Atmospheric Sciences Section of AGU Newsletter

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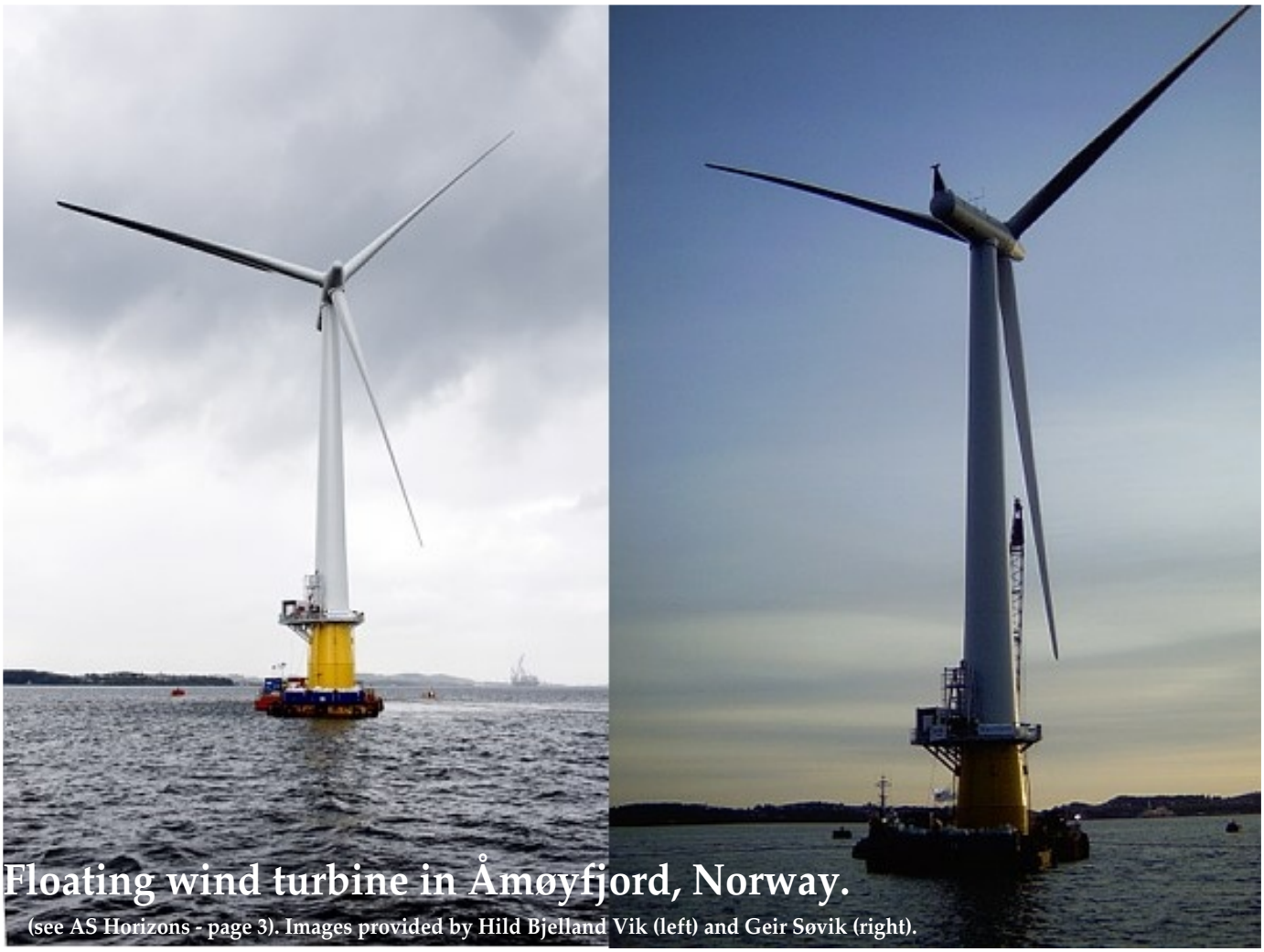

Floating wind turbine in Åmøyfjord, Norway.

(see AS Horizons - page 3). Images provided by Hild Bjelland Vik (left) and Geir Søvik (right).

AS Newsletter - Editorial -

Hello Readers,

A new issue of the newsletter is here. I hope you have remembered to submit your abstracts for our next AGU Fall Meeting.

In this number we introduce you the new Holton Winner Award, Dr. Simona Bordoni, and you will learn about the promising offshore windpower in the AS Horizon section. Also, Dr René Laprise, a prominent scientist on the field of regional climate modelling (RCM), answers questions in an interview conducted by Hans van Torch. A report on the workshop about RCMs held in Lund (Sweden) and an article about pollution in Beijing during and after the Olympics complete this issue.

In addition, of course, we provide our usual section with opportunities, schools and conferences.

Remember, we are looking for contributions, don't hesitate contacting us. Juan A. Añel <j.anhel@uvigo.es>.

Happy Reading,

Juan A. Añel, Editor-in-Chief

EPhysLab, Univ. of Vigo at Ourense, Spain, and CESAM, Univ. of Aveiro, Portugal.

Section News

Alan Robock

As a member of AGU Council and the Future Focus Task Force, I have been deeply involved with recommendations to change the AGU governance structure. This may not be that interesting to most of you, but the changes will very much improve the ability of members to have input to the most important functions, meetings and journals, and allow your officers to focus on what is important. Our recommendations are to split the current Council into a Board of Directors to handle the financial and business aspects of AGU and a new, larger Council with representation from focus groups and committees. This will allow the Council to focus only on the scientific and award functions of the Union, with much more flexibility as we move into the future to deal with new scientific directions. For example, the Global Environmental Change focus group will have as much say as the Atmospheric Sciences section, while we will all still retain our relative number of new Fellows each year based on our total numbers. I urge you to read the details in the September 15 *EOS* (vol. 90, No. 37), available at http://www.agu.org/pubs/eos and then vote for the new structure when you receive your ballot. If you have any questions, please contact me at robock@envsci.rutgers.edu.

My term will be over next June 30. I also encourage you to vote for the new President-Elect this Fall when you receive your ballot. The nominees are listed below for this office and for secretaries.

Nominees for AGU 2010–2012

Election of Officers (AS Section)

President-elect:

Charles E. Kolb and Peter J. Webster

Sec. Aerosols and Clouds (AA):

Surabi Menon and Omar Torres

Sec. Physics, Climate, and Dynamics (AP):

Natalia Andronova, unopposed

Sec. Composition and Chemistry(AC):

John E. Mak and Sasha Madronich

Additional nominations may be made by membership petition. Nominees must be either a member or a fellow of the Union. Each petition must be accompanied by a letter from the proposed nominee, agreeing to serve if elected. There are no age, nationality, residence, or other analogous restrictions on who may serve as an officer. Petitions should be sent to the General Secretary, American Geophysical Union, 2000 Florida Avenue, NW, Washington, DC 20009, USA. They must be received no later than 27 October 2009.

As prescribed by the bylaws, each petition must be signed by at least 1% of the members of the Union or the section, as the case maybe. The number of names required for a valid petition is as follows in our section is 188.

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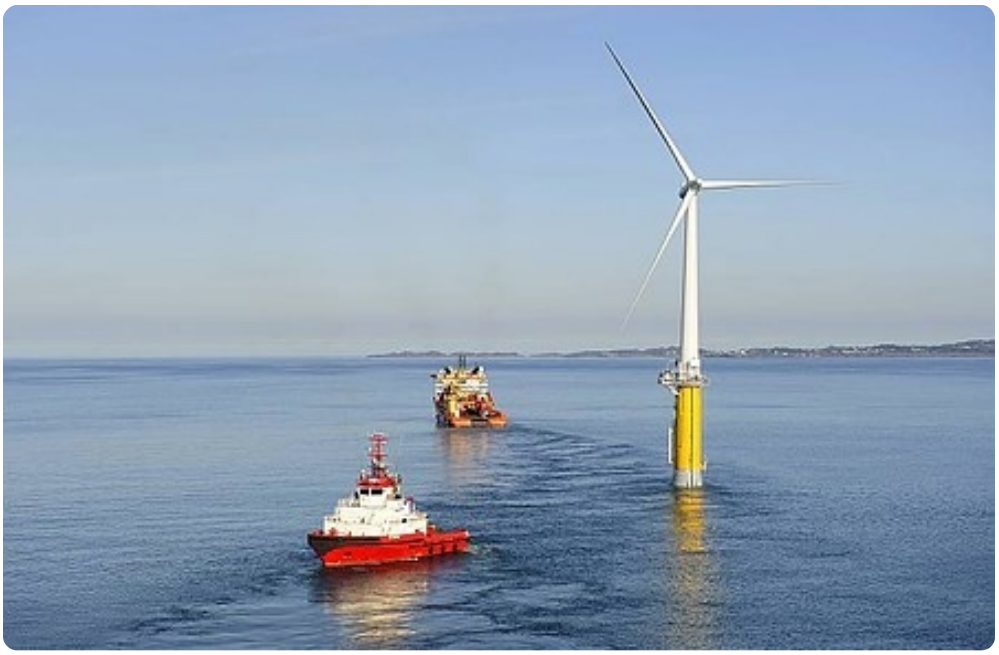
Please do not miss the annual Atmospheric Sciences Chinese banquet, which will be held at 7 pm, on Tuesday, December 15, at the Empress of China restaurant. We will have a jazz pianist providing background music (with a weather theme) and also a performance after dinner. This year the banquet will be joint with the Global Environmental Change section. section. We will present the Holton and Kaufman Awards, as well as honor winners of the Namias and Hofmann student travel awards and the student awards for best presentations at the Joint Assembly. This year, we have reduced the price, $39 for regular members and $19 for students. This includes hors d'ouvres during drinks (cash bar) for the first half hour. Please come and mingle, and then enjoy the dinner and the show. Register for the banquet when you register for the Fall Meeting.

AS Horizons

Michel d. S. Mesquita and Idar Barstad

The Promising Future of Wind Energy: Offshore "Floating" Turbines



Hywind installed on June 8, 2009. Photography courtesy of Øyvind Hagen.

The "harvest" of wind to produce energy has been used for many years and it is now in the spotlight of an increasing trend: renewable energy demand. The first wind farms were mainly on land, but their use has become somewhat controversial because of their environmental effects and the landscape aesthetics. In order to circumvent that, offshore technologies have been developed. The newest technology uses "floating" turbines, which can be used in the open sea, where winds are higher, and thus showing a promising future for wind energy.

Many are the reasons for using offshore wind power production. For example, North America, northern Europe and the North Sea are among the regions for great wind power potential [*Archer and Jacobson*, 2005]. In the United States, 810 of the more than 1000 gigawatts of offshore wind potential are in waters deeper than 30 meters [*Patel*, 2009]. A recent study has shown good potential for wind power production in the North Sea in the future (2020-2060) using downscaling methods [*Mesquita and Barstad*, 2009].

There are however some drawbacks. Large-scale use of wind power can alter local and global climate by extracting kinetic energy and altering turbulent transport in the atmospheric boundary layer [*Keith et al.*, 2004]. *Kirk-Davidoff and Keith* [2008], based on model simulations, have found a consistent Rossby wave response in the mean winds to roughness anomalies across a range of model implementations, with appreciable cloudiness, wind and temperature anomalies. In spite of the potential regional/global impacts of wind farms, *Keith et al.* [2004] mention that a single wind turbine has an infinitesimal direct effect on global climate, but it also makes an infinitesimal indirect contribution to reducing climate change by slowing the growth of atmospheric CO_2. They also add that the direct climate changes that are due to wind power may be beneficial because they can act to reduce, rather than increase, aggregate climate impacts.

The world's first large-scale offshore wind farm is the Horns Rev (Denmark) farm, located 14 km offshore at water depths of 5-15 m [*Christiansen and Hasager*, 2006]. Many other similar farms have been installed throughout Europe. Most of them are about 20 km away from the shore. Germany has projects to build wind farms at water depths of 20-40 m located around 40 km away from the coast, which can impose challenges to build such structures using traditional offshore technologies [*Fairley*, 2009].

The conditions offshore are different than on land, mainly due to three aspects [*Tambke et al.*, 2005]: a) non-linear wind-wave interaction (variable surface roughness); b) large heat capacity of the water which affects the thermal stratification; and c) internal boundary layers due to the land-sea discontinuity. Atmospheric stability / stratification plays a more important role than on land, since non-neutral stratification occurs more frequently at higher wind speeds, which are important for wind energy usage [*Jimenez et al.*, 2007; *Lange et al.*, 2003]. Wake effects must also be considered [*Christiansen and Hasager*, 2006]. The main advantage of offshore wind technology is reduced surface roughness, which results in higher wind speed and greater wind power production – an offshore wind farm can experience wind speeds that are 90% higher than wind speeds at an onshore wind farm [*Archer and Jacobson*, 2005].

In order to achieve further results in wind power production, a new technology was needed: to bring turbines further away from the shore, to the open sea, where winds are higher. This imposes an enormous challenge! However, a new technology has been developed. It is the use of "floating" wind turbines tethered to the seabed with cables, which make their construction and installation more feasible for the open sea. On June 8, the steel tower was deployed 10 km southwest of Karmøy (Åmøyfjord), Norway: the world's first full-scale floating wind turbine had been born!

The StatoilHydro floating turbine is called HyWind. The floating section of the turbine extends 100 m under the surface and it is then anchored to the seabed by three cables. It is a 2.3 MW turbine, weighing 138 tons. The turbine height is 65 m and the rotor diameter is 82.4 m. The wind turbine can be placed at ocean depths between 120 and 700 m, which makes it easier to be placed in the open sea. The pilot test will last for two years starting from autumn 2009. The project cost is about 400 million Norwegian Kroner (about US $67 million). Even though the cost is high, the benefits of such technology are several. Another floating turbine prototype was installed off Puglia (Italy) by the Blue H Technologies, a company from the Netherlands, as reported by *Patel* [2009].

The "floating" turbine seems to be a feasible solution to the ongoing renewable energy demand. This kind of technology not only can produce more energy, but it is also far from sight, that is, it does not spoil landscape aesthetics. If Hywind proves to be successful, the wind energy future will seem very promising!

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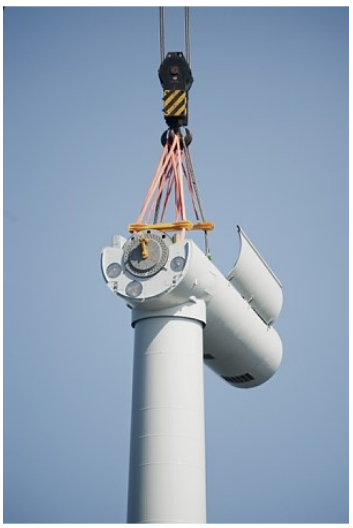

Hywind pilot being installed. Photography courtesy of Philip Tornes.

Holton Award Winner 2009: Simona Bordoni

Morgan Yarker

Dr. Simona Bordoni. Photography obtained from the AGU Atmospheric Sciences Section web page.

Meet the newest Holton Award winner, Dr. Simona Bordoni. Her new position is as Assistant Professor of Environmental Science and Engineering at the California Institute of Technology (Caltech). She recently finished her work as a postdoctoral scholar at NCAR in the Advanced Study Program and Mesoscale and Microscale Meteorology Division. As a young researcher, she has made outstanding contributions to the field, with seven refereed publications and a long list of awards and professional service experiences.

Bordoni's career began in Italy, where she received her degree in physics from the University of Rome Tor Vergata. Being there she found research to be extremely interesting and enjoyable, but the topic of her thesis did not seem applicable to real-world issues. After her graduation, she worked as an engineer for a meteorological equipment provider. That experience helped her develop a passion for meteorology and atmospheric sciences that led to her decision to get her PhD at the University of California at Los Angeles (UCLA).

While she was at UCLA, Bordoni conducted research on the North American Monsoon using high-resolution satellite derived and reanalysis data. Her work focused on the meso-scale dynamics of the monsoon. Having worked for some time on what some consider a minor monsoon, she began using idealized models to investigate more general aspects of larger-scale monsoon systems, such as the Asian monsoon. This research project became what she describes as one of her biggest research accomplishments.

She explains, "Using idealized models, we were able to simulate monsoon formation even in the absence of land-sea contrast, which traditionally has been considered necessary for the development of monsoons." She concluded that monsoons can arise from the interaction between the tropical circulation and the large-scale waves generated in mid-latitudes. Feedbacks between the mean circulation, the upper-level winds, and the large-scale waves make it possible for the circulation to change rapidly, as it is seen at the onset of Earth's monsoons.

Along with the Holton Award, Bordoni's previous honors include the UCLA Bjerknes Memorial Award for "novel insights into the structure of gulf surges and the North American Monsoon," a Student Poster Presentation 1st place award for the International CLIVAR Science Conference, the Bosart Award for "unselfish service to fellow students and positive contribution to department life while demonstrating a firm commitment to academics" at UCLA, a Caltech Moore Postdoctoral Fellowship in Environmental Science and Engineering, and various student fellowships, including the NASA Graduate Student Fellowship in Earth System Science.

Bordoni has also served the scientific community as a reviewer for four journals, and as a member of the Thompson Lecture Committee, Max Eaton Award Committee, and the Graduate Curriculum Committee at UCLA. She was also co-president and treasurer of the Chi Epsilon Pi student organization and is a member of both AGU and the American Meteorological Society.

Dr. Bordoni is greatly looking forward to her future at Caltech as an assistant professor. She explains, "Teaching and advising are great ways to share knowledge and also to learn in the process." She would also like to expand the understanding of the fundamental dynamical mechanisms that are implicated in the existence, location and geographical features of all monsoon systems, and to bridge the gap between large and small scales.

In her spare time, Bordoni enjoys spending time with her two kids, Francesco (four years old) and Jacopo (five months old). They enjoy hiking and going to the beach.

Congratulations Dr. Bordoni!

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 un-physical, 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

Participants in the 2nd Lund Regional-scale Climate Modelling School.

to very high resolution simulations (10 km grid mesh size and smaller) were shown and they gave an insight on the future possibilities of regional climate models.

In recent years there has been a growing number of large projects around the world, in which regional climate modelling plays a major role. The results from several of these projects were presented at the workshop (e.g. ENSEMBLES, NARCCAP, GEWEX/CEOP, AMMA, CLARIS, CLAVIER). An outlook on the future of regional climate modelling was given in a special session. In the future, the coupling of regional systems will become more and more standard, e.g. regional atmosphere and ocean models will increasingly run in a coupled mode, rather than independently. Other modules, like ice models, aerosol chemistry, dynamic vegetation and others may also be coupled to the atmosphere and ocean models. All this goes into the direction of regional earth system, or regional environment models. Other aspects discussed were the use of global climate models (GCMs) with regional refinement in grid mesh size, dynamic grid stretching and mosaic GCMs. The "added value" of regional climate models in comparison to global models, which had been a topic already at the Lund meeting in 2004, was again discussed. An added value has been identified with respect to the presentation of medium spatial scale variability, which is regions with physiographic details, such as coastlines or mountain ranges, as well as sub-synoptic dynamical phenomena such as polar lows.

Results from regional climate scenarios, or projections, are the basic input for many impact studies. Therefore, a special session was dedicated to this aspect. There was a broad range of applications dealing with water quality, forest damage, the Sahel zone, socio-economic impacts, urban areas and mega cities, and the impact of land use change on regional climate projections.

The workshop was co-organised by Lars Bärring from the Swedish Meteorological and Hydrological Institute (SMHI) and Lund University, Burkhardt Rockel of GKSS-Forschungszentrum Geesthacht GmbH (GKSS), the Danish Meteorological Institute (DMI), and the International BALTEX Secretariat. BALTEX is a regional environmental research network for the Baltic Sea basin. Regional climate modelling for the Baltic Sea region is one of the major research objectives of BALTEX.

Extended abstracts of all contributions are compiled in the Workshop Proceedings (International BALTEX Secretariat, ISSN 1681-6471, Publication No. 41, April 2009), and are available online: http://www.baltex-research.eu/RCM2009/. A special issue on the workshop will be published in a dedicated international climate research journal, tentatively to be published in 2010.

The Olympic Legacy: What Were the Effects of the Pollution Controls During Beijing Summer Olympics?

Anna Harper

More than a year has past since the world's eyes were on the city of Beijing for the Summer Olympics. The athletic ability, courage, and determination of Olympic athletes can leave a lasting impression on their spectators. The people of Beijing may enjoy an additional legacy from the 2008 Olympics. Pollution controls during the Olympics reduced concentrations of particulate matter and black carbon, and Beijing has continued to implement some of these controls. In July 2008, we reported on Beijing's plans for curbing emission (http://atmospheres.agu.org/Newsletters/ASnewsletterVol2No3.pdf).

Here we report on some of the research that was done during the Olympics and Paralympics, which lasted from Aug. 8 through Sept. 17. Several posters on the Beijing pollution controls were presented at the Fall and Spring AGU meetings. At the 2009 Joint Assembly, a special section entitled "Characterization of air pollution and its interactions with weather and climate in East Asia before, during, and after the 2008 Beijing Olympic games" included six talks and six posters. Gary Morris from Valparaiso University, and Edward Celarier from the Goddard Earth Sciences and Technology Center presided over the session. "This was a very good, focused session. It does appear that the pollution controls implemented by the Chinese government have had an impact," said Morris.

Pollution has been linked to many respiratory diseases, and China is a long-sufferer of these effects of industrialization. According to the World Health Organization (WHO), in China in 2006 39 million people suffered from asthma and 32.8 million had chronic obstructive pulmonary disease (which includes lung diseases such as bronchitis). Beijing air masses also carry pollutants to other regions. Morris said the most polluted day out of a 19-day field campaign in Sapporo, Japan was influenced by the lower atmosphere near Beijing, based on air mass trajectories and the shape of the ozonesonde profile. Therefore, reduced pollution during the Olympic games benefited many more people than just the athletes.

Two recently released articles confirm the effectiveness of pollution controls during the Olympics and the Paralympics. Starting in early 2008, vehicle emissions standards were raised to European levels (Euro IV) [*X. Wang et al.*, 2009]. The first indication of success was from emission factors of carbon monoxide, black carbon (BC), and ultrafine particles (UFP). The emission factor is a measure of fuel cleanliness and is defined as the grams of pollutant released per kilogram of fuel consumed. Compared to 2007, the 2008 emission factors for light duty vehicles decreased by 33%, 47%, and 78% for BC, CO, and UFP, respectively. Heavy duty vehicle emission factors decreased by 67% for UFPs,

but there was no significant change for CO or BC. These decreases brought the particle and CO emissions on par with those in major U.S. and European cities, but the black carbon emission factors are still relatively high [*X. Wang et al.*, 2009].

The second step was to reduce the volume of traffic and other sources of pollution, such as coal burning, trash incinerators and construction. Traffic controls removed 1.9 million vehicles from the roads each day in Beijing (for an overview see Section 2 of *X. Wang et al.* [2009]). According to the United Nations Environment Programme, the total cost of the pollution control efforts was $17 billion.

The concentration of pollutants decreased, although different studies cite different values depending on their location and measuring techniques. For example, *W. Wang et al.* [2009] measured PM10 values 30% higher than those reported by the Beijing Environmental Protection Bureau. Compared to levels during the Olympic traffic controls, black carbon concentrations were 3.8 times higher during non-traffic control days surrounding the Olympics [*X. Wang et al.*, 2009]. PM2.5 and PM10 levels were also about three times higher during non-traffic control days [*W. Wang et al.*, 2009].

Meteorological effects, such as shifting winds and precipitation, accounted for 40% of the variation in PM10, while traffic controls accounted for 16% [*W. Wang et al.*, 2009]. For example, the accumulated precipitation from Aug. 8-24 in the Beijing area was 151.7 mm, compared to the 30-year average of 80 mm [*UNEP*, 2009].

That's the good news. The bad news is that Beijing's baseline levels of pollution are so high that despite these improvements, the PM2.5 and PM10 still exceeded WHO 24-hour guidelines 100% and 81% of the time, respectively [*W. Wang et al.*, 2009]. Beijing is the world's 13th most polluted city [*World Bank*, 2004].

For Beijing's 14 million residents, there is one extra piece of good news. During October, November, and December of 2008, PM10 levels were 9 to 27% lower than the same period in 2007, suggesting a long-term effect of the pollution controls (although the economic down-turn in late 2008 could also have played a role) [*W. Wang et al.*, 2009]. During the first seven months of 2009, there were 171 days of low pollution levels, compared to 149 days during the first seven months of 2008, according to the Beijing government [*Bristow*, 2009]. The city plans to continue to bar vehicles from the roads during weekdays, and to keep heavy emitting cars and trucks out of the city. Between these two measures, the Beijing Traffic Management Bureau estimates a 20% reduction in emissions [*Watts*, 2009].

Air pollution

Due to the many adverse health effects of air pollution, permanently reduced pollution in Beijing would improve quality of life and health for millions of people, even as far away as Hokkaido University in Sapporo, Japan, where Morris measured ozone pollution from air masses coming from Beijing.

References

Bristow, M., August 8, 2009, Beijing air "cleaner" since Games, *BBC News*

Wang, W. et al., 2009, Atmospheric particulate matter pollution during the 2008 Beijing Olympics, 2009, *Env. Sci. Technol.*, doi: 1021/es9007504.

Wang, X. et al., 2009, Evaluating the air quality impacts of the 2008 Beijing Olympic Games: On-road emission factors and black carbon profiles, *Atmos. Environ., 43*(30): 4535-4543, doi: 10.1016/j.atmosenv.2009.06.054.

Watts, J., April 6, 2009, Beijing keeps Olympic restrictions on cars after air quality improves, *The Guardian*

Opportunities

Note: You may be asked for your AGU member # to open the following links. Visit the AS Section website for links to other job opportunities not listed here.

Some of these job postings and others can be found at:

http://www.agu.org/cgi-bin/membership_services/joblistings.cgi

Atmospheric Sciences

* Biogeochemical Modeling Scientist II/III, NCAR, Boulder, CO. (reference tracking code #9162).

* Civil Space Division Director, Space Dynamics Lab, Logan, UT (http://www.sdljobs.org).

* Tenure-track faculty position in the area of mesoscale dynamics and modeling, Department of Marine, Earth, and Atmospheric Sciences (MEAS) at North Carolina State University.

* Mars Data Assimilation Research Scientist, Ashima Research, Pasadena, CA.

* Postdoctoral Fellow, Department of Atmospheric, Oceanic and Space Sciences, University of Michigan. Contacts: Prof. Christiane Jablonowski (cjablono@umich.edu) and Prof. Richard Rood (rbrood@umich.edu)

* Project Manager II, Scientific/Technical Development, NCAR, Boulder, CO. (reference tracking code #9193).

* Research Associate (Post Doc) in Carbon Cycle Modeling, Oregon State University (http://oregonstate.edu/jobs)(Posting #0004629).

* Research Associate Position, 610-111-392, University of Maryland, Baltimore County Goddard Earth Sciences and Technology (GEST) Center.

* Research Associate Position, 610-73-253, University of Maryland, Baltimore County Goddard Earth Sciences and Technology (GEST) Center.

* Tenure-Track Faculty Position in Mesoscale Data Assimilation, Department of Atmospheric and Oceanic Sciences, McGill University.

* Tenure-Track Faculty Position in Satellite Remote Sensing, Department of Atmospheric and Oceanic Sciences, McGill University.

* Research Scientist for development and validation of atmosphere measurement using the GPS satellites, Danish Meteorological Institute, Denmark. (http://www.dmi.dk/eng/scientist_041-0059-2009).

* Climate Scientist (11199), Australian Government-Bureau of Meteorology, Australia. Contact: Bertrand Timbal (b.timbal@bom.gov.au).

* Junior or Senior Faculty Position in Climate Science, NASA, Yale School of Forestry & Environmental Studies. Contact: James Saiers (james.saiers@yale.edu).

* Postdoctoral Fellow, Division of Earth and Life Studies, National Academy of Sciences (Job Req #: 090149-7).

* Postdoctoral, Research and Visiting Research Scientists, Atmospheric and Oceanic Sciences Program, Princeton University.

* Research Associate Position with expertise in tropospheric chemistry, 613-111-388, University of Maryland, Baltimore County Goddard Earth Sciences and Technology (GEST) Center.

* Scientist/Postdoc (SAS2009-27) to investigate in the context of the ICON model the impact of the turbulence scheme on the simulated circulation, Max Planck Institute for Meteorology, Hamburg, Germany. Contact: Marco Giorgetta (Marco.Giorgetta@zmaw.de).

* Postdoctoral position at CNRS GAME (Meteo-France), Climsec Project, Toulouse, France. Contact: Jean-Michel Soubeyroux (jean-michel.soubeyroux@meteo.fr).

* Postdoctoral position at CNRS GAME (Meteo-France), Project GICC/"ADAPT FVR", Toulouse, France. Contact: Yves Tourre (yvestourre@aol.com).

* Postdoctoral Research Associate to investigate the causes of change in European mean and extreme climate over the past five centuries (Vacancy Reference: 3011593), University of Edinburgh. Contact: Gabriele Hegerl (gabi.hegerl@ed.ac.uk).

* Project Scientist I, WACCM Liasion (#9205), Atmospheric Chemistry Division, National Center for Atmospheric Research, Boulder, CO.

Interdisciplinary

* Postdoctoral Fellow with credentials in Bayesian statistics, George Lemaître Center for Climate and Earth Research, Université catholique de Louvain, Belgium. Contact: Michel Crucifix (michel.crucifix@uclouvain.be).

* Postgraduate Research Fellow with training and interest in dynamical system theory and analysis, George Lemaître Center for Climate and Earth Research, Université catholique de Louvain, Belgium. Contact: Michel Crucifix (michel.crucifix@uclouvain.be).

* Postgraduate Research Fellow with training and interest in experiment design and analysis, George Lemaître Center for Climate and Earth Research, Université catholique de Louvain, Belgium. Contact: Michel Crucifix (michel.crucifix@uclouvain.be).

* Postdoctoral position at Cornell University held jointly across four academic departments (City and Regional Planning, Biological and Environmental Engineering, Mechanical and Aerospace Engineering, and Earth and Atmospheric Sciences). Contact: Peter Hess (pgh25@cornell.edu)

* Assistant Professor in Microclimatology, Department of Geography, University of South Carolina, Columbia, SC. Contact: Greg Carbone (greg.carbone@sc.edu).

* 5 New Faculty Positions in Energy & Environmental Systems, Institute for Sustainable Energy, Environment and Economy's, University of Calgary, Calgary, Canada.

* Assistant/Associate Professor Physical Geography, Department of Earth Sciences, Montana State University.

* Climate Postdoctoral Fellow (23252), Lawrence Berkley National Laboratory.

* Climate Postdoctoral Fellow (23258), Lawrence Berkley National Laboratory.

* Directorship, Institute of Earth Sciences, Academia Sinica, Taipei, Taiwan. Contact: Chung-Ho Wang (chwang@earth.sinica.edu.tw).

* Full-time faculty member in the Earth Sciences, Quest University, Vancouver, CA. (http://www.questu.ca/human_resources/faculty.php).

* Postdoctoral Fellowship in Atmospheric Science & Policy, Civil and Environmental Engineering Department, Princeton University. Contact: Denise Mauzerall (http://www.princeton.edu/~mauzeral).

Student Opportunities

* PhD in Sea-Ice Research (SAS2009-24), Max Planck Institute for Meteorology, Hamburg, Germany.

* PhD. position in the DFG-project, IFM-GEOMAR, Kiel, Germany. Contact: Dietmar Dommenget (ddommenget@ifm-geomar.de).

* PhD. position for the investigation of biophysical coupling in the seasonal ice zone, Alfred-Wegener Institute, Bremerhaven, Germany. Contact: Martin Losch (Martin.Losch@awi.de).

* Research Assistantships, Atmospheric Science Program, Department of Geography, University of Kansas, Lawrence, Kansas. Contact: Nathaniel Brunsell (nbrunsell@ku.edu) or David Mechem (dmechem@ku.edu).

* PhD student to investigate the variability of weather and climate extremes in Germany and Europe, Department of Geography, Department of Geography, University of Giessen, Germany. Contact: Jürg Luterbacher (juerg.luterbacher@geogr.uni-giessen.de).

* Grants to course a one-year MSc. in Climate Sciences, EPhysLab, Universidade de Vigo, Ourense, Spain. (http://masterclima.uvigo.es). Contact: Luis Gimeno (l.gimeno@uvigo.es).

Project Opportunities

Requests for Computing Resources at NCAR, CISL, NCAR, Boulder, CO. (http://www.cisl.ucar.edu/resources/overviewalloc.shtml),

Schools

Joint NCAR-NCAS WRF Users Workshop and Tutorial

Cambridge, UK. 28 September - 2 October 2009.

http://www.ncas.ac.uk/wrfworkshop

International Summer School on Land Cover Change and Hydroclimate of the La Plata Basin

Foz do Iguaçu, Paraná, Brasil. 2 - 13 November 2009.

http://www.cptec.inpe.br/conference

Conferences

// European Conference on Applications of Meteorology - EMS Annual Meeting //

Toulouse, France. 28 - 29 September 2009.

http://meetings.copernicus.org/ems2009/

// Joint ICTP/IAEA Workshop on Alternative Response Actions to Climate Change and Energy Options //

Trieste, Italy. 5 - 9 October 2009.

http://www.ictp.it

// 34th Conference on Radar Meteorology //

Williamsburg, VA, U.S.A., 5 - 9 October 2009.

http://www.ametsoc.org/MEET/fainst/200934radar.html

// Eighth Symposium on Fire and Forest Meteorology //

Kalispell, Montana, U.S.A., 13 – 15 October 2009.

http://www.ametsoc.org/MEET/fainst/20098fireforest.html

// The Extra-tropical UTLS: observations, concepts and future directions //

Boulder, CO, U.S.A. 19 - 22 October 2009.

http://www.acd.ucar.edu/utls/workshop.shtml

// AGU 2009 Fall Meeting //

San Francisco, CA, U.S.A., 14 - 18 December 2009.

http://www.agu.org/meetings/fm09/

// 90th AMS Annual Meeting //

Atlanta, GA, U.S.A., 17 – 21 January 2010.

http://www.ametsoc.org/meet/annual/index.html

// Local Air Quality and its Interactions with Vegetation //

Antwerp, Belgium, 21 - 22 January 2010.

http://www.vito.be/aq-vegetation-workshop

// Arctic Frontiers 2010 //

Tromsø, Norway, 27 - 29 January 2010.

http://www.articfrontiers.com

// International Conference on Polar Climate and Environmental Change in the Last Millennium //

Torun, Poland, from 1 - 3 February 2010.

http://www.zklim.umk.pl/nowa/polarna

// AGU Chapman Conference on Complexity and Extreme Events in Geosciences //

Hyderabad, India, 15–19 February 2010.

http://www.agu.org/meetings/chapman/2010/bcall/

// 29th Conference on Hurricanes and Tropical Meteorology //

Tucson, Arizona, 10 – 14 May 2010.

// CWE2010 - Fifth International Symposium on Computational Wind Engineering //
Chapel Hill, North Carolina, USA. 23-27 May 2010.
http://www.cwe2010.org
// 13th Conference on Harmonisation within Atmospheric Dispersion Modelling for Regulatory Purposes //
Paris, Franc, 1 - 4 June 2010.
http://www.aria.fr/harmo/

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