Joël Noilhan's career from 1985 to 2010

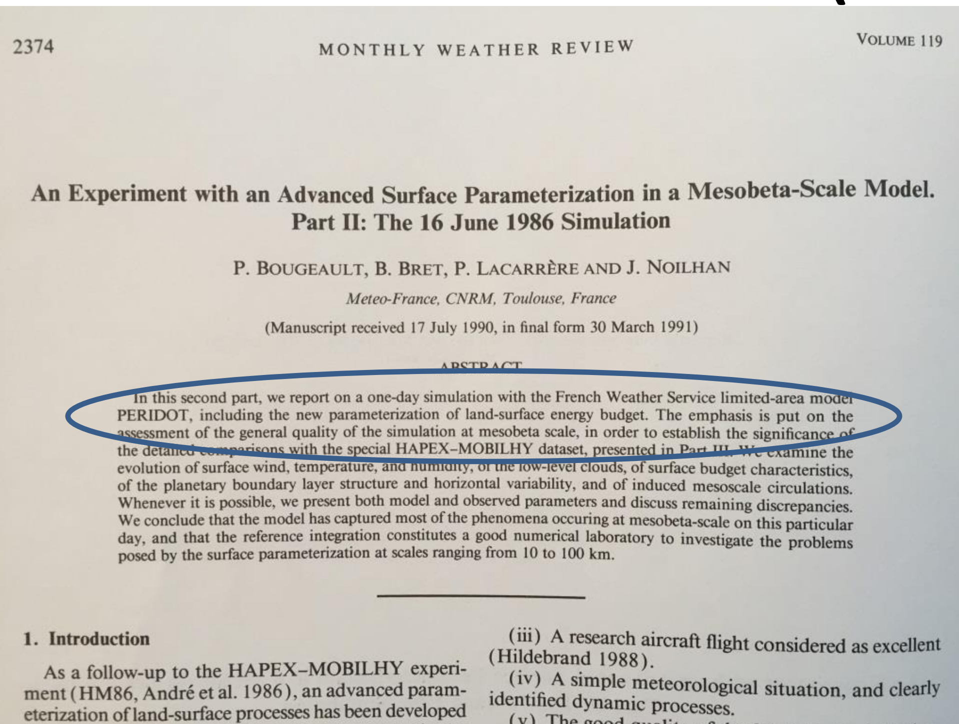
by Philippe Bougeault

Special thanks to Véronique Ducrocq for conserving and supplying Joël's activity reports and to Anita Hubert for locating administrative records!

Three ages

- Working together in the MC2 team (1985-1993)
- Joël as head of the MC2 team (1993-2003)
- Joël as head of the GMME group (2003-2009)

Working together in the MC2 research team (1985-1993)



An Experiment with an Advanced Surface Parameterization in a Mesobeta-Scale Model. Part II: The 16 June 1986 Simulation

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ABSTRACT

In this second part, we report on a one-day simulation with the French Weather Service limited-area model PERIDOT, including the new parameterization of land-surface energy budget. The emphasis is put on the assessment of the general quality of the simulation at mesobeta scale, in order to establish the significance of the detailed comparisons with the special HAPEX–MOBILHY dataset, presented in Part III. We examine the evolution of surface wind, temperature, and humidity, of the low-level clouds, of surface budget characteristics, of the planetary boundary layer structure and horizontal variability, and of induced mesoscale circulations. Whenever it is possible, we present both model and observed parameters and discuss remaining discrepancies. We conclude that the model has captured most of the phenomena occuring at mesobeta-scale on this particular day, and that the reference integration constitutes a good numerical laboratory to investigate the problems posed by the surface parameterization at scales ranging from 10 to 100 km.

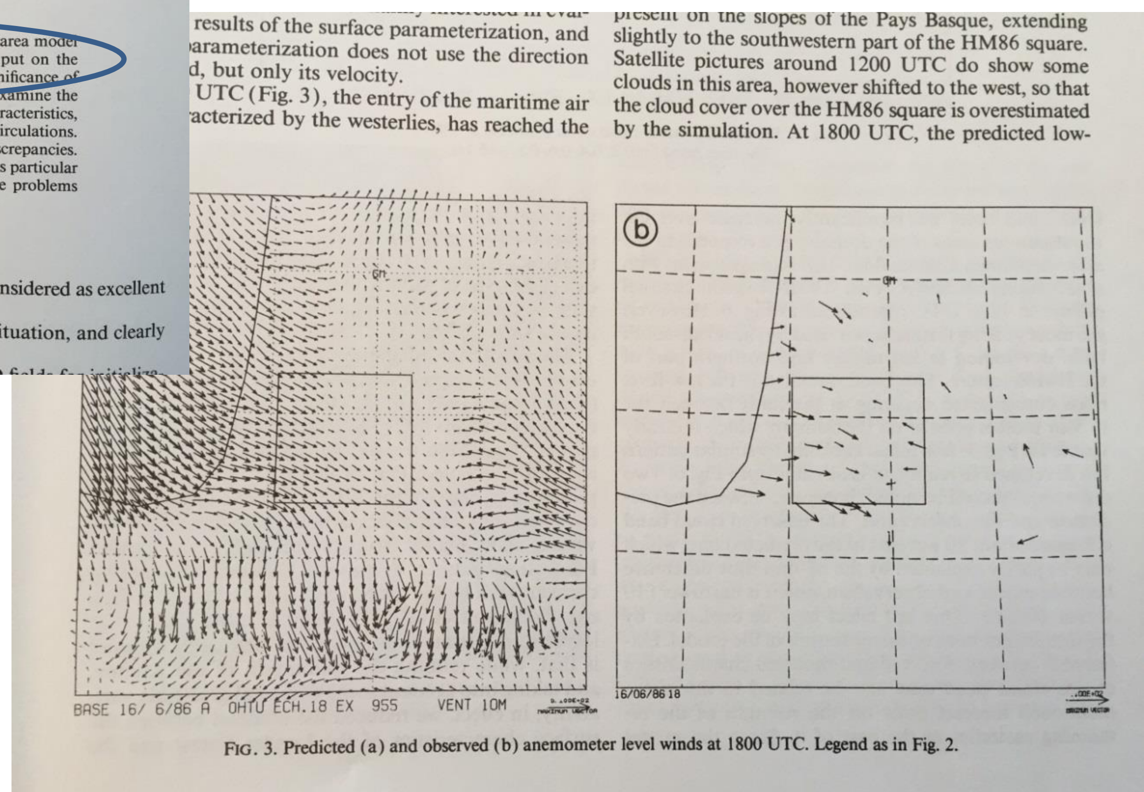
1. Introduction

As a follow-up to the HAPEX–MOBILHY experiment (HM86, André et al. 1986), an advanced parameterization of land-surface processes has been developed

(iii) A research aircraft flight considered as excellent (Hildebrand 1988).

(iv) A simple meteorological situation, and clearly identified dynamic processes.

(v) The good quality of the 3D fields for initializa-



results of the surface parameterization, and parameterization does not use the direction d, but only its velocity. UTC (Fig. 3), the entry of the maritime air characterized by the westerlies, has reached the

present on the slopes of the Pays Basque, extending slightly to the southwestern part of the HM86 square. Satellite pictures around 1200 UTC do show some clouds in this area, however shifted to the west, so that the cloud cover over the HM86 square is overestimated by the simulation. At 1800 UTC, the predicted low-

FIG. 3. Predicted (a) and observed (b) anemometer level winds at 1800 UTC. Legend as in Fig. 2.

HAPEX-MOBILHY and the development of meso-scale modelling at Météo-France

Success in simulating an observed cloud pattern with PERIDOT

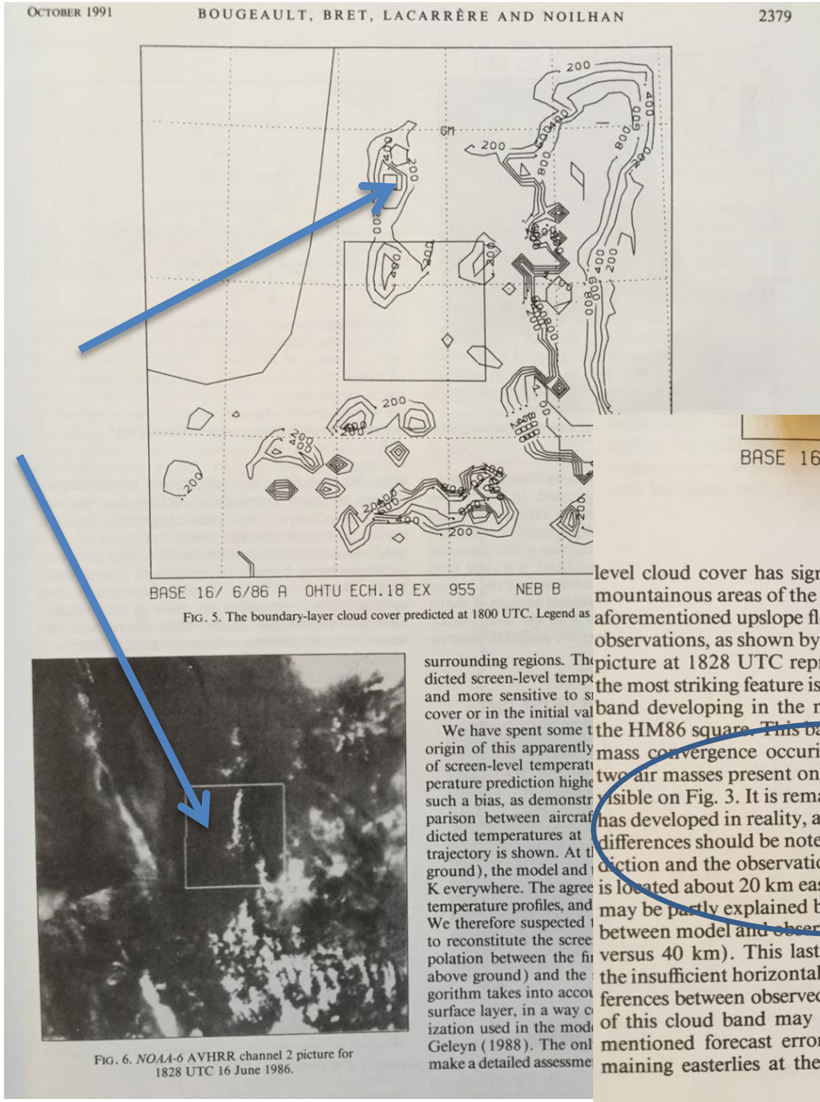


FIG. 5. The boundary-layer cloud cover predicted at 1800 UTC. Legend as

FIG. 6. *NOAA-6* AVHRR channel 2 picture for 1828 UTC 16 June 1986.

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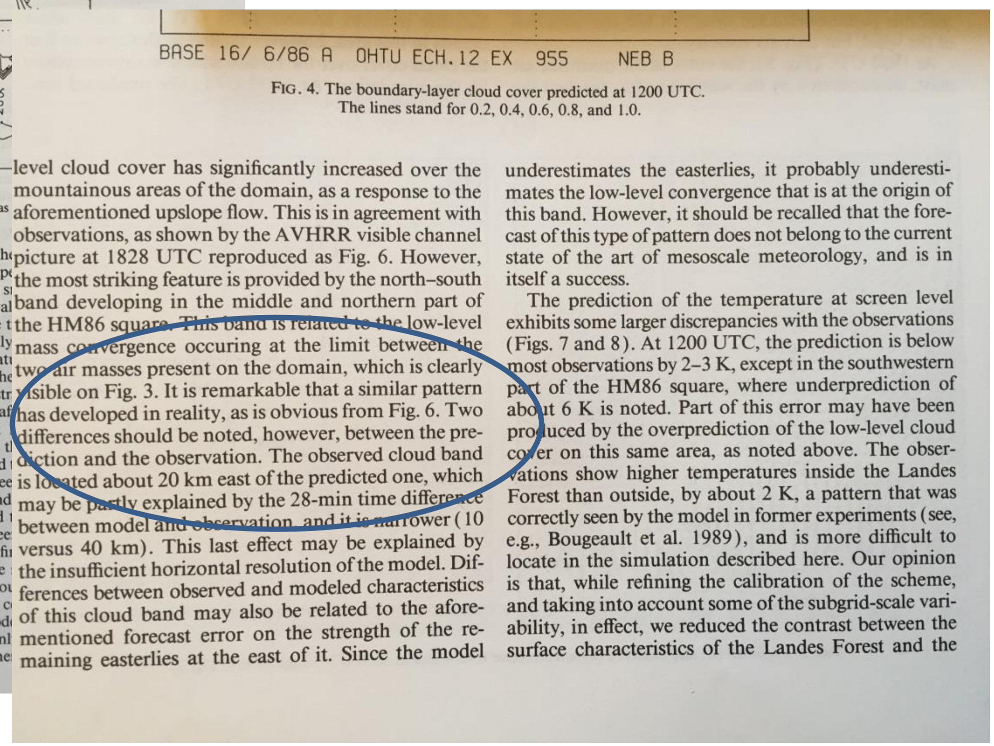
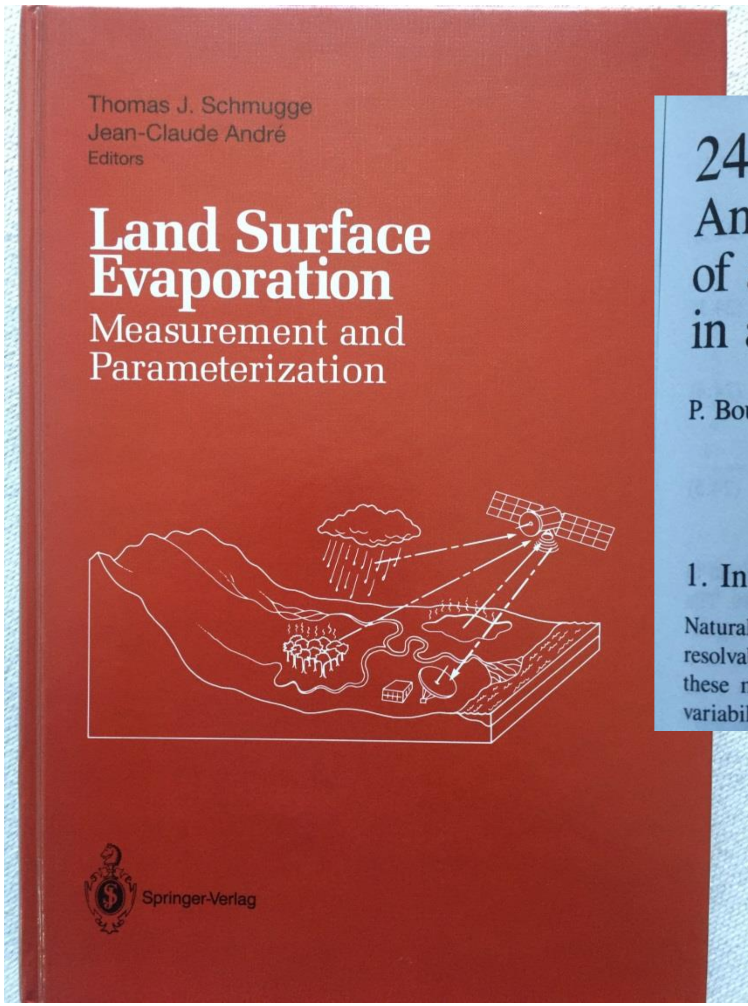


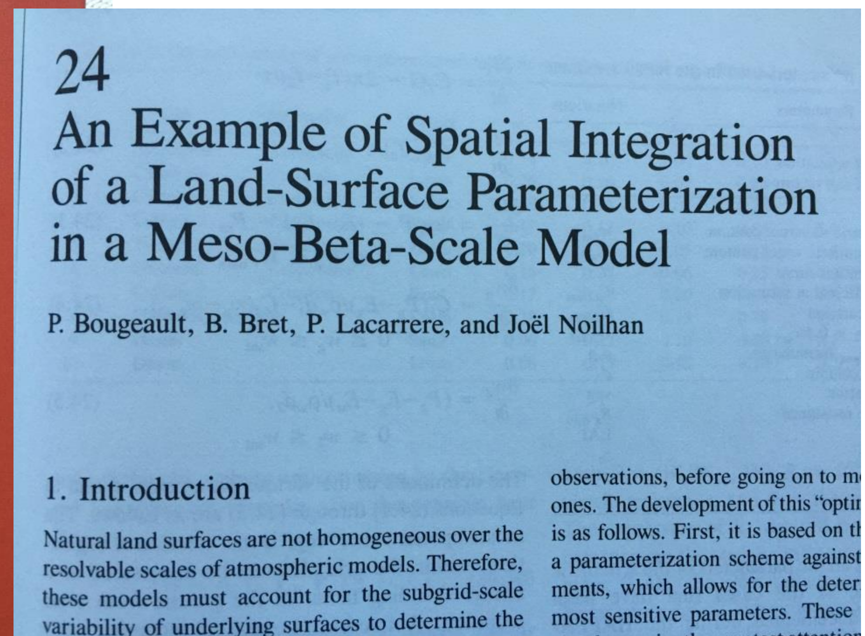
FIG. 4. The boundary-layer cloud cover predicted at 1200 UTC. The lines stand for 0.2, 0.4, 0.6, 0.8, and 1.0.

level cloud cover has significantly increased over the mountainous areas of the domain, as a response to the aforementioned upslope flow. This is in agreement with observations, as shown by the AVHRR visible channel picture at 1828 UTC reproduced as Fig. 6. However, the most striking feature is provided by the north–south band developing in the middle and northern part of the HM86 square. This band is related to the low-level mass convergence occuring at the limit between the two air masses present on the domain, which is clearly visible on Fig. 3. It is remarkable that a similar pattern has developed in reality, as is obvious from Fig. 6. Two differences should be noted, however, between the prediction and the observation. The observed cloud band is located about 20 km east of the predicted one, which may be partly explained by the 28-min time difference between model and observation, and it is narrower (10 versus 40 km). This last effect may be explained by the insufficient horizontal resolution of the model. Differences between observed and modeled characteristics of this cloud band may also be related to the aforementioned forecast error on the strength of the remaining easterlies at the east of it. Since the model underestimates the easterlies, it probably underestimates the low-level convergence that is at the origin of this band. However, it should be recalled that the forecast of this type of pattern does not belong to the current state of the art of mesoscale meteorology, and is in itself a success.

The prediction of the temperature at screen level exhibits some larger discrepancies with the observations (Figs. 7 and 8). At 1200 UTC, the prediction is below most observations by 2–3 K, except in the southwestern part of the HM86 square, where underprediction of about 6 K is noted. Part of this error may have been produced by the overprediction of the low-level cloud cover on this same area, as noted above. The observations show higher temperatures inside the Landes Forest than outside, by about 2 K, a pattern that was correctly seen by the model in former experiments (see, e.g., Bougeault et al. 1989), and is more difficult to locate in the simulation described here. Our opinion is that, while refining the calibration of the scheme, and taking into account some of the subgrid-scale variability, in effect, we reduced the contrast between the surface characteristics of the Landes Forest and the

Banyuls summer school and the resulting book





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An Example of Spatial Integration of a Land-Surface Parameterization in a Meso-Beta-Scale Model

P. Bougeault, B. Bret, P. Lacarrere, and Joël Noilhan

1. Introduction

Natural land surfaces are not homogeneous over the resolvable scales of atmospheric models. Therefore, these models must account for the subgrid-scale variability of underlying surfaces to determine the

observations, before going on to m ones. The development of this "optir is as follows. First, it is based on th a parameterization scheme against ments, which allows for the deter most sensitive parameters. These

Joël as head of the MC2 research team (1993-2003)

- The team grew from 6 scientists in 1993 to 15 in 2003
- Covering surface processes, atmospheric boundary layer, and increasingly hydrology
- Continuous development of ISBA scheme and validation against observations from multiple field campaigns
- Long-standing contribution to the international PILPS programme (ISBA was engaged in all PILPS exercises and often came out among the best models)
- ISBA was progressively integrated into all models of Météo-France
- Strong contribution to the development of the MesoNH atmospheric research model
- Start of work on assimilation of remote-sensing data in surface models
- First attempts to include the carbon cycle into ISBA (ISBA-Ags by JC Calvet)

Towards a research and development programme in hydrology (1995-2000)

- Towards 1993 we realized that ISBA was providing a key contribution to surface hydrology, and if properly coupled to a distributed hydrological model, could be the basis of a powerful new hydrological modelling system
- The comparison of observed and modeled run-off could also help us to trace the remaining weaknesses in the representation of surface processes: it was a win-win situation!
- Joël developed the cooperation with the main french research institutes in hydrology (CEMAGREF – now IRSTEA, BRGM, IRD, Ecole des Mines de Paris, CETP – now LATMOS, LTHE – now IGE) and some operational organizations (Agence de l'Eau Adour-Garonne).
- He patiently built a mutual trust and acquired a wealth of run-off data for the main french rivers
- He led the development of the Safran-ISBA-Modcou (SIM) system over several years – this was transfered to operations in 2003
- Joël was particularly proud of the success of SIM and its acceptance by the whole hydrological community (after the initial reservations!)

Joël as Head of GMME (2003-2009)

- A group of about 60 people, in rapid evolution with 3 out of 6 research teams created under Joël's tenure
- GMME covered most of the foundation science themes for our forecast models (surface, turbulence, convection, etc…)
- Development of a new surface model SURFEX (SURFace EXternalisée), integration of ISBA, TEB, etc.. and coupling with all models of Météo-France
- A strong contribution to the development of the AROME high resolution operational NWP system (became operational in 2008)
- The start of new efforts on fog prediction
- The rise of a new theme: urban processes
- A great attention to the young scientists: initial integration within the group and preparation of their future career

A snapshot of Joël's personal research in 2003-2008

- Improving the hydrologic aspects of ISBA, coupling with MODCOU and TOPMODEL
  - Revision of drainage and hydraulic conductivity formulations
  - Extension of SIM to more basins
- Exploration of carbon budget of land surfaces: CARBOEUROPE project and its regional field campaigns CERES 2005 and 2007:
  - an estimation of regional sources and sinks of carbone, using atmospheric modelling (MesoNH) to demonstrate the impact of atmospheric turbulence and mesoscale circulations on the regional budget of carbone

More surface processes, hydrology ad assimilation (2005-2010)

- The regular improvement of the SIM system for its users (Météo-France and SCHAPI)
- The start of the Hydrology SAF of EUMETSAT
- A new tool for predicting road surface temperatures for assistance to traffic (derived from SIM)
- The European project ELDAS coordinated by Bart van den Hurk at KNMI (2001-2004) allowed a clean intercomparison of several approaches to land surface data assimilation.
  - This opened the way to our participation into current efforts in surface reanalyses under Copernicus (EURO4M, UERA, C3S contracts, etc…)
- Start of an ensemble river flow forecast system based on SIM (parallel to EFAS at the scale of the french territory)
- Projects on impact of climate change on hydrological regimes (e.g. GICC-Rhône)
- Early discussions on more ambitious objectives: capture the whole hydrology of France in a single tool => towards the Aqui-FR project.

An inspiration to all of us

Joël's golden rule

- 1/3 of time: personal research
  - Over time, he covered boundary layer dynamics, land surface processes, hydrology, carbon budget, with always a balance between observation-based research and model development
- 1/3 of time: leading his team/group
  - MC2 research team (1993-2003), GMME research group (2003-2009). Defining directions, building partnerships, training young scientists, recalling the expectations of the funding organizations, etc…
- 1/3 of time: engaging in wider science animation activities at national and international levels
  - Multiple committees, jurys and projects

Joël's qualities stressed by his bosses

- « A strong international visibility (committees, invited talks) »
- « A constant attention to the operational needs of Météo-France »
- « A unique role to facilitate the dialogue between experimental science and the development of numerical models »
- « Always looking for synergy with the other research teams »
- « A real skill to develop cooperative work and partnerships with other institutions »
- « An exemplary role for transfering research results to operations »
- « A remarkable success in attracting and training young scientists »

Joël's presence in committees and working groups

- Programme National de Télédétection Spatiale
- Programme National de Recherche en Hydrologie
- Programme National Dynamique de la Biosphere Continentale
- Commission Spécialisée Surfaces et Interfaces Continentales de l'INSU
- CNRS Section 20 (2004-2008)
- Commissions scientifiques et de recrutement de l'INRA
- Comité Scientifique et Technique des Avions de Recherche
- Conseil Scientifique et Technique du SCHAPI
- Conseil Scientifique de l'OMP
- **GEWEX Scientific Steering Group**

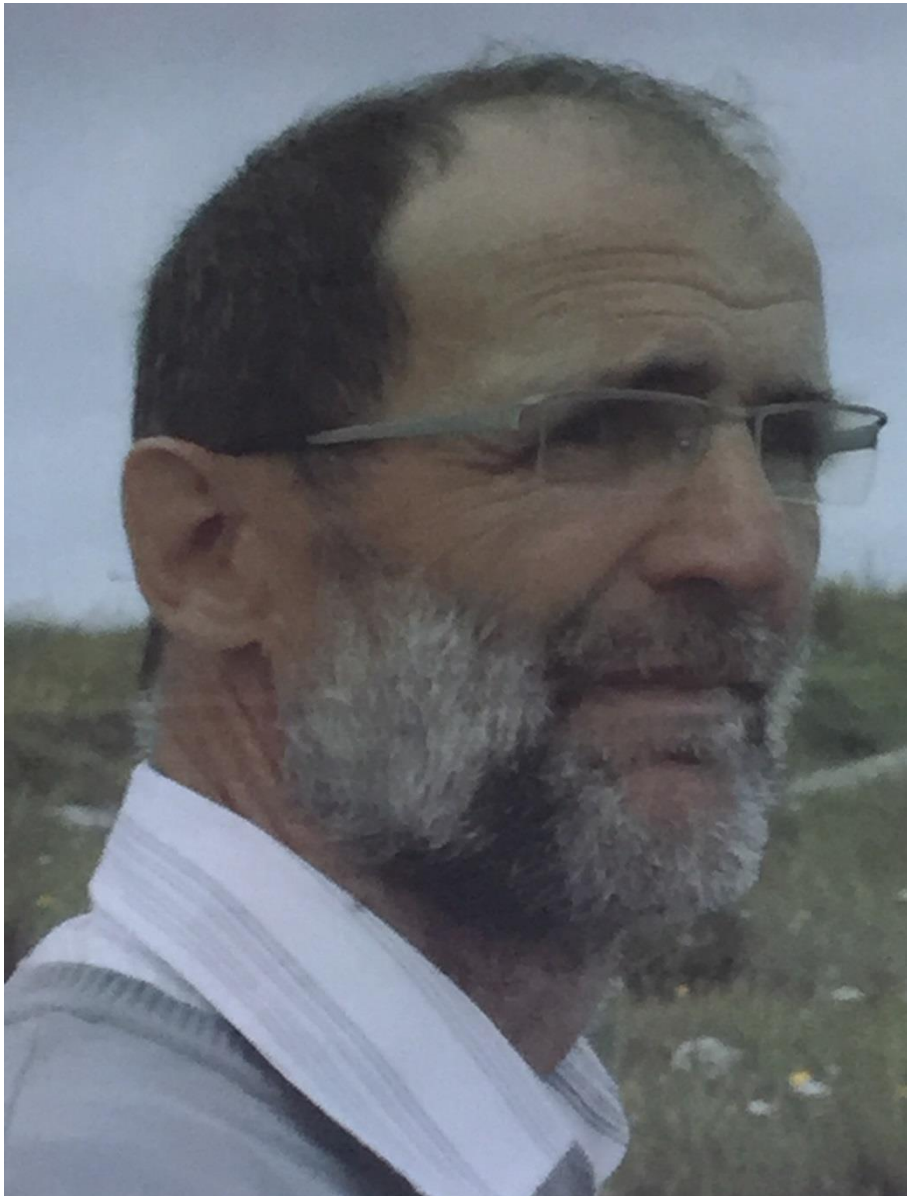
What will remain of Joël's work?

- In 2009, Web of Science was mentioning 92 peer-reviewed publications, 3688 citations, a H-Index of 32
- ISBA used by more than 50 institutes at times
- The PhD theses of Gian-Paolo Balsamo, Aaron Boone, Bertrand Decharme, Pierre Etchevers, Florence Habets, Thomas Lauvaux, Fabienne Rousset, Rui Salgado, Sophie Morel, etc..
- Numerous visitors and post-doc were welcomed by Joël, found later permanent positions at other research institutes and created a kind « CNRM diaspora ». This contributed to reinforce our relations with many partners.

An exemple of Joël's honesty

reference	pourcentage de Noilhan	remarque
Andre et al . 97	30%	
Alvala et al. 96	5%	
Belair et al. 97	15%	
Calvet et al. 97	10%	(murex)
Calvet et al. 97	5%	(mesures physiques...)
Calvet et al. 97	10%	CO2
Calvet et al. 97	5%	cartographie
Chen et al 97	1%	(PILPS/Cabauw)
Delire et al. 97	20%	(Abracos 0D)
Giordani et al. 96	50%	(EFEDA 1d)
Goutorbe et al. 97	15%	(HapexSahel 1D)
Habets et al. 97	50%	(Adour)
Linder et al. 97	25%	(EFEDA, intercomp.)
Mahfouf et al. 96	5%	(Pilps, RICE)
Mahfouf-Noilhan 96	40%	(JAM)
Noilhan 97	100%	(Houille blanche)
Noilhan 96	60%	(J. Hydrol.)
Noilhan 96	50%	(rap. EFEDA)
Noilhan-Mahfouf 97	60%	(Pilps, RICE)
Noilhan et al 97	50%	(Chambre)
Pitman et al. 97	1%	(Pilps/1c)
Wetzel et al. 96	5%	(Pilps, RICE)
TOTAL	612%	

Table 1: Auto-évaluation de ma contribution dans les publications, conduisant a environ 6 publications pour 2 ans (ou 25 % d'investissement par publication en moyenne)



Thank you Joël!