Met Éireann's Weather and Climate Research Programme

Call for Proposals

Topic 3

Weather radar applications

Additional Information

December 2024

1 Background

Ireland's weather radar network provides critical information on real time precipitation over Ireland. Data and products from the network are key inputs to the weather forecasting and warning production processes in Met Éireann. An upgraded weather radar network with additional dual-polarisation weather radars is planned to provide an enhanced weather service to Ireland and to bring this essential infrastructure in line with European norms. To support this expansion, two research gaps are of interest: 1) identification & mitigation of wind turbine interference, as wind energy development continues to grow and 2) the use of dual-polarisation data to monitor hail as it can have a significant impact to road operations.

As of December 2024, Ireland's weather radar network consists of two C-band weather radars located at Shannon and Dublin. Data from the network is included in radar images on Met Éireann website & apps, widely used in weather and flood forecasting and warning production in Met Éireann, shared with national weather services across Europe and shared via open data to researchers, academics, commercial weather companies and any interested parties. The network is owned, maintained, and operated by Met Éireann. The radars operate 365 days a year, 7 days a week and 24 hours per day, with scans every 5 minutes for precipitation and wind. To keep the radar network operational and maintain data quality at source, maintenance and monitoring of the radar infrastructure is essential. Radar data quality can also be impacted by interference by wind turbines and by wireless technology using the same frequency as the weather radar. Society's need has grown significantly for renewable energy, so numbers of wind turbines are increasing and will continue to increase. One of the sub-topics seeks to address the challenge of co-existence of weather radars & wind turbines, using a variety of techniques.

The second sub-topic seeks to investigate the use of dual-polarisation weather radar parameters to monitor and create hail alerts for motorway operators using data from the dual-polarisation weather radar installed in Shannon in mid-2023. Hail is very impactful to motorway operations, especially in parts of the mid-west and has been linked to road traffic accidents in recent years. Forecasts of convective precipitation such as hail are difficult provide to motorway level accuracy. This topic provides the opportunity to investigate a specific impact from hail using data from numerical weather prediction models, Met Éireann and Transport Infrastructure Ireland weather stations in addition to data from dual-polarised weather data from Shannon radar initially and data from any other dual-polarisation radars which may be installed as part of the weather radar upgrade and expansion programme.

2 Sub-Topic Objectives and Expected Outcomes

Sub-topic 3.1: Impact of Wind Turbines on Dual-Polarisation Weather Radar Data

Some of the expected outcomes here included:

- Investigate & report on the effect of wind turbines on polarimetric variables (e.g., ZDR, ΦDP, ρHV) using the latest techniques.
- Development of a software tool which can be implemented in the real-time operational signal processing and radar data processing chain to minimize the effect of the wind

turbines using the data from the new dual-pol radar at Shannon and additional radars in the expanded network.

Sub-topic 3.2: Hail monitoring & alerting

Some of the expected outcomes here included:

- Investigate & report on case studies of hail events using dual-pol weather radar data, data from Transport Infrastructure Ireland (TII)'s hail monitoring network and numerical weather prediction models.
- Literature review of hydrometeor classification algorithms for dual-pol weather radar data.
- Development of an application which uses dual-pol weather radar data, numerical weather prediction model data and data from the TII hail monitoring network and provides forecasters with the tools to monitor and alert of hail events in specific areas.

3 Budget and Duration

Proposals are invited for research projects with a maximum duration of 36 months and a maximum budget of €600,000, addressing one or more sub-topics are sought.

4 Useful websites

The webpage of OPERA, the radar programme of EUMETNET (the Conference of National Meteorological Services of Europe) contains useful and relevant publications at https://www.eumetnet.eu/activities/observations-programme/current-activities/opera/

Radar research conferences have taken place in Europe in Sept. 2024 (https://www.erad2024.it/) and the USA in September 2023 (https://www.ametsoc.org/index.cfm/ams/meetings-events/ams-meetings/40th-conference-on-radar-meteorology/.