Dr. René Laprise. Photography courtesy of René Laprise.

Interview with René Laprise

Hans von Storch

René Laprise is a French Canadian trained meteorologist and forecaster. He studied physics at Sherbrook, meteorology at McGill (master in 1977) and the University of Toronto (PhD in 1988). Since 1988, he is a professor in the department of "Sciences de la Terre et de l'Atmosphère" at the University Québec à Montréal (UQAM). He has led the Canadian Network for Regional Climate Modelling (CRCM) till recently and is presently director of UQAM's ESCER "Centre pour l'Étude et la Simulation du Climat à l'Échelle Régionale".

René Laprise was instrumental in setting up Ouranos in Québec: the Consortium on Regional Climatology and Adaptation to Climate Change. This Ouranos is a consortium that brings together 250 scientists and professionals from different disciplines. It focuses on two main themes: Climate Sciences and Impacts & Adaptation.

He was recognized as "Personality of the Year" 2007 by La Presse/Radio-Canada, in the category of "Humanities, Natural Sciences and Technology," as being the father of Regional Climate Modelling (RCM) in Canada, among other achievements.

You have been a pioneer in developing and using regional climate models. What do you think is the significance of these tools?

Sometimes, objections are raised, arguing that the use of lateral boundaries is be unphysical, or that such models will be outdated with enough increase of computer power.

One should keep in mind that a regional-nested model is a tool, not a purpose in itself. The goal of regional models is to reduce computing demand compared to a global model with the same high resolution. All models are based on a set of approximations: numerical discretisation, resolution truncation, parameterisation of the sub-grid effects. Regional models have an additional approximation related to the imposition of artificial lateral boundaries. My team has been able to show with a set of systematic idealised experiments based on the perfect-prognosis "Big-Brother Experiment," that regional models can perform adequately when some basic rules are followed with respect to resolution jump, domain size and nesting technique.

Nowadays, regional climate models allow making high-resolution climate simulations that resolve mesoscale circulations at a computationally affordable cost. Computing power will continue to increase in time; this will make feasible to integrate global models at much higher resolution soon. This does not mean that RCM will become outdated; on the contrary, they will allow addressing other challenges at even higher resolution. For example ultra high resolution (e.g. 1 km or 100 m mesh) will permit to tackle fascinating issues relating to very fine-scale topographic or physiographic features. Such models could be used advantageously for example to explore potential sites for wind-power generation.

In Montreal, you are with the Ouranos consortium. Could you say something about the concept, its significance and performance?

The major weather events that have struck Québec in recent years, in particular the Saguenay flood in July 1996 and the ice storm in January 1998, have focused the attention on the vulnerability of society to such disasters. The Ouranos Consortium on regional climatology and adaptation to climate change was established in 2001, as a joint initiative by the Québec provincial government, the Hydro-Québec electric utility and Environment Canada, with four member universities. Ouranos acts as a reference center to decision makers for all concerns relating to climate fluctuations, climate changes and their impacts on a wide range of issues, such as public safety, infrastructures, energy supply, water resources, health, forestry agriculture, tourism, transportation, and the natural environment.

Ouranos is a unique institution in Canada; it constitutes a stable infrastructure to secure the expertise, and it provides a rich milieu where climate scientists and practitioners in climate impacts and adaptation can interact. Graduate students can greatly benefit from such multidisciplinary working environment.

You are a French-Canadian, i.e., a person with a non-English cultural background – to what extent is this an advantage or disadvantage for your scientific endeavor?

The status of English as lingua franca for international (and Canadian!) science certainly creates an additional challenge to non-English speakers, here in Québec and elsewhere. I think this is especially acute early in one's career when "learning the ropes of the trade." In my group, our several foreign graduate students who are neither from French nor from English background face a double challenge: they attend classes and write exams in French, and when they are ready to communicate their research findings, they are sent to international conferences and asked to write scientific papers in English. But they all succeed remarkably well! Possibly the fact that their professors themselves face the language challenge serves them as "role model."

What would you consider the two most significant achievements in your career?

The first is the dynamical formulation of a "universal" model based on the fully elastic atmospheric equations solved by semi-implicit and semi-Lagrangian marching scheme (Tanguay, M., A. Robert and R. Laprise, 1990: A semi-implicit semi-Lagrangian fully compressible regional forecast model. Mon. Wea. Rev. 118: 1970-1980.), with terrain-following mass vertical coordinates (Laprise, R., 1992: The Euler equation of motion with hydrostatic pressure as independent coordinate. Mon. Wea. Rev. 120: 197-207.). This work demonstrated that the same model could be used efficiently from cloud-resolving scale (without the need to invoke the anelastic approximation) to global scales (without the need for the hydrostatic approximation). Similar approaches are now used in several models around the world, including GEM in Canada, WRF in the USA, HIRLAM in Scandinavia, ALADIN and AROME in France.

The second is clearly my 18-year endeavor to develop from scratch a regional climate modelling team in Canada (Laprise, R., 2008: Regional climate modelling. J. Comp. Phys. 227: 3641–3666.). With graduate students and junior research associates, we built an original (and efficient) Regional Climate Model, developed a suite of diagnostics analysis tools and graphics software, and initiated a set of climate simulations and climate-change projections over North America. Through this effort some 60 young scientists have been trained, and this highly qualified personnel constitutes in my opinion the most important legacy of this endeavour. This RCM team has been instrumental in initiating the Ouranos Consortium.

When you look back in time, what where the most significant, exciting or surprising developments in atmospheric science?

Sophisticated data assimilation techniques and widespread satellite remote sensing data have greatly improved the accuracy of the initial state of the atmosphere for weather forecasts. Faster computers have had tremendous impact, making possible the treatment of the vast amount of observational data, the integration of high-resolution complex numerical weather prediction models, and the automation of weather forecasting.

Is there a politicization of atmospheric science?

In my view, science gains by being policy relevant, but it should refrain from the temptation of becoming policy prescriptive. When asked by media to give my personal opinion on a topic such as global warming, and emission reduction targets or strategies, I always restrict myself from explaining the consequences on the climate of actions or inactions in terms of emissions, and some of the expected impacts on the natural environment. I feel that scientists lose the edge conferred by their profession when making statements outside their own specialisation area, and when they do they join the pack of ordinary opinionated citizens.

What constitutes "good" science?

I think that scientists should constantly question the current science paradigms. I have been rather surprised early in my career to find that, contrary to my initial naïve view of science aimed at pushing back the limits of knowledge, the majority of scientists tend to be very conservative and not much interested in encouraging the emergence of new scientific ideas.

For myself, I prefer to work on scientific topics that lend themselves to combining theory and application. Theory alone is what I would call "a solution that seeks a problem to solve;" not my cup of tea. Applications alone lead to engineering approaches; may be very important in practice, but not of much interest for me.

What is the subjective element in scientific practice? Does culture matter? What is the role of instinct?

I do not believe much in natural, spontaneous instinct. On the other hand I think that one's character and personality exert great impact on the scientific practice. I think that what is often referred to as instinct is in fact developed from previous experiences, personal progression, and hence one's scientific culture. For example, I do not think I would ever have conceived working on the formulation of a universal model if I had not been acquainted before with a hydrostatic global model while working at the Canadian Climate Centre, and later with an anelastic mountain wave model for my doctoral research.

The 2nd Lund Regional-scale Climate Modelling Workshop

Burkhardt Rockel, Lars Bärring and Marcus Reckermann

From 4-8 May 2009, about 200 climate scientists from around the world met in Lund, Sweden, for exchanging and discussing the latest developments in regional climate modelling. This Second Lund Regional-scale Climate Modelling Workshop was a follow-up to the first regional-scale climate modelling workshop held in Lund, Sweden in 2004. Now, five years later, it was time to take stock of the scientific progress in the wide range of topics that regional climate modelling spans. These range from the theoretical understanding and parametriza tion of meso-scale and regional processes in the atmosphere / ocean / land surface / biosphere system to the numerical methods and links between regional climate modelling and global climate/earth system models, as well as numerical weather prediction models, the evaluation of models using various observational datasets, the model intercomparison and ensemble-based methods, the production and utility of regional climate scenarios, and the application of regional climate modelling output for impact studies. In this Second Lund Regional-scale Climate Modelling Workshop those present summarised develop ments and progress achieved in the last five years, discussed open issues and focused on expected future challenges related to regional climate modelling. Thus, the overall theme for this workshop was 21st Century Challenges in Regional-scale Climate Modelling.

The response to the workshop was overwhelming. We received over 170 paper contributions from scientists from all continents, and a total of about 220 participants from 43 countries registered for the workshop. This was more than twice as many as in the first workshop in 2004, reflecting the growing interest in regional climate modelling, largely driven by the growing demand for high resolution climate projections.

The workshop was structured in seven topic areas, which were represented both in the oral and the poster sessions. Since a prominent application of regional climate models is the provision of high resolution climate scenarios by downscaling global climate model scenarios, it was not surprising that the session on dynamical downscaling was the most frequented. In particular, the use of spectral nudging techniques (a method imposing time-variable large-scale atmospheric states on regional atmospheric models in order to improve downscaling), received much attention. Spectral nudging techniques are now used in regional "reconstructions," i.e., downscaling of re-analyses of the last few decades, dealing with, for instance, the changing statistics of the East Asian summer monsoon, or of polar lows. Results from the next generation of regional climate models, which are applicable