Météo-France

Scientists in charge: Lucie Rottner, Laure Raynaud, Olivier Jaron, Philippe Arbogast

Subject: Integration of weather forecast uncertainty in severe convection prediction

Applicants are invited for a 12 month post-doctoral or civil engineer position starting on **between 5th and 12th November 2018** on the following subject: **"Integration of weather forecast uncertainty in severe convection prediction"** in the framework of Météo-France participation to a SESAR2020 demonstration project.

The deadline for application is 16th september 2018.

Context

This subject is addressed in the framework of one of the SESAR2020 Very Large Scale demonstration projects, namely the project PJ24 for "Network Collaborative Management (NCM)" in which Météo-France is partner to the industrial Thalès Air Systems.

The Network Collaborative Management (NCM) project is based on a collaborative approach involving the whole spectrum of Air Traffic Management actors: Airspace Users (AUs), Airports, Air Navigation Service Providers (ANSPs) and Network Manager (NM).

In Air Traffic Flow and Capacity Management (ATFCM), the performance targets and expectations at the network and local level could be better achieved only through a collaborative synchronised effort of all the involved actors supported by a common situational awareness of the airspace conditions. These include the meteorological conditions with a focus on weather phenomena with a strong impact on air traffic management and network operations such as convection.

In the framework of this project, Météo-France provides an expertise in the field of convection forecast with a focus on the use of ensemble prediction system to derive a probabilistic information. Météo-France will also deliver convection forecast information (data) to Thalès for the purpose of trials and demonstration exercises of the project and will support in the execution and post-analysis of those exercises for MET-related aspects.

Scientific Objectives

Providing a set of forecasts is a real break in the weather services to aviation because it leads into probabilistic decision support systems that will sustain decisions on a quantitative assessment of probable impacts.

In order to cope with small-scale unpredictable details of mesoscale structures, it is suggested that model outputs are processed following a fuzzy object-oriented approach to extract precipitating features which are associated with a higher predictability than the direct model outputs. This approach partly outlined in Arbogast et al. (2016) is currently used to identify coherent precipitation object within the convective-scale ensemble PEARO. The purpose of the present contract is to extent this approach to the global ensemble PEARP developed at Météo-France (Descamps et al, 2015). Since the main object attribute is the precipitation histogram which is very sensitive to the model resolution an important milestone of the project will be the calibration of the object detection algorithm to 10km scale model outputs using a data base of

past-events. The adapted fuzzy-object detection method will then be applied to the detection of severe convection feature in the frame of a campaign that will occur over Central Europe in spring 2019. The purpose is to assess to what extent we can monitor the Air Traffic Control (ATC) using probabilistic guidance of the risk of severe convection.

The expected work of the position is (1) the production of daily fuzzy objects of severe convection risk, and (2) communication activities (reports, presentations) to diffuse the lessons learned by the experiment in the SESAR community.

Required skills

• Experience in numerical modeling of the atmosphere

• Very good knowledge in meteorology (particularly physics of convection, precipitations and boundary layer) and statistical tools (data analysis)

• Good computer level: shell development (Linux), python

• Aptitude for scientific work and written and oral communication in English, meetings abroad

The position will be in the National Centre for Meteorological Research (CNRM) at Météo-France in Toulouse, he or she will be as a post-doctoral researcher in the team in charge of ARPEGE ensemble forecasting, with the necessary tools and environment for work (computer resources, office, and close supervision).

Expected Results

. The expected deliverables are:

• D1 - Month 2: Report identifying the strategy of severe convection depiction within general circulation models. Related precipitation and/or other model parameter histogram based on past events.

• D2 – Month 4: Python software able to detect severe convection objects within the global ensemble.

• D3 - Month 6: predicted objects are sent routinely to an operation center in an agreed format.

• D4 - Month 12: Report on the lessons learned by the use of probabilistic forecast of severe convection in the monitoring of ATC during the spring campaign.

Practical information:

The successful applicant will be based at the Météopole in Toulouse, in the Centre National de Recherche Météorologique. The position will start preferentially on the October 2018 for 12 months .

The gross monthly indicative salary before taxes will range:

- between 2552 and 3280 euros for an engineer, depending upon experience.
- 3280 for a junior researcher.

For full consideration, an application letter shall include a detailed statement of research interest, along with a curriculum vitae (including research experience, publications and conferences, computing skills and different language practice) and the names, telephone and email address of 2 referees.

The package should be sent by email before September 16th 2018 to stephanie.desbios@meteo.fr , philippe.arbogast@meteo.fr and alain.gradot@meteo.fr. Due to spam filters applied in Météo-France, without rapid acknowledgement of receipt by email from one of the three addressees, it is recommended to verify the correct receipt of the candidate's email with a phone call (Philippe Arbogast: +33 (0)5 61 07 96 39).

For scientific questions, please contact:

Philippe Arbogast

Météo-France CNRM
42 avenue G. Coriolis
31057 Toulouse Cedex 1
France

Tel: +33 (0)5 61 07 96 39

Email: philippe.arbogast@meteo.fr

For more information, please contact :

Alain GRADOT

Météo-France DCT/GFE

42 avenue G. Coriolis
31057 Toulouse Cedex 1
France

Tel.: +33 (0)5 61 07 80 24
Email: alain.gradot@meteo.fr

References

Arbogast, P., Pannekoucke, O. , Raynaud, L. , Lalanne, R. and Mémin, E. (2016), Object-oriented processing of CRM precipitation forecasts by stochastic filtering. Q.J.R. Meteorol. Soc., 142: 2827-2838. doi:10.1002/qj.2871

Descamps, L. , Labadie, C. , Joly, A. , Bazile, E. , Arbogast, P. and Cébron, P. (2015), PEARP, the Météo-France short-range ensemble prediction system. Q.J.R. Meteorol. Soc, 141: 1671-1685. doi:10.1002/qj.2469