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	2019
Project Title:	Evaluation, Tuning and Optimisation of Surface Physics Parametrizations in HARMONIE-AROME for NWP forecasting for Ireland
Computer Project Account:	spieglee
Principal Investigator(s):	Emily Gleeson
Affiliation:	Met Eireann
Name of ECMWF scientist(s) collaborating to the project (if applicable)	
Start date of the project:	01/01/2019
Expected end date:	31/12/2021

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)		5 M	0 M
Data storage capacity	(Gbytes)		10 TB	0 TB

Summary of project objectives (10 lines max)

The focus of this project is primarily on testing surface related physics modules in the model in order to improve weather forecasts for Ireland but also to feed all improvements back into the shared ALADIN-HIRLAM system for the benefit of all collaborating members. This work has currently not been carried out for any HARMONIE domain and it crucial in order to make the best use of the system and to continue to improve the skill of the forecasts. Testing the sensitivity of the surface physics will also feed into the mesoscale ensemble systems of the members.

Summary of problems encountered (10 lines max)

We recruited a postdoctoral fellow to look firstly at the surface physiography for Ireland. The person only started work in March and is still on the physiography improvement phase of the work. This is why no SBUs have been used to date. We will start simulations in the second half of the year – when applying for the special project, I did not think that we needed to space the using of the SBUs out evenly over the year.

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

A 3-year long HARMONIE-AROME cycle 43 simulation in climate rather than NWP mode. This will be used to test the new surface physics options in the model (soil, snow, vegetation) over the Irish operational domain in order to identify systematic biases – it is important to run it in climate mode as using the system with data assimilation masks/reduces much of the biases and from experience we have found that a climate stylesimulation is a lot more revealing. SBU cost (using the smaller domain) ~ 4M SBUs – this task will not be done using the SBUs as we need to use a larger Irish domain – will use our operational allocation for this work.

SURFEX uses physiography databases relating to land-cover, topography, soil/clay/sand and lakes. These databases have not been thoroughly checked for Ireland – several issues have been uncovered for other domains and a thorough check and comparison with local databases for Ireland (e.g. GSI, agriculture databases) will firstly be carried out. Summer and Winter month-long simulations using HARMONIE-AROME cycle 43 simulation in climate rather than NWP mode will be carried out to test the sensitivity of the physiography datasets. Tests using SURFEX in offline mode will also be carried out to evaluate a complete set of surface options. SBU cost (smaller domain) based on 5 sensitivity tests, each 2 months long: 4 M SBUs. - require alot more resources that originally planned as we need to use a larger Irish domain.

When upgrading to cycle 40 of HARMONIE-AROME we found issues relating to maximum temperatures and over-prediction of fog which are thought to be related to issues with the surface model. The remainder of the SBUs will therefore be used for a suite of sensitivity experiments that will help and lead to the tuning of various surface parametrizations. Many of the tunings are currently only valid for specific climates. SBU estimate: 5M SBUs.

List of publications/reports from the project with complete references

Using the best available physiography to improve weather forecasts for Ireland by **Geoffrey Bessardon and Emily Gleeson** – submitted for the EMS conference in 2019 in Copenhagen – paper will be published after the conference.

Summary of results

If submitted **during the first project year**, please summarise the results achieved during the period from the project start to June of the current year. A few paragraphs might be sufficient. If submitted **during the second project year**, this summary should be more detailed and cover the period from the project start. The length, at most 8 pages, should reflect the complexity of the project. Alternatively, it could be replaced by a short summary plus an existing scientific report on the project attached to this document. If submitted **during the third project year**, please summarise the results achieved during the period from July of the previous year to June of the current year. A few paragraphs might be sufficient.

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As the project is delayed we do not have any useful results to present at this stage as have not run any simulations. We have been comparing the ECOCLIMAP databases in HARMONIE-AROME with local datasets but it's not yet at the stage where updates can be applied to ECOCLIMAP and tested in 3D simulations.