EUMETNET SRNWP- EPS Phase II

Workshop on "Probabilistic prediction of severe weather phenomena: role of physics perturbations"

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Abstracts of presentations

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The new phase 2019 – 2023 of the EUMETNET programmes and the NWP Cooperation Programme

Manuel Palomares, AEMET (Spain) / EUMETNET Secretariat (Belgium), Programmes and Projects Coordinator

Since 2017 EUMETNET has been involved in process to prepare the new phase of the existing programmes in the period 2019 – 2023, their revision and the incorporation of new programmes or activities. The Assembly of EUMETNET Assembly at its 20th meeting on 30th – 31st May 2018 approved the requirements proposed by the Forecasting Drafting Team for the new NWP Cooperation Programme and authorized the tendering process for awarding the programme to a Coordinating Members (or consortia). The only proposal was received from a consortium integrated by RMI (Belgium), OMSZ (Hungary), AEMET (Spain) and ItAF-REMET (Italy) also including as subcontractor Arpae-SIMC (Italy).
Under this proposal the coordination is realized on three specific areas which are represented as modules in the NWP cooperation Programme. The C-SRNWP module (OMSZ in charge) is aiming to enhance collaboration between NWP consortia on all aspects of model development, however, the main topic of this module is data assimilation which links LAM NWP activities with the Observation programmes of EUMETNET. The SRNWP EPS module (AEMET, REMET COMET and Arpae SIMC) is dealing with the quickly evolving topic of high resolution probabilistic forecasts and their application (e.g. model calibration). The Post-processing module (RMI who will be also in charge of the general coordination of the NWP Cooperation programme) investigate current and future possibilities for the harmonization and better exploitation of post-processing techniques. Both the SRNWP EPS and the Post-processing modules will make a strong link to other modules of the Forecasting Capability Area A, like Nowcasting and Impact-Based Warnings.
An Assessment Team of experts from the EUMETNET Members and an external consultant have been evaluating the proposal during the month of September. Their report together with the proposal were discussed on 17th October at the joint meeting of the advisory committees of EUMETNET (STAC and PFAC) which have agreed upon a recommendation to the Assembly for the awarding of the Programme.
The oral presentation at the 4th workshop of the programme SRNP-EPS Phase 2 gives a summarized account of this process and the outcome so far.

Convective forecasts using EPS-based computation of Universal Tornadic Index

Andzej Mazur, Institute of Meteorology and Water Management – National Research Institute (Poland)

A relatively simple method of forecasting extreme convective phenomena has been proposed. This method uses Universal Tornadic Index as an indicator of the occurrence of a convective phenomenon. Since it utilizes many factors (CAPE, storm relative helicity, convective precipitation, wind shear etc.) – it can be useful in forecasting not only tornadoes, but also thunderstorms or squalls. In turn, the application of the Ensemble Prediction System in convection-permitting scale based on time-lagged ICs/BCs allows to improve these forecasts, especially due to the removal of false alarms. The research was carried out using archive data, starting from 2015. The noteworthy correlation between significantly higher UTI values (ensemble means) and occurrence of thunderstorms was established in this research.

Thunderstorm forecasting with the convection-permitting RMI-EPS and model error based stochastic perturbations

Geert Smet, Royal Meteorological Institute, Ringlaan 3, B-1180 Brussels (Belgium)

RMI-EPS is a prototype convection-permitting EPS run in semi-operational mode by the Royal Meteorological Institute of Belgium (RMI) since September 2017. It currently consists of 22 ensemble members at 2.5km horizontal resolution, 11 with AROME physics and 11 with ALARO physics. One of the main differences in the physics relevant for thunderstorm forecasting is that ALARO still has a deep convection parameterization, unlike AROME. Additionally, there are considerable differences in the microphysics, turbulence and radiation schemes, so that the precipitation forecasts of ALARO and AROME can sometimes be very different, especially in convective situations.

Forecast results of the convection-permitting RMI-EPS for several thunderstorm cases over Belgium and Madeira (Portugal) are discussed, together with statistical verification scores. A comparison is made with the global EPS of ECMWF, and the performance of the AROME and ALARO subensembles within RMI-EPS is studied. Finally, we outline our future plans towards an operational convection-permitting EPS at the RMI.

We also present a new approach for the quantification of model error related to deep convection. The source of model error related to convective transport is estimated and statistically described by comparing forecasts of different model configurations (with and without parameterized deep convection), using the ALARO configuration of the ALADIN/HIRLAM NWP system. This error source is then re-used to introduce stochastic perturbations that have the correct statistical distribution, vertical correlation and correlation between variables. A first test (without taking into account horizontal and time correlation) shows already an improvement in RMSE together with a reasonable spread, especially for upper air variables.

Physics and surface perturbations in HarmonEPS

Inger-Lise Frogner, MET Norway (Norway)

Ulf Andrae, SMHI (Sweden)

HarmonEPS is an ensemble prediction system for the short range (~48h) based on the non-hydrostatic HARMONIE-AROME model configuration in the ALADIN-HIRLAM NWP system. HarmonEPS is a flexible system and includes a range of possibilities to describe uncertainties in different parts of the system. HarmonEPS is operationalized in a few HIRLAM institutes, eg MEPS in MetCoOp (Sweden, Norway and Finland). For representation of model uncertainty we are developing SPP (Stochastically perturbed parameterizations), a parameter perturbation approach, where sensitive parameters in micro-physics, cloud processes, radiation and turbulence, are perturbed randomly by a spatio-temporal correlation pattern. The surface perturbation code from Meteo France is included in HarmonEPS, where SST, surface moisture, LAI, roughness length over land, albedo etc. are perturbed. In this talk we will review and show results from experiments with parameter perturbations and surface perturbations that have been run in the context of the SRNWP EPS II program, and present plans for further work on the lines of this project.

Representing model uncertainty in MOGREPS-UK: an evaluation of the Random Parameter scheme

Anne McCabe, Aurore Porson and Adrian Lock, Met Office (United Kingdom)

Convective-scale ensemble-prediction-systems are often run over areas where there is particular interest in local high-impact weather events such as convective rainfall, thunderstorms and fog. Such events can be difficult to forecast accurately as they depend on local scales that may be inherently uncertain and poorly observed. High resolution ensemble prediction systems can give very realistic looking forecasts, but can be over-confident (under-spread) and may fail to predict observed events altogether. Alongside techniques to capture the uncertainties arising in the initial and boundary conditions, stochastic physics schemes designed to represent uncertainty in the model physics are often used to address this lack of spread. Model uncertainty is represented in the Met Office's convective-scale ensemble prediction system for the UK, MOGREPS-UK, by the Random Parameter (RP) scheme. The RP scheme is a perturbed parameter scheme where a subset of physics parameters are stochastically perturbed in time throughout the forecast. As part of the SRNWP-EPS II framework, we present results from trials where the parameters are initialised randomly and then held fixed throughout the forecast. We compare these results with the standard RP set-up and investigate the question: how sensitive are different weather events to the different perturbation methods? We will also present future plans for MOGREPS-UK, including new perturbed parameters from the convective BL parametrization, the move from four forecasts a day to "hourly cycling", and a research project looking at high resolution ensemble forecasting of fog in observational campaigns.

Status of the Application Task: products

R. Golino and F. Marcucci, COMET (Italy)

Status of the Application Task: calibration

P. Escribà, M. Martínez and A. Callado, AEMET (Spain)