

# Using the best available physiography to improve weather forecasts for Ireland

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**1. Introduction: Background and motivation** 





# a. What is physiography?

- **No clear definition:** Another name for geomorphology, physical geography (Collins Dictionary)
- My definition: Any natural or anthropogenic feature affecting the Earth's surface

Topography

#### Soil property



Example of soil layers





Sugarloaf peak, County



Land use





## b. Why is physiography important for Numerical

### Weather Prediction?

- Important exchange happens at the Earth's surface through multiple physical processes with the Atmospheric Boundary Layer.
- Understanding the exchange at the surface is important as it is where we live, produce our food and emit chemicals.



- c. Numerical weather prediction model at Met Éireann
- Met Éireann currently runs the HARMONIE-**AROME** configuration of the ALADIN-**HIRLAM** system
- Operational configuration cycle 40h1 (cycle 43 used for testing)
- 1000 × 900 grid points
- 2.5 km horizontal resolution
- 65 vertical layers
- Surface modelling: SURFEX



d. Why look at physiography to improve weather forecast for Ireland?

- Some HARMONIE-AROME performance issues are attributed to surface processes and physiography issues <sup>[6]</sup>.
- The use of an improved physiography

**3. Results:** 

## a. Sand and clay fractions

![](_page_0_Figure_38.jpeg)

Differences in sand and clay fractions between SOILGRID and SOILGRID-BLEND

![](_page_0_Figure_40.jpeg)

## b. Albedo

Changing **soil maps** has a **moderate** effect on **albedo** (Exp. 1 - control) while changing land cover (Exp. 2 - control) part has a significant effect.

![](_page_0_Figure_43.jpeg)

![](_page_0_Figure_44.jpeg)

#### c. Soil moisture

• Changing soil maps has a significant effect on soil moisture (Exp. 1 control) while changing the land cover (Exp. 2 - control) part has a moderate effect.

![](_page_0_Figure_47.jpeg)

to experiment 1 (middle), and experiment 2 (right)

#### f. Horizontal wind

• The control experiment and experiment 1 tend to have the largest wind speed and direction biases while experiment 2 has the smallest bias

![](_page_0_Figure_51.jpeg)

#### 20' 20-20' 20' 20-

Wind speed (WS) and direction (WD) biases timeline for 28 stations over Ireland (control experiment (red), experiment 1 (green), experiment 2 (blue))

#### 20 20

2-m temperature (T2m) bias timeline for 28 stations over Ireland (control experiment (red), experiment 1 (green), experiment 2 (blue))

20

Relative humidity (RH) bias timeline for 28 stations over Ireland (control experiment (red), experiment 1 (green), experiment 2 (blue))

### 4. Conclusions, implications and outlook:

### a. Conclusions

- New sand and clay fraction maps have been created for Ireland using a blend of national and international databases
- This new map presents significant sand and clay fraction differences (up to 20 %).
- A comparative experiment has been launched over a 4-day foggy period
- The new soil map has little influence on albedo and surface friction while ECOCLIMAP-SG presents significant differences
- The new soil map has an important influence on soil moisture compared to ECOCLIMAP-SG
- Both soil maps represent an improvement in forecast of relative humidity at the surface and 2-m temperature
- On average the new soil map has a very little influence on winds while ECOCLIMAP-SG presents a significant improvement
- These encouraging results need to be tested using more cases

#### b. Outlook:

- Test using both the new soil map and the new land use map
- HWSD-blend experiment currently under analysis

![](_page_0_Figure_71.jpeg)

#### **5.References:** [1] Creamer, R., et, al. (2014). [7] Petersen, G. N., et al. (2017). Using the best available physiography to [4] Masson, V., et, al. (2013). [2] http://www.umr-cnrm.fr/surfex/spip.php?article134 [5] Operational NWP In Met Éireann. Retrieved August 1, 2019 improve weather forecasts. [3] https://opensource.umr-cnrm.fr/projects/ecoclimap-sg/wiki [6] Bengtsson, L., et, al. (2017).