible.

Summary of problems encountered

None.

Summary of plans for the continuation of the project

It is crucial for the objectives of this project to include a stochastic convection scheme into the model to better represent small-scale variability from convection and subsequent upscale error growth in simulations of O(>10km) gridsizes. In past studies we used the scheme of Plant and Craig (PC, e.g. Selz et al. 2022), which has several disadvantages. We are now investigating potential improvements to the PC scheme versus using a stochastic version of the Tiedtke-Bechtold scheme, for which a technical implementation is available from DWD. Before running the large case sample, comprehensive testing is required to figure out which scheme works best in what setup. The main testmetric will be upscale error growth from small amplitude perturbations and we plan to run convection-permitting simulations in limited area mode as a reference, preferably over continental North America.

List of publications/reports from the project with complete references

None.

Summary of results

There are no results from this project yet. We have however successfully installed and run the ICON model on the Atos machine and basically completed the migration. We plan to start the experiments in August or September, when the Atos computer is fully operational.