SPECIAL PROJECT PROGRESS REPORT

All the following mandatory information needs to be provided. The length should *reflect the complexity and duration* of the project.

Reporting year 2025

Project Title: Forecasting at sub-kilometre resolution with the HARMONIE-AROME model

Computer Project Account: spiecla2

Principal Investigator(s): Colm Clancy

Affiliation: Met Éireann

Name of ECMWF scientist(s) collaborating to the project (if applicable) -

Start date of the project: 1st January 2023

Expected end date: 31st December 2025

Computer resources allocated/used for the current year and the previous one (if applicable)
Please answer for all project resources

		Previous year		Current year	
		Allocated	Used	Allocated	Used
High Performance Computing Facility	(units)	30 M	29.88 M	30 M	21.68 M
Data storage capacity	(Gbytes)	0	0	0	0

Summary of project objectives (10 lines max)

The objective of this project is to explore configurations for running the HARMONIE-AROME limited-area NWP model at hectometric resolutions, and to assess the potential benefits for forecasting over Ireland.

Summary of problems encountered (10 lines max)

In recent months the HPC seems to be less stable, with more random crashes requiring task requeues. Retrieval of old experiment files from the ECFS has been quite slow too.

Summary of plans for the continuation of the project (10 lines max)

The remaining SBU will mostly be used to continue to investigate the time scheme options in HARMONIE-AROME, and the influence of the domain size.

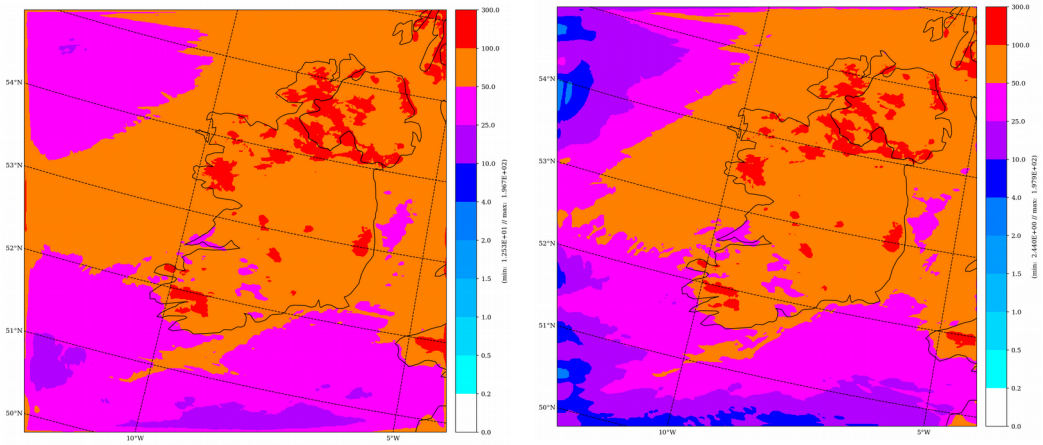
List of publications/reports from the project with complete references

None since last report

Summary of results

Since the 2024 Progress Report, work has continued using the latest Cy46h1.1 of the HARMONIE-AROME model. Experiments had shown that it was difficult to demonstrate objectively a benefit from increasing the grid resolution to 500m, and so most of the testing has stayed at 750m. Comparisons of tests with and without 3DVAR showed little differences in verification scores after the first few hours, and so the assimilation was generally switched off, making it technically easier to test across different domains and resolutions.

Previous reports discussed the benefit of coupling hydrometeors from the boundaries. This has been studied in more detail, with further modifications still under consideration. Shown below are 10 days of accumulated rainfall from a succession of forecasts from the 10-20th of February 2022. On the left, all available hydrometeors and cloud water species are fully coupled. The maxima on the western boundary appear to be somewhat unphysical. On the right, only cloud liquid is fully coupled, with cloud ice coupled only at the beginning.



Increasing the size of the domain would seem to be a good idea, and could be feasible computationally if one decides not to increase resolution. However, mixed results were found, with some poorer verification scores on a larger domain. In particular, this was very evident when experimenting with time scheme options for stability. This remains under investigation.