

Post-doctoral research fellowship in RADARMETEOROLOGY

Application deadline : 15 November 2008

Duration / Start : 18 months, starting \approx end of 2008 – beginning of 2009

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

Place : Centre de Météorologie Radar, Direction des Systèmes d'Observation, Météo France, 42, Avenue Coriolis, 31057 Toulouse. The Météo France center in Toulouse is located about 6 km west of the town center (about 20 minutes by bike and 30 minutes by metro). Temporary lodging at the Météo France site is possible.

Work description

Météo France (the French National Weather Service) and CEMAGREF (Research Institute on Hydrology and Environment) are seeking a post-doctoral researcher to work on the improvement of polarimetric radar Quantitative Precipitation Estimates (QPE). The first French polarimetric radar (C-band) was installed in Trappes, near Paris about 4 years ago. Since then a significant amount of work has been carried out to make progress on : data quality assessment and monitoring, artefact removal, attenuation correction, bright band identification, hydrometeor classification, effect of orography and QPE evaluation. Those works are summarized in the following papers (+ numerous conference papers available upon request) :

Friedrich, K., U. Germann and P. Tabary, 2008 : Influence of Ground Clutter Contamination on Polarimetric Radar Parameters, accepted in *J. Atmos. Oceanic Technol.*

Gourley, JJ., A.J. Illingworth and P. Tabary, 2008 : Absolute calibration of radar reflectivity using redundancy of the polarization observations and implied constraints on drop shapes, submitted to *J. Atmos. Oceanic Technol.*

Tabary, P., Vulpiani, G., J.J. Gourley, A.J. Illingworth and O. Bousquet, 2008 : Unusually high differential attenuation at C-band : results from a two-year analysis of the French Trappes polarimetric radar data, submitted to *J. Appl. Meteor.*

Vulpiani, G., P. Tabary, J. Parent-du-Chatelet and Frank S. Marzano, 2008 : Comparison of advanced radar polarimetric techniques for operational attenuation correction at C-band, *J. Atmos. Oceanic Technol.*, 25, Issue 7 (July 2008) pp. 1118–1135

Friedrich, K., U. Germann, J.J. Gourley, and P. Tabary, 2007: Effects of radar beam shielding on rainfall estimation for polarimetric C-band radar, *J. Atmos. Oceanic Technol.*, 24, No 11, 1839 – 1859.

Gourley, JJ, P. Tabary, J. Parent-du-Chatelet, 2007: Empirical estimation of attenuation from differential propagation phase measurements at C-band, *J. Appl. Meteor.*, 46, No. 3, 306 – 317.

Gourley, JJ, P. Tabary, J. Parent-du-Chatelet, 2007: A fuzzy logic algorithm for the separation of precipitating from non-precipitating echoes using polarimetric radar, *J. Atmos. Oceanic Technol.* Vol. 24, No. 8, 1439–1451.

Gourley, JJ, P. Tabary, J. Parent-du-Chatelet, 2006: Data quality of the Météo France C-band polarimetric radar, *J. Atmos. Oceanic Technol.* , 23, No. 10, 1340–1356.

The extremely positive results obtained have led to the extension of dual-polarisation to other radars of the network, which now counts 6 operational polarimetric elements (5 at C-band and 1 at S-band) and soon 10. A polarimetric processing chain including 1) polarimetric variable monitoring (including the monitoring of horizontal reflectivity Z_H using the consistency relationship), 2) artefact removal, 3) attenuation correction, 4) bright band identification and 5) hydrometeor classification will be introduced in operations in the course of 2009.

The main work remaining ahead is the development, testing and validation of an “all-weather” rain rate estimator taking advantage as much as possible of the entire polarimetric information. A first step in that direction has been done using one year of Trappes radar data. Only one elevation scan (1.5°) was used to compute the QPE. Two polarimetric algorithms – only valid in rain – were compared against the classical conventional Marshall-Palmer estimator : ZZDR, which makes use of Z_H and Z_{DR} (Illingworth and Thompson 2005) only and ZPHI (Testud et al. 2000), which relies on Z_H and ϕ_{DP} .

Illingworth, A.J. and R.J. Thompson, 2005 : The estimation of moderate rain rates with operational polarisation radar, 32nd Int. Conf. On Radar Meteorology, Albuquerque, Paper P9R.1, Am. Meteorol. Soc.

Testud, J., E. Le Bouar, E. Obligis, and M. Ali-Mehenni, 2000: The rain profiling algorithm applied to polarimetric weather radar, *J. Atmos. Oceanic Technol.*, **17**, 332-356.

Both polarimetric algorithms were demonstrated to be superior to the conventional one but they were also shown to be strongly dependent upon the calibration of the variables (Z_H and Z_{DR}) . The triggering conditions of the two algorithms appeared to be complementary, which calls for the development of a combination between the two approaches.

The work proposed here will consist in extending the QPE work carried out so far by :

- considering more cases (3 years of dual-pol data are now available) and more radars (in particular the operational polarimetric radars located south of France where rain intensities are higher);
- running ZPHI, ZZDR and a K_{DP} -based estimator on several tilts (and not only the 1.5°) and making the optimal synthesis of the available rain rate estimations;
- proposing robust and operationally viable rain rate estimators for all rain intensities in rain (high – low);
- proposing operational solutions (potentially based on revisited VPR techniques) to the rain rate estimation in the bright band, hail and snow region;
- assessing and validating the uncertainty of QPE estimations;
- ...

The validation of the algorithms will be performed at the hourly and daily time steps using the dense rain gauge operated by Météo France and other partners (e.g. CEMAGREF).

Required qualification

Applicants should have a Ph.D. in Environment, Atmospheric Sciences or Remote Sensing. A good knowledge of radars, radar data and their interpretation is required. Knowledge of polarimetric radars and related algorithms would definitely be an advantage. Applicants should be fluent in oral and written English or French. Knowledge of UNIX / LINUX is required (FORTRAN, C, C++) and experience with IDL or PV-WAVE highly recommended. The work will be supervised by Dr. Pierre Tabary (Météo France, Toulouse, France) in liaison with Dr. Anthony Illingworth (U. Reading, Reading, UK) and Dr. H. Andrieu (LCPC, Bouguenais, France). 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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