

Post-doctoral research fellowship in HYDROMETEOROLOGY

Application deadline: 15 November 2008

Duration / Start: 24 months, starting \approx end of 2008 – beginning of 2009

Salary: between 2.3 and 2.9 k€net monthly depending on the experience of candidate.

Place : CEMAGREF, Antony (near Paris), with regular trips to the Météo France national center in Toulouse during the first year.

Context - objectives

To the hydrologist, radar technology should provide both a mean to follow the spatial dynamics of rainfall fields and a quantitative evaluation of precipitation depths. Combined together, this information would provide spatially distributed rainfall depths that are *potentially* more informative than traditional ground rain gauge networks that only give point rainfall estimate.

Over the last years, many studies have focused on the assessment of radar-based precipitation data for simulating streamflow through a hydrological model. However, the continuous and rapid evolution of radar technology has made the assessment of the operational value of radar rainfall estimates very difficult. Moreover, most studies have dealt only with a limited number of 'selected' events on a limited number of 'selected' areas.

In that context, Météo France (the French national weather service), in close relationship with several French hydrology labs, has decided to launch a national collaborative project aiming at producing a 10-year reference data base of Quantitative Precipitation Estimations (QPE). The objective is to make use optimally at any time of all available information (radars, hourly and daily rain gauges, satellite data, model freezing level heights, ...) to obtain the best surface precipitation estimation. Subsequently, the goal is to make the resulting data base, consisting of hourly and possibly infra-hourly (5 or 15 minutes), 1km² QPE covering the entire French territory, a common reference for hydrologists from different groups, used for calibrating the model parameters, assessing the added value of high space-time resolution, ... Also worth being mentioned is the exploitation of that data base in the global warming assessment context.

Work description

In the context mentioned above, Météo France and Cemagref are jointly seeking a post-doctoral researcher to work on the theme of **multi-source QPE re-analyses and their introduction in hydrological models**. The work consists in two parts :

❖ Development and test of the multi-source QPE re-analysis methodology :

The ingredients of the re-analysis methodology are :

- ❑ operational radar data;
- ❑ satellite data;
- ❑ hourly rain gauge data;
- ❑ daily rain gauge data;

- ❑ model re-analyses (providing for instance the height of the freezing level);

All aspects of the methodology have not been decided yet but the efforts that will have to be deployed can be ranked into four categories :

- ❑ efforts to remove non-meteorological echoes (clear-air echoes and unfiltered ground clutter). Satellite data present undoubtedly a value for that.
- ❑ Efforts to correct partial beam blocking and, if possible, Vertical Profile of Reflectivity (bright band) errors.
- ❑ Efforts to merge optimally radar and rain gauge data, for instance by comparing the event-based accumulations.
- ❑ Efforts to assess the uncertainty of the estimation, for instance using independent hourly gauge.

The work will be carried step by step within a team of radar and rain gauge experts of Météo France and associated laboratories. Most tools (krieking, visualisation, de-archiving, ...) are existing and the candidate will be introduced to all of them. It is envisioned that the candidate will work one year on that subject and that a first version of the reference database will be available.

❖ **Use of that dataset to force lumped hydrological simulation models over a dataset of 1000 French catchments**

This phase will focus on comparing the possibilities offered by homogeneous and distributed rainfall inputs to feed hydrological (rainfall-runoff) models that will be tested on the catchment set. Several hydrological models will be used:

- the GR4J lumped rainfall-runoff model (developed at Cemagref), using specific approaches in the case of distributed inputs (multi-model approach or use of rainfall variability indices) ;
- the Isba-Modcou distributed model of Météo-France.

The models will be tested in simulation and/or forecasting mode. Results will be analysed in terms of streamflow simulation quality at catchment outlets.

Qualification of the research teams

The Direction des Systèmes d'Observation is in charge of maintaining and developing the operational Météo France observing network and the associated products. It concentrates expertise on radar data processing, rain gauge analysis techniques (krieking), radar – rain gauge merging approaches, ... The radar group typically publishes 3 – 4 papers in peer-reviewed journals a year and participates in several French and European research projects. References are available upon request.

The Hydrology group at Cemagref in Antony has been developing hydrological models over the last 25 years, with a focus on operational model applications (flood and low-flow forecasting, reservoir management, etc.). The team is composed of about 12 people. Detailed information and references can be found at: www.cemagref.fr/webgr

Required qualification

Applicants should have a Ph.D. in Hydrology or Atmospheric Sciences. A good knowledge of radarmeteorology, rain gauge criticism, radar – rain gauge comparisons would be an advantage. For the hydrological part, a background in modelling is required (experience with

lumped models will be a plus). Applicants should be fluent in oral and written English (or French). Knowledge of a programming language (FORTRAN and C or C++) is required, experience of UNIX system a plus. The work will be supervised by Dr Pierre Tabary (Météo France, Toulouse), Dr Jacques Parent du Châtelet (Météo France, Trappes) and Dr Cécile Loumagne and Dr Vazken Andréassian (Cemagref, Antony). This job is offered with no restriction on age, sex nor nationality, in accordance with French law.

Applicants should send a letter of interest, a curriculum vitae (resume + list of publications), date of availability and names, fax numbers, e-mail and post addresses of two references by **15 November 2008** to:

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