

Performance of the WRF numerical weather prediction model in simulating historical Irish storms.

Storms in Ireland are occasionally severe enough to lead to a significant loss of life and damage to property. With a warming climate it is expected that such events may increase in frequency and intensity due to rising Sea Surface Temperatures. According to the IPCC report, there is likely to be an increase in the number of intense cyclones and associated strong winds, particularly in winter over the North Atlantic. A slight pole-ward shift of the storm tracks is also likely. With this in mind, it is vital that our current numerical weather prediction models can accurately forecast extreme storm events.

This project will investigate the ability of the WRF model to accurately forecast extreme storm events in Ireland.

The student will choose a number of notable Irish storms which caused widespread damage (such as the remnants of Hurricane Charley in 1986) and:

- Familiarize him/herself with the WRF forecasting model.
- Run a forecast of the storm using ECMWF Reanalysis data to drive the WRF model.
- Investigate if the forecast was accurate by comparing the output of WRF with reanalysis data and/or observations.
- Run additional forecasts to investigate the effects of changing parameters such as the horizontal resolution (Δx & Δy), the time step (Δt), time stepping schemes (leapfrog or Runge-Kutta), the size of the model domain, length of forecast, the model physics flags, optimization flags, etc.
- Familiarize him/herself with netcdf post-processing tools such as ncdump & cdo.
- Create graphical output from the WRF netcdf output data.
- Run the model in parallel using MPI (access to a parallel machine will be arranged) and investigate the speed-up of WRF with increasing CPUs.
- Investigate the usefulness of using WRF's automatic-vortex tracking option.

The student will summarize his/her findings in a report.

References:

The WRF Model - <http://www.wrf-model.org/index.php>