

# Irish climate re-analysis studies by Met Éireann and collaborators

Emily Gleeson<sup>1</sup>, Eoin Whelan<sup>1</sup>, Ray McGrath<sup>1</sup>, Roxana Tiron<sup>2</sup>, Sarah Gallagher<sup>1,2</sup>, Frederic Dias<sup>2</sup>

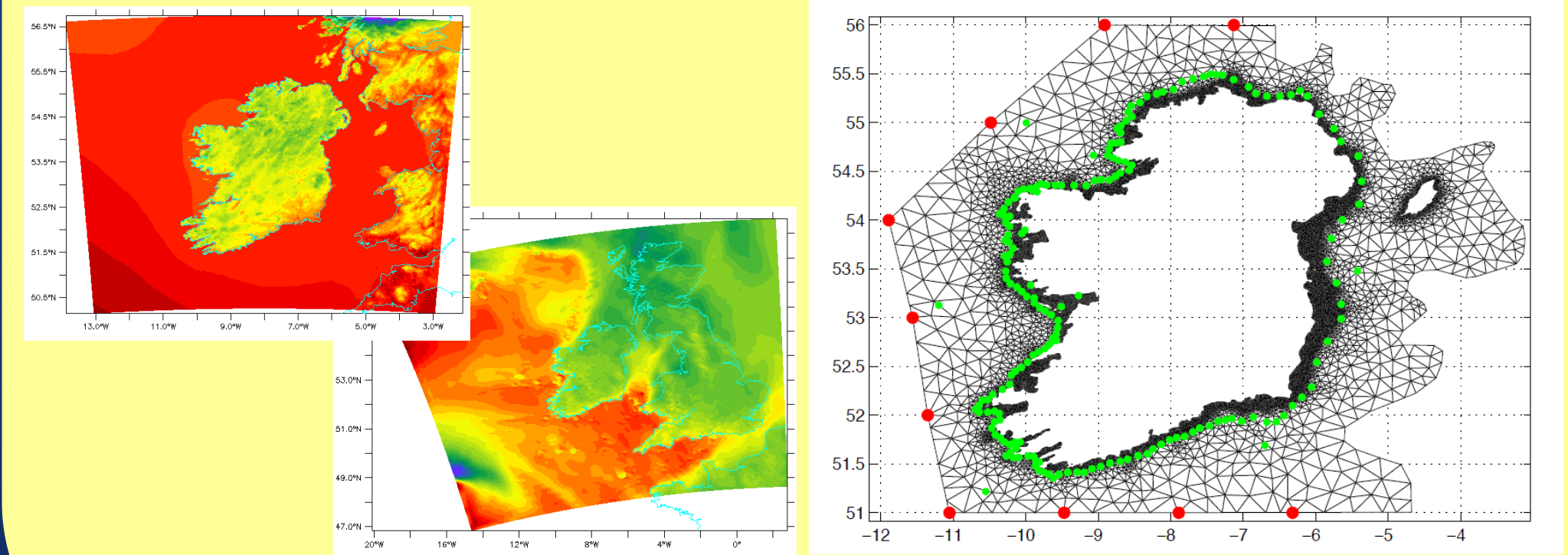
<sup>1</sup>Met Éireann, Dublin, Ireland. <sup>2</sup>University College Dublin, Ireland

## 1. Introduction

- Over the past year Met Éireann has been using HARMONIE for re-analysis studies of the Irish climate.
- One study involved a 13 year analysis of the wind and wave climate of Ireland in collaboration with UCD using the WAVEWATCH III wave model. This was performed on a triangular grid with a resolution of 10km offshore and 225m nearshore.
- A second study is now underway where we will produce a 30+ year re-analysis of the Irish climate (called MÉRA). This will be the highest resolution dataset available over Ireland and a very important resource for the country.

## 2. Simulation Details

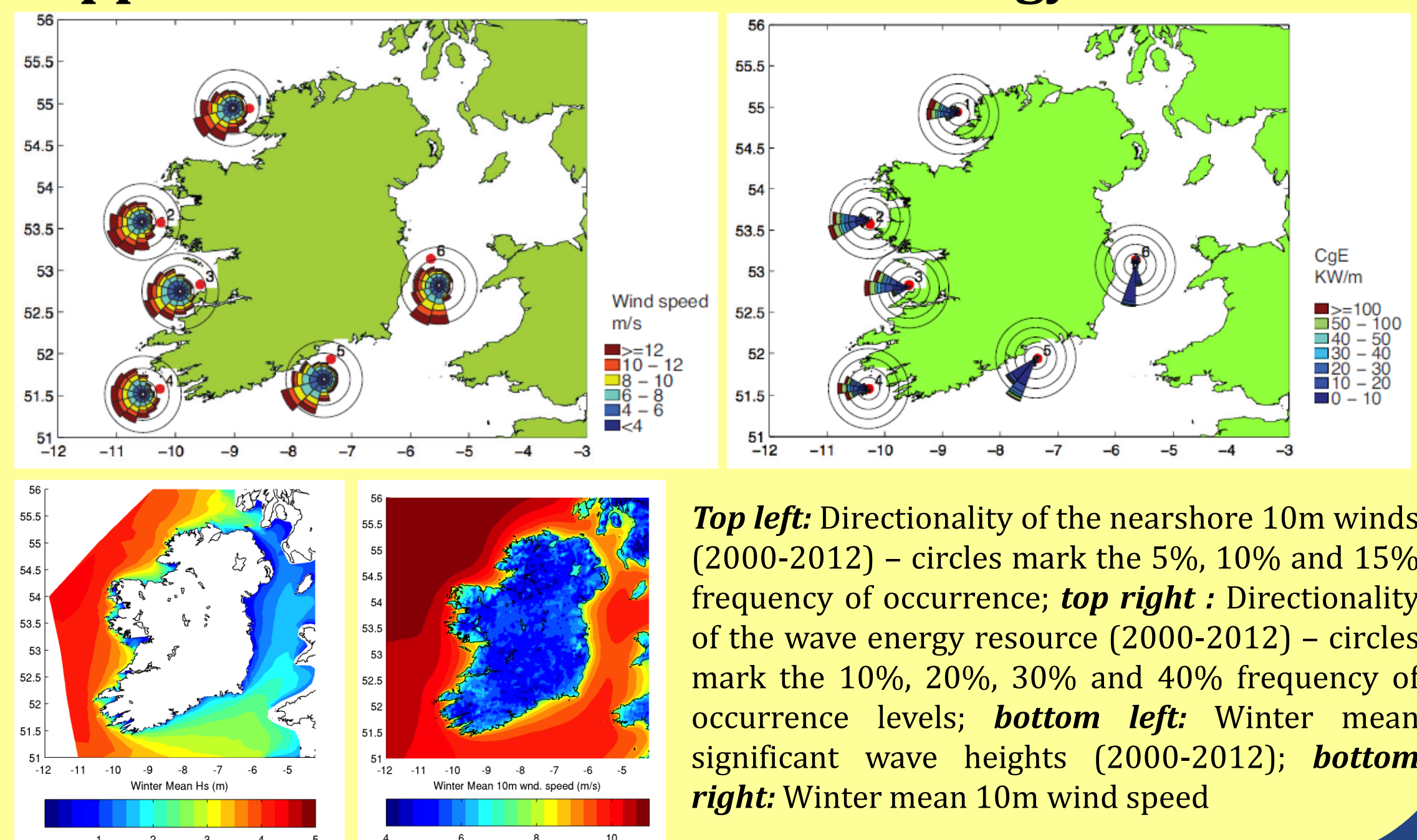
	Wave/Wind Study	MÉRA
HARMONIE version:	tag/37h1.2	branches/37h1 (separate MÉRA branch will be created)
Domain:	300x300 (2.5km)	540x500 (2.5km) as per operational
Forecast cycle:	6 hour cycle	3 hour cycle
Data Assimilation:	Surface analysis only	Surface analysis + 3DVAR (conventional obs. only)
Forecast:	6h @ 00z,06z,12z,18z	48h @ 00z,12z



Top left: Wave/Wind grid; bottom left: MÉRA grid; right: Wave model triangular grid

## 3. Spatial and Seasonal Variability of the Nearshore Wave and Wind Climate of Ireland: A High Resolution Hindcast for 2000 - 2012 with Applications for the Renewable Energy Sector

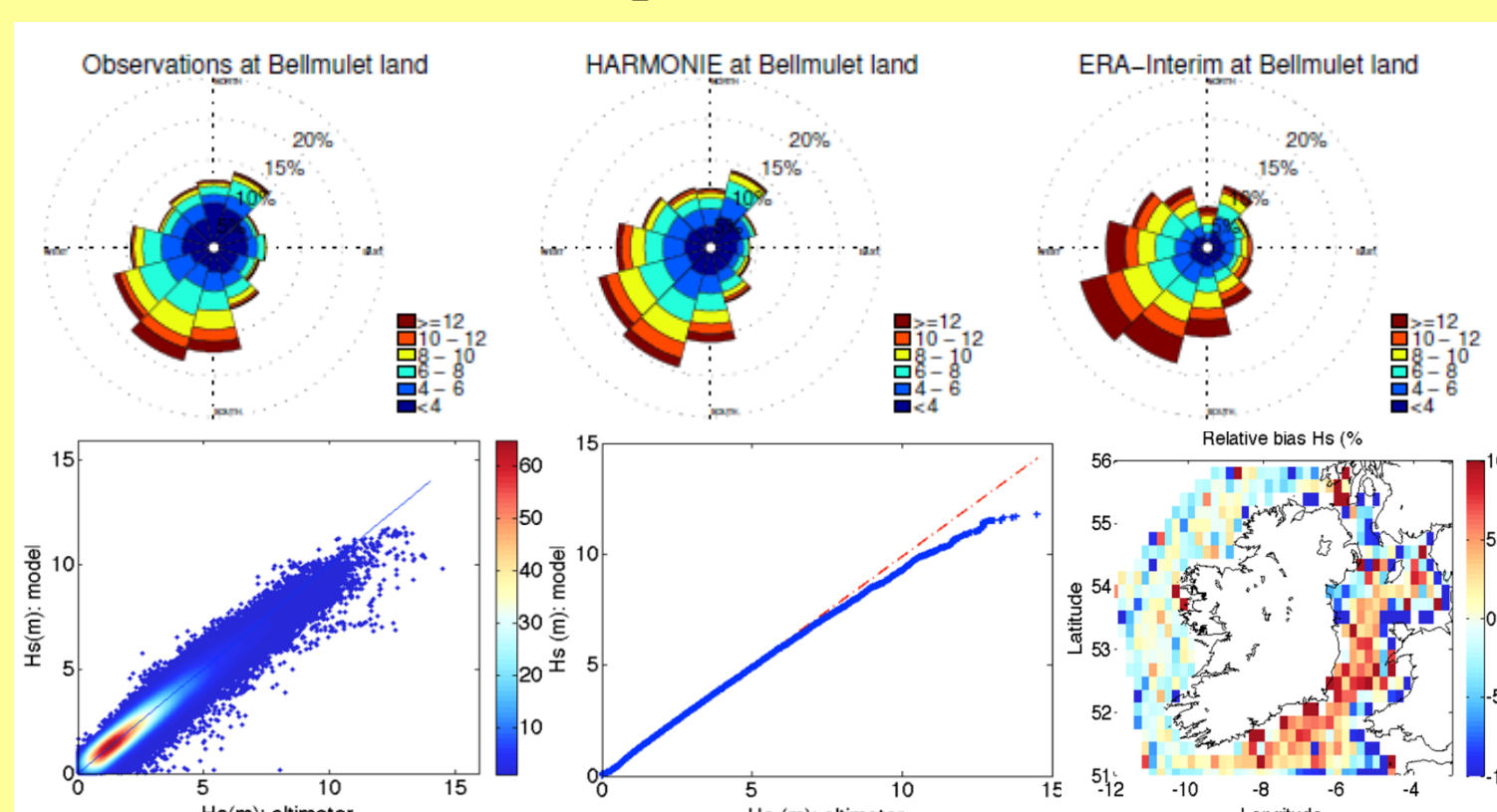
- The ECMWF ERA-Interim Atmospheric re-analysis data were downscaled using HARMONIE.
- The 10m winds derived from the downscaled atmospheric dataset were used as forcing for a regional wave model for Ireland, constructed using the third generation wave model WAVEWATCH III.
- The wave model was forced at the offshore boundary with directional wave spectra from the ECMWF ERA-Interim re-analysis Global Wave dataset.



Top left: Directionality of the nearshore 10m winds (2000-2012) – circles mark the 5%, 10% and 15% frequency of occurrence; top right: Directionality of the wave energy resource (2000-2012) – circles mark the 10%, 20%, 30% and 40% frequency of occurrence levels; bottom left: Winter mean significant wave heights (2000-2012); bottom right: Winter mean 10m wind speed

## 4. HARMONIE Re-analysis Verification

- Observations from land stations, marine buoys and altimeter data were used in the verification. Sample results are shown below.
- The top figure shows HARMONIE's superiority over the ERA-Interim dataset at modelling the Irish wind climate over land. The lower 3 figures show verification of HARMONIE winds compared to altimeter data.



## 5. MÉRA: Met Éireann re-analysis of the Irish climate (1981-2014)

- An NWP re-analysis of Irish weather from 1981 to the present (HARMONIE 37h1.2, 2.5km, 65 levels) covering Ireland, UK and sea areas will be done.
- The following will be used: ERA-Interim analysis fields as boundaries, SURFEX surface analysis, 3DVAR.
- 3 parallel 10 year simulations will be run, with 1 year of spin-up.
- We will include bug fixes and some of the radiation improvements available in HARMONIE 38h1.1.
- Creating a climatology for Ireland or any area by interpolating observation data is not accurate. An NWP re-analysis is far superior.
- We plan to focus on rainfall, wind events, renewable energies and agricultural applications.

## Reference:

F. Dias, S. Gallagher, E. Gleeson, R. McGrath, R. Tiron. and E. Whelan, Spatial and seasonal variability of the nearshore wave and wind climate of Ireland: a high resolution hindcast for 2000-2012 with applications to the renewable energy sector. Tech.rep., SEAI, 2013.