

EMI R&D 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 2026

Project Title: Interrogating sources of predictable circulation signals in seasonal forecasts

Computer Project Account: spgborei

Principal Investigator(s): Christopher O'Reilly

Affiliation: University of Reading

Name of ECMWF scientist(s) collaborating to the project (if applicable) Antje Weisheimer, Kristian Strommen.

Start date of the project: 1st April 2026

Expected end date: 31st Dec, 2028

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)	N/A	N/A	260 million	0
Data storage capacity	(Gbytes)	N/A	N/A	190Tb	0

Summary of project objectives (10 lines max)

Previous studies suggest that large-scale teleconnection responses to predictable drivers are underestimated in seasonal forecasts. Multiple factors may contribute to the weak circulation signals and therefore the signal-to-noise errors seen in many seasonal forecasts. However, direct assessment of individual predictability drivers from existing hindcasts is difficult due to short hindcast periods and complex driver interactions. This project will address this problem by explicitly probing sources of predictable circulation signals through targeted denial and isolation experiments using a version of ECMWF seasonal forecasting system (SEAS6) that systematically move away from full seasonal hindcasts. By comparing these experiments with the operational hindcasts, we can evaluate the linearity of different sources of predictable signals and reveal how individual and collective dynamical driving mechanisms contribute to the signal-to-noise paradox (SNP).

Summary of problems encountered (10 lines max)

So far we have been slightly hampered by the development of the ECMWF SEAS6 final version that we are planning to use as the base case. In addition we have been planning the exact methods to be used for the planned assimilation runs and how to best achieve these nudged stats in the ocean model, something that has been new to us. We are now set to press on with our test runs for this now we have developed a strategy for running these. The small tests for this have been done by a colleague at ECMWF in the research department, which is why they do not show up on the account usage numbers.

We have also had delays due to recruitment of postdocs on the project but these are now in place

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

Over the second half of 2026 we will perform the initial denial experiments, planned initially for a small subset of years and just a couple of important sources of potential predictability, specifically full depth ocean variability in the tropical Pacific and the initial conditions in the stratosphere. This will provide a useful test cases for the approach and we will then be set to run more extensive ensembles and sets of years/regions. This work is part of the wider NERC-funded AUSPICE project and we are also developing companion experiments with the UK Met Office DePreSys4 system, to add more value to these experiments.

List of publications/reports from the project with complete references

N/A

Summary of results

So far our work has been limited to small tests so no clear results to show as of yet.