

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: Experiments on Cloud-Aerosol-Radiation Interactions in HARMONIE-AROME Cycle 49T2h

Computer Project Account: dum
Emily Gleeson

Principal Investigator(s):

Affiliation: Met Éireann

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

Start date of the project: 01/01/2026

Expected end date: 31/12/2026

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)			25 M	2.2 M
Data storage capacity	(Gbytes)			National	

Summary of project objectives (10 lines max)

Testing of aerosol, microphysics and radiation options in HARMONIE-AROME CY49. So far I've mainly used the single column model MUSC and ran about 500 experiments using this, which enabled us to figure a lot about the aerosols and aerosol backgrounds especially.

Summary of problems encountered (10 lines max)

There were no major problems as such.

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

I am now moving on to 3D experiments and experiments involving clouds. As the work plan is substantial, I have also applied for an extension for another year. Much of the comparisons will be done in collaboration with Météo France and ALARO colleagues, who use different physics.

List of publications/reports from the project with complete references

A paper on the MPACE microphysics single column case is currently in progress and cannot be shared yet.

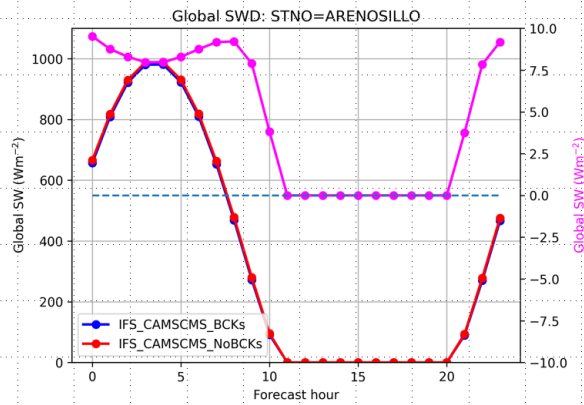
Summary of results

- 100s of MUSC single column clear sky experiments figuring out the differences between our CAMS aerosol climatology and that used by default in ecRad, and also how to control background aerosols. Comparisons were done between Tegen and the CAMS climatology (high res) and the lower version CAMS that comes with ecRad, both with and without backgrounds. Also tested the impact of the solar constant, the greenhouse gas and ozone usage, and the vertical profile of the aerosols and choice of optical properties.
- Experiments on the MPACE and DYCOMS2 microphysics single column idealised cases.
- 3 x 1-month 500m simulations nested within 2.5km runs (forgot to set ACCOUNT to this project so SBUs not deducted from this) but the data will be used in the microphysics studies.
- Microphysics comparisons: ICE3 with OCND2 versus ICE-T compared to EarthCare data.
- Experiments on testing the externalisation of the cloud droplet number concentration from radiation and microphysics.
- Experimentation with RADAER vs RADACT aerosol calls within radiation.

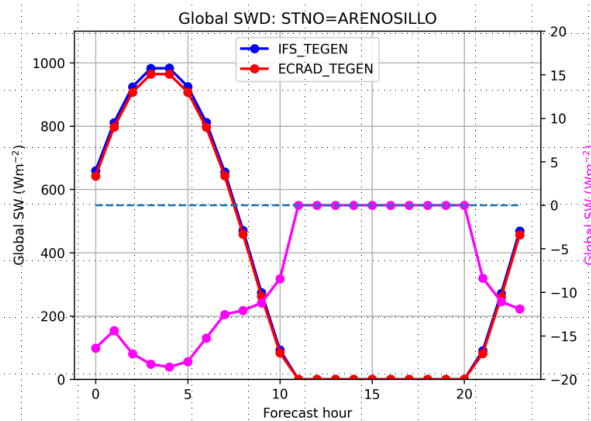
A few sample results are shown below:

Impact of Backgrounds IFS CAMSCMS

(i.e. Tropospheric and Stratospheric background)

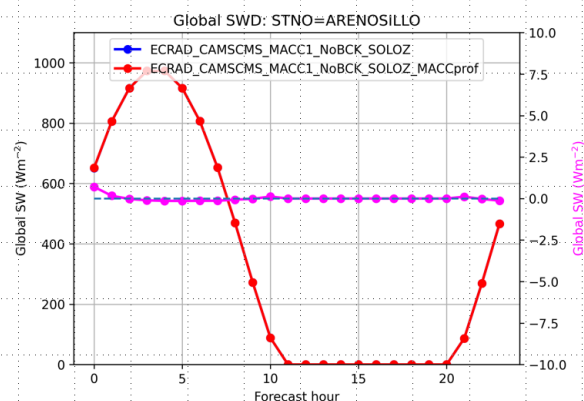


IFS vs ECRAD with TEGEN

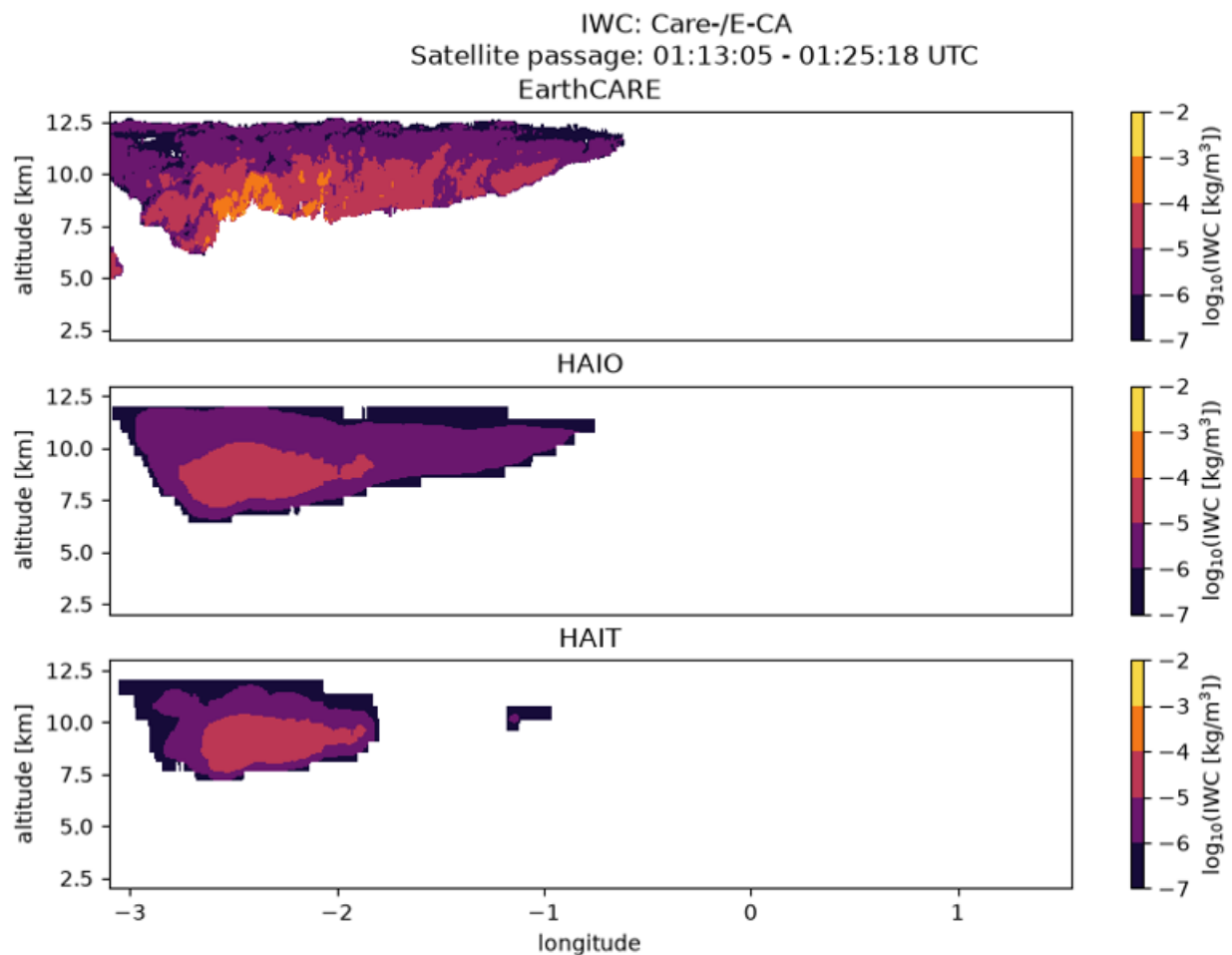


ECRAD CAMSCMS: Impact of Profiles

(No BCKs, updated RI0 and O3, the RADAER coeffs vs the RADACT coeffs for MACC)



(Top) Impact of backgrounds when using the CAMS climatological aerosols on a clear case over Spain. **(Centre)** The IFS vs ecRad schemes with Tegen aerosols. **(Bottom)** Impact of aerosol vertical profiles.



HARMONIE-AROME with ICE3+OCND2 (**HAIO**) and with ICE-T (**HAIT**) versus EarthCare (ACM-CAP_2B) satellite data.