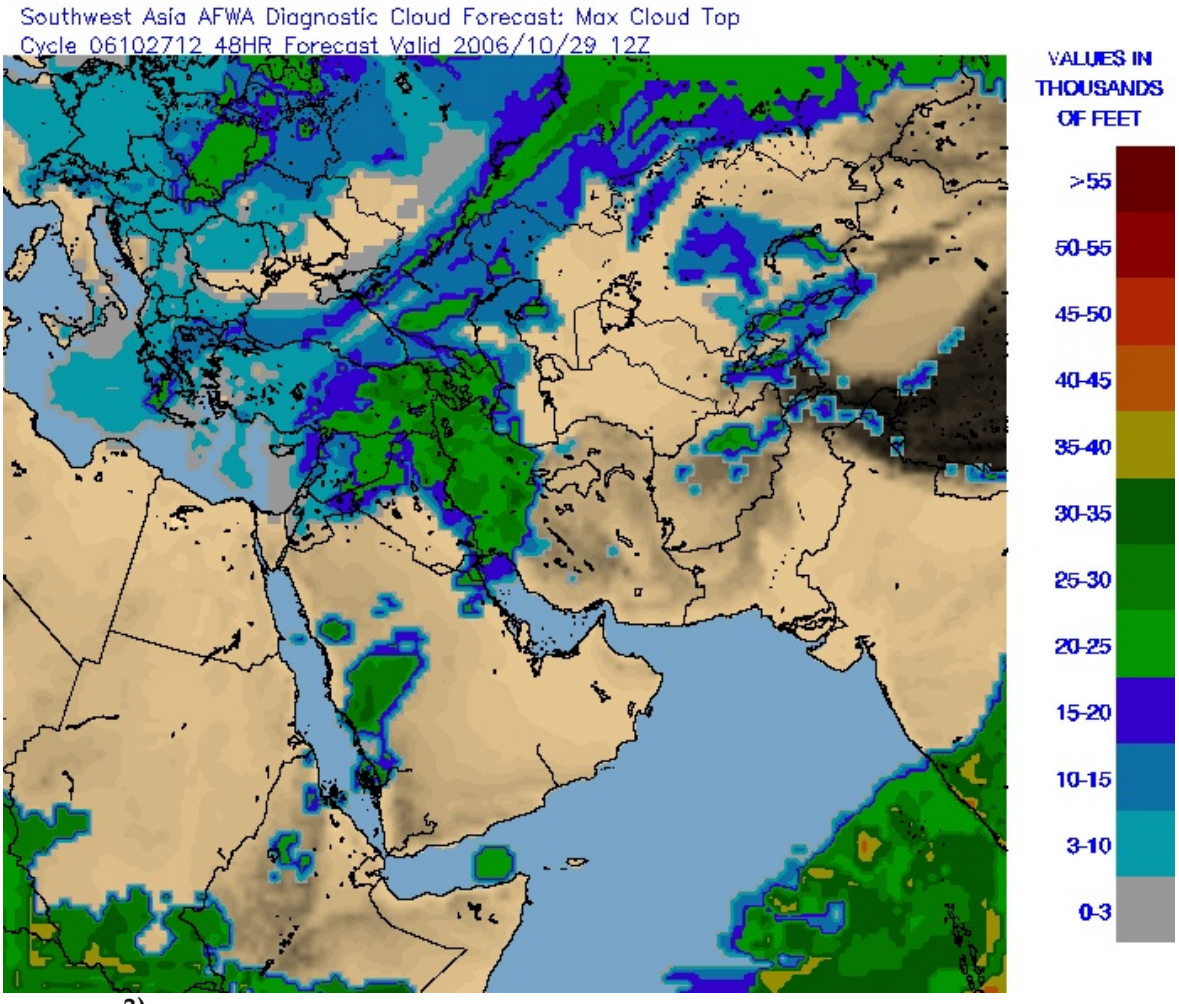
Atmospheric Sciences Section of AGU Newsletter

Volume 4, Issue 5 November 2010



(see AS Horizons - page 3)

NSF and the Atmospheric Sciences: Current Opportunities and Future Strategies

16 December 2010 - AGU Fall Meeting

12:30:00 PM - 1:30:00 PM - Moscone West, Room 2009

The Atmospheric Sciences community is invited to meet with Michael Morgan, the new AGS Division Director, and program officers from NSF's Atmosphere Section (AS), to learn about AS programs and opportunities. A brief overview of current activities and an introduction to the new AS strategic planning initiative will be followed by ample time for informal discussion and interaction.

AS Newsletter - Editorial -

Dear Readers,

a new issue of the Atmospheric Sciences Section of AGU Newsletter is here.

First of all, I would like to draw your attention to our announcement for the position of Editor-in-Chief included in this page. We are looking for somebody, perhaps you, to take this role.

Also the AGU Fall Meeting is now close and several announcements concerning it are included. Consider attending the meeting with the NSF's Atmosphere Section officers announced in the front page.

In this issue we review the recent release of the Community Earth System Model (CESM), include a report from a recent workshop held in Norway, interview Dr. Nanne Weber and present the second part of the article about meteorology in the military. Happy reading!

Juan A. Añel, Editor-in-Chief
EPhysLab, Univ. of Vigo at Ourense, Spain

Section News

Looking for Editor-in-Chief

Our section is looking for a new Editor-in-Chief for this newsletter beginning January 2011. Duties include: collecting and distributing announcements of activities related to Atmospheric Sciences, Section news, interviews, scientific news, reports from meetings, and job announcements. You will manage a team of Contributor Editors and will decide about the contents of each issue.

If you desire to contribute to the AGU as an active part of our community in a engaging and interesting role, this is a good opportunity. You will participate in the Atmospheric Sciences Section and work with top researchers and leaders in the community. Also you will develop communication skills and enjoy visibility among an AGU Section with more than 10,000 affiliates. We encourage your application. Open to everyone, this is an excellent opportunity for an advanced PhD. candidate or postdoctoral researcher. Part-time professionals might also consider applying.

To apply, send a statement of your background and interest in diong the job, along with a CV to Prof. Alan Robock (robock@envsci.rutgers.edu).

Outstanding Papers Awards

We would like to congratulate the recipients of the Outstanding Paper Awards in atmospheric sciences published the 26 June 2010 issue of EOS, thanking them for their contribution and work. They are:

Kelly Baustian	Lelia Hawkins	Sophie Peyridieu
Marcia DeLonge	Yi-wen Huang	Theran Riedel
Kelly Kathleen Everhart	Paul g. Koster van Groos	Michael Schwartz
Brian Giebel	Seungmin Lee	Patrick Veres
Stephen Griffith	Katherine Mackey	Yan Zhang
Elaine Hart	Samar G. Moussa	

THE NATIONAL SPACE TROPHY

Call for Nominations for the recipient of the National Space Trophy. Nominations can be submitted by leaders in government, industry, professional organizations, and the media. 2011 nominations are due by Monday, November 15, 2010. A ballot is voted upon by the RNASA's Board of Advisors, all individuals intimately involved with the space program, including NASA center directors, presidents of aerospace corporations, military, newsmedia, academic, and political leaders, and previous trophy winners. Their confidential votes are tabulated by an independent accounting firm. The winner is presented with the National Space Trophy at a black-tie gala held in the spring of each year. For more information: http://www.rnasa.org/

NOAA- DAVID JOHNSON AWARD

FOR

OUTSTANDING INNOVATIVE USE OF EARTH OBSERVATION SATELLITE DATA

The NOAA-David Johnson Award is presented by the National Space Club, in honor of the first Administrator of what was to become the National Environmental Satellite, Data, and Information Service (NESDIS). This award is given to young professionals who have developed an innovative use of Earth observation satellite data (alone, or in combination with non-satellite data) that is, or could be, used for operational purposes to assess and/or predict atmospheric, oceanic, or terrestrial conditions. The nomination deadline is December 15, 2010. For more information: http://www.nesdis.noaa.gov/

AS Horizons

NCAR Announces the Release of the Community Earth System Model (CESM)

Morgan B. Yarker

Community Earth System Model CESM

The National Center for Atmospheric Research (NCAR) recently announced its release of the Community Earth System Model (CESM). The CESM is an improvement of the most recent version of the Community Climate System Model (CCSM), which currently has four coupled components: atmosphere, ocean, land, and sea-ice. The new CESM has the same components as the CCSM, but with added Earth Systems components that feature four new module options: an interactive carbon cycle, atmospheric chemistry, full atmosphere, and land-ice.

The interactive carbon cycle allows the user to predict future carbon concentrations rather than to use emissions as a fixed input. Peter Gent, an NCAR Senior Scientist explained, 'If you think about current climate prediction models, they are all based off scenarios with fixed input values. With the interactive carbon cycle, we don't have to do that anymore. We can actually predict future values.'

In addition, NCAR added an atmospheric chemistry component that allows the user to consider atmospheric chemical reactions. This is especially helpful in order to predict aerosol levels. Gent described that it could be used to study scenarios that involve predicting changes in pollution levels in big cities.

The full atmosphere module allows the user to extend the typical 20 km height limit to 70 km, in order to include the stratosphere. This is particularly useful to help us identify and predict the ozone hole recovery progress, 'which is shown could have an impact on the strength of the southern hemisphere atmosphere circulation,' Gent explained.

Finally, the most recent development for the CESM is the inclusion of land-ice. Currently, this is being used to identify how changes in the Greenland ice sheet may impact sea-level rise and ocean currents. This addition can shed light on the topic of sea-level rise, which has not been very well covered in the most recent IPCC report.

The UCAR website has documentation on the newest release of the CCSM as well as the additional components that make up the CESM. The newly engineered CCSM is designed to be easier for the user to operate than previous versions of the model and also to allow the user to choose which (if any) of the four new CESM components they would like to run. In this way users will have the choice to run the original CCSM with its newest updates or any/all components of the new Earth System model.

The CESM can be downloaded from the UCAR website, along with documentation and instructions for running the model, at http://www.cesm.ucar.edu

The need of High-Resolution Climate Data

Michel d. S. Mesquita

High-resolution climatological data has become essential to improve the impact and adaptation studies. There are several ongoing projects in Europe to address the need for such data and to provide better capacity building in several countries. Two recent meetings have addressed the issue of the need for high-resolution datasets: the '10th European Meteorological Society Annual Meeting' (Switzerland) and the 'WRF Lecture Series at the Bjerknes Centre' (Norway).

The 10th EMS Annual Meeting was organized together with the 8th European Conference on Applied Climatology (ECAC). The theme topic this year was 'High resolution climatology – towards climate change services.' The conference was held at the ETH Zurich in Switzerland from 12-16 September, 2010. The conference gathered 630 participants from 42 different countries. One of the highlights of the EMS/ECAC conference was the session 'Strategic Lectures: Towards high resolution climate services,' where speakers talked about the role of the climate services today. Speakers such as Dr. Guy Brasseur (Climate Service Center, Hamburg), Dr. Johannes Schmetz (EUMETSAT) and Dr. Dick Dee (ECMWF) discussed the importance of high-resolution climate and reanalyses datasets.

The WRF Lecture Series at the Bjerknes Centre (the NCAR Visit to the Bjerknes Centre) was organized by the Bjerknes Centre for Climate Research, in Bergen, Norway. It was held at the Geophysical Institute of the University of Bergen from 20-24 September, 2010. The workshop had on average 30 participants from 12 different countries, representing institutions such as the National Center for Atmospheric Research (NCAR, USA), the University of Tokyo, Princeton University (USA), the Energy and Resources Institute (TERI, India), the Bangladesh Center for Advanced Studies (BCAS, Bangladesh), the Rudjer Boskovic Institute (Croatia), StormGeo (Norway), met.no (Norway), the Institute for Meteorological Research - Belgingur (Iceland), the National Agency of Ethiopia (Ethiopia), the Asian Disaster Preparedness Center (ADPC, Thailand), the University of Bergen (Norway), the University of Granada (Spain), Lund University (Sweden) and many others.

This workshop specifically addressed the technicalities of running the Weather Research & Forecasting (WRF) model and presented results from applying the model in different set ups. The WRF Lecture Series involved topics such as: advanced aspects of the WRF model, physics of the model, tropical channel domains, spectral nudging, model verification, climate runs, offshore wind research and many others. It also addressed questions related to the need for high-resolution climatology data for disaster-prone regions, such as Bangladesh. Many of the talks also involved the need to use a Regional Climate Model (RCM) for impact studies in India, Vietnam, Bangladesh, Nepal, Thailand, Brazil and other countries. The participants had also the chance to attend a meeting of the WRF-Bergen Google group, in which different members of the group presented results from their research work.

Efforts such as the meetings highlighted here are necessary to better address the increasingly need for high-resolution climatological datasets.

Fig. 1: Attendants to the WRF Lecture Series at the Bjerknes Centre.

Interview with Nanne Weber

Hans von Storch

Nanne Weber (1959) graduated with honours in mathematics in 1985 at the University of Amsterdam. She obtained her Ph.D. with a thesis on ocean waves in 1989 at the University of Utrecht and worked at the MPI-M in Hamburg (BRD) in 1990-1991, witnessing from close by the German Unification. In addition, she learned a lot about climate research. After that she worked at KNMI, specializing in paleoclimate modeling. Her research interests range from the last millennium to Milankovitch timescales. She worked in different KNMI divisions and was division head in 2001-2004, but decided to move back to research. She became part-time professor at the Faculty of Geosciences at Utrecht University in 2007, giving her inaugural address on February 29, 2008.

Nanne Weber participates in the Paleoclimate Modeling Intercomparison Project (PMIP), convenes a successful 'PMIP' session at the EGU General Assembly and is editor of Climate of the Past.

Nanne Weber.

Nanne, after being trained as a mathematician first and having studied the ocean waves after that, you are presently mostly working on paleoclimate. One would not call this a linear development but more a career with significant breaks and changes. How did that come about?

When I went to university I chose mathematics. I had no idea that something like climate studies existed. After graduation I looked around for a Ph.D. position in a field with more concrete subjects of study than mathematical objects and I found ocean waves. This was fun for some time, but when I became acquainted with the field of climate research (as a post-doc at the MPI-M in Hamburg), it appealed much more to me. I am not sure whether you should strive for a linear career. When you are young you are flexible and you can make these shifts. Climate research used to be a small field in the Netherlands and many people who are active in it have backgrounds in physics, mathematics, etc. Such a 'hard science' background is useful, but of course you need to catch up on topics like climatology, etc.

For most of your career you have worked at the Royal Netherlands Meteorological Institute (KNMI), which is a governmental institute combining climate and weather research with an operational Weather Service. Later, you became a part-time professor at the neighbouring Utrecht University (UU) – how do these two lines of work fit together?

KNMI likes to have some professors among its research staff, as this provides for natural links with the university. The UU, on the other hand, likes to have easy access to the modelling expertise at KNMI and its meteorological/oceanographic data. So, there are benefits on both sides. For me personally, there is a smooth transition between my two work places. At the university, I do some teaching and supervising of students. However, my students (Master and Ph.D.) often get a place to work at KNMI too, as they work with models that are developed at KNMI. So these activities are carried over to my KNMI office. In my own research, there are some topics which are typically 'KNMI'. This mostly has to do with contributions to reports commissioned by the government or public outreach projects. Contrary to general belief, there is quite some commercial consultancy work done by university staff so this type of work is not completely alien to my colleagues at UU. Apart from this, my research is a patchwork of interconnected projects not confined to one workplace.

There are still not many women among the 'higher' ranks, such as professors, department heads and the like. Are meteorology and climate science still 'male territory'?

Obviously yes. It is difficult to pinpoint down the reasons for this or to find the solutions. I had never been in favour of positive discrimination or quota until I had the following experience. I sat on a selection committee for a managing position and could not prevent a well–qualified female candidate being put aside and a less-qualified male being appointed. The psychology behind this process is very subtle (in this case it was a wish to maintain a monolithic team). I found that you can only fight such an attitude when there are more people involved who recognize the process. We put in complaints and pointed out to the 'higher levels' that they were going to miss their targets if they let go of talented women like this. When a similar position became vacant shortly after that, she was appointed. Since this experience I am all in favour of quota. This simple pressure works faster than re-socialising a whole generation of men. Once the women are there, the male establishment has to adapt anyway.

At the university I see that a dedicated effort toward promoting diversity has already increased the number of women in higher ranks. The self-evident support of this policy by the dean, department heads, etc., has created an atmosphere where diversity is the standard. This works especially well, because other cultural and ethnic groups are included.

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

Being offered a part-time professorship at the Faculty of Geosciences of the Utrecht University is definitively one. For me, this was a recognition of my efforts over the last decade to bring scientists working with paleodata together with modellers, to integrate empirical and model-based science and to put model-data mismatches on the research agenda.

The second achievement is a small set of my best papers. Their value for me personally has to do with the results that they describe, their level of recognition, and the fun of working with the people involved in that particular paper. One example is one of my papers on the glacial thermohaline circulation (THC) in the Atlantic ocean. For this paper we analysed mechanisms of the THC response to glacial conditions and found that there is no convergence among models, nor between models and data. So we understand little of past THC changes.

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

The slow merging of on the one hand geography and geology, with their emphasis on data collection and phenomenological approach, and on the other hand, the climate modeling community that is primarily process-based and whose members identify with physics rather than geosciences. At least in the Netherlands these used to be worlds apart. But bridges are starting to be built and especially young people do not confine themselves to one discipline. This is an exciting development which will bring new research topics and challenges. Do we understand past Greenhouse climates? How

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can we presume to be able to predict the future THC, if we do not understand its past behaviour? What is the role of solar and volcanic activity in explaining climate variations during the recent past?

Is there a politicization of atmospheric science?

It is more a politicization of some members of the scientific community than of the community as a whole. The public debate on global changes brings some individuals to extreme positions (either alarmist or skeptic), which are more based on politics than on science. This rarely leads to 'good' science.

What constitutes 'good' science?

Good science is science that inspires. Necessary conditions are scientific work that is transparent and solid, raises new questions, leaves room for doubt and alternative explanations, gives credit to and relates to earlier work. In addition, there should be an element of surprise, a spark which catches and keeps your attention.

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

Instinct helps in choosing the right topics and in sorting out the more and less relevant results. So there is definitively a subjective element. Everyone knows examples of papers in which they have discovered errors (in methodology, data, computations – you name it). But then in the end we have to admit that this paper contains 'good' science and the author is right on the concepts that are proposed. This is the best illustration I know of the power of instinct that some scientists have. Those of us who are less gifted in this respect obviously have to be very scrupulous and avoid any sort of error.

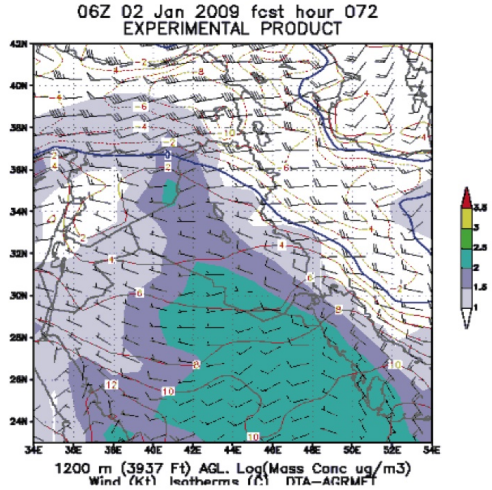
Nanne Weber in 1986.

The opinions presented in the interview do not necessarily represent those of the interviewer or the AGU.

Meteorology in the Military Part II: AFW Research and Development Program

Lt. Col. Neil Sanger, Lt. Col. Lee Byerle, and Yolande Serra

What research and development (R&D) is taking place within Air Force Weather (AFW)? To answer this question, we will take a look at some of the work being done by AFW's primary innovative development organization within the Air Force Weather Agency (AFWA), the 16th Weather Squadron (16th WS). The 16th WS is a center of excellence for development, implementation, and visualization of terrestrial, atmospheric and space weather models, displaying observational data, and identifying environmental impacts on future weapons systems. Its mission is to exploit cutting-edge technologies, science, and innovations to provide responsive, accurate, and relevant weather intelligence for military operations and other national agencies.



A 72 hour forecast of 1.2 km AGL dust concentration from DTA-MM5 valid 2 January 2009 06Z.

While the 16th WS is often associated with traditional, mesoscale weather modeling, They also develop and support a broad range of highly specialized models, which address specific environmental issues critical to military operations such as clouds, dust, ensembles, and even space weather. Additionally, they are creating a revolutionary web visualization tool hosted on one URL that provides dynamic interaction and Google Earth geo-locatable capabilities for all AFW data. Finally, they are the technical staff that supports AFWA's exploitation of meteorological satellite imagery and raw data.

The following is a synopsis of just some of the projects the 16th WS is undertaking in the areas of cloud forecasting, land-surface characterization, dust forecasting, and mesoscale and ensemble modeling:

Cloud Forecasting: AFWA uses the cloud depiction and forecast system, version 2 (CDFS-II), which produces cloud analyses for individual satellites and merges them together, along with conventional observations, into a Worldwide Merged Cloud Analysis. In addition, CDFS-II is responsible for three different techniques used in the cloud forecast models. These models are both user and forecast-time specific. Traditional numerical weather models, even when using complex microphysics, often fall short of the degree of accuracy in cloud forecasting required for the full spectrum of DoD operations. To that end, the 16th WS has developed a suite of cloud models that improve greatly upon numerical guidance. All of the cloud models leverage a real-time analysis from a mosaic of satellite imagery from multiple platforms.

The Diagnostic Cloud Forecast (DCF), for example, is a statistical model that correlates model predictors with actual clouds in the merged CDFS-II analysis, producing more accurate 12-hour to 3-day cloud forecasts than numerical models alone. DCF consists of two processes: the coefficient building process and the forecast process. The coefficient building process executes every three hours, creating linear relationships between cloudy pixels and the available forecast model predictors for a sliding 10-day period. The forecast process then uses the 10-day statistics and a multiple discriminate analysis (MDA) method to diagnose clouds from the forecast model predictor fields (Fig. 1). The forecast process is applied as a post-processor to WRF and is configured based on theater-specific configurations. DCF produces more accurate cloud forecasts beyond 9-12 hours and provides additional cloud information, including cloud base, cloud heights, and cloud type. The method quickly adapts to large-scale weather patterns due to the moving 10-day statistical period. DCF is a purely statistical model so its performance is directly related to that of the forecast model. Errors in the cloud analysis from the numerical model will propagate into the cloud forecast. Finally, DCF can produce a global or regional cloud forecast depending on the domain of the forecast model.

Land-surface characterization using the Land information System (LIS): over the past 5 years, the 16th WS has been closely collaborating with NASA's Goddard Space

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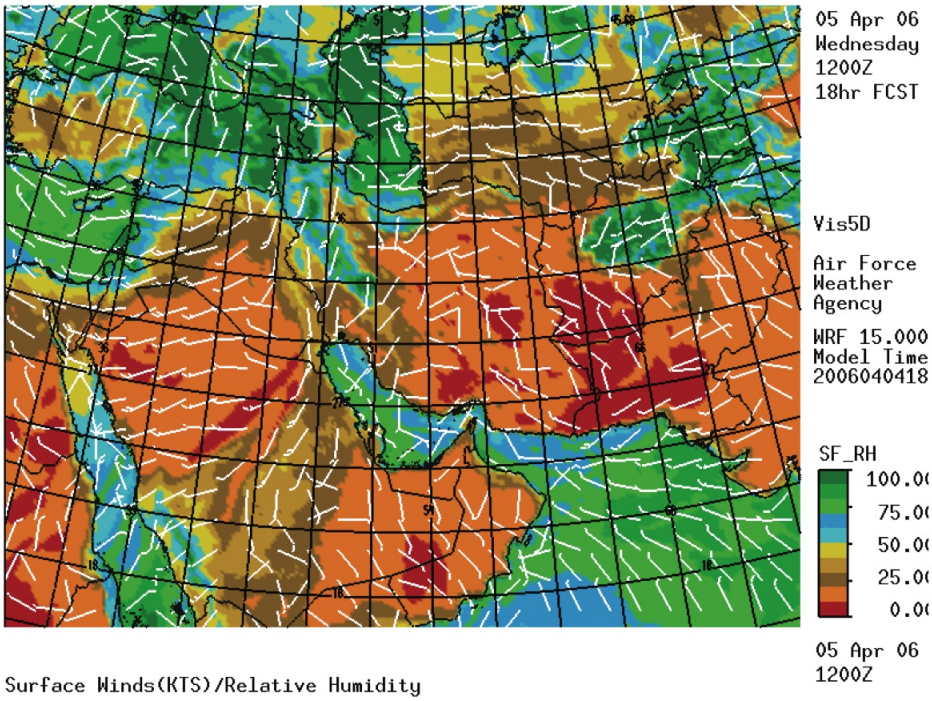

An 18 hour forecast of surface winds and relative humidity from a 15 km AFWA WRF simulation valid 5 April 2006 12Z.

Flight Center to improve its global Agricultural Meteorology (AGRMET) modeling system. The effort resulted in a new community land data assimilation modeling framework called the Land Information System (LIS), which replaces the current AFWA AGRMET model. The LIS is a complex land-surface characterization package that supports many different requirements. LIS integrates data related to topography, land surface type, vegetation properties, snow cover and depth, soil moisture and skin temperature to produce outputs which can then be used in specific applications (e.g., WRF, Army Corp of Engineers flash flood models). There are significant benefits associated with AFWA migrating toward using the LIS modeling framework:

1.LIS can calculate surface properties at resolutions up to 1 km, which is a significant improvement over the ½ degree grid of AGRMET. The higher resolution capability is important to improve operational Army/Marines support for mobility/trafficability applications (e.g., flash flood forecasting in Afghanistan and Iraq).

2.LIS can produce output on both regional and global domains. This is important for initializing the regional AFWA Weather Research and Forecasting (WRF) model domains.

3.The LIS software contains parallel computing directives for platforms which support parallel computing. This is important when computing on high resolution domains, in order to provide products in a timely manner.

4.All of the LIS domains run independently, supporting concurrent computing for nested domains.

5.The same LIS software used to support real-time operations can be reconfigured also to support re-analyses (science testing). This capability enables the science community to use the exact same software that AFWA uses in operations, and enables a faster transition of research and development into the operational baseline.

The LIS software supports ensemble weather analyses and prediction. LIS has numerous parameterizations, input forcing datasets (e.g. climatology fields, vegetation health, land surface type), and/or land surface modeling options. The additional LIS members will improve uncertainty estimates required for ensemble prediction.

Aerosol Improvements: Dr. Owen Toon and Pete Colarco of the University of Colorado, Boulder, developed the Community Aerosol Research Model from Ames/NASA (CARMA). Johns Hopkins Applied Physics Laboratory then modified CARMA to allow for the incorporation of AFWA NWP data including wind, moisture, temperature, and terrain parameters. AFWA refers to the specially modified version of CARMA as the Dust Transport Application (DTA). DTA ingests WRF or GFS surface wind data, which are used to calculate the surface dust flux based on wind threshold velocity. There are differing threshold velocities based upon the dust particles' diameter, air and particle density, and soil moisture. The 16th WS has recently worked with Dr. Ginoux to integrate a higher resolution source region database (400% increase) into DTA forecasts.

The 16th WS focus areas include soil physics, dust, and dust source region analysis and improvement, and aerosol analysis and forecasting. Primary products are dust forecasts (both visibility and concentration; Fig. 2), aerosol forecasts, and some recent work in ensemble/probabilistic forecast products to enable increased forecast accuracy of small-scale dust storms. The 16th WS has partnered recently with the Desert Research Institute to develop a high-resolution dust source region required for convective-resolving (4 km) forecasting of dust storms called haboobs. The WRF-Chem/GOCART, originally developed by NOAA/GSD and enhanced by AFWA, as well as the Dust Transport Application (DTA) in partnership with Johns Hopkins University, are the primary tools used for these forecast products.

WRF Modeling: AFWA is the primary provider of operational fine-scale environmental intelligence for the Air Force and Army. It collaborates with NCAR to develop and improve the WRF model, the model data assimilation system, the future operational ensemble capability, and provides analyses of model performance. AFWA used the MM5 model in operations in the mid-1990's, before transitioning fully to the WRF model in 2009 (Fig. 3). The current WRF configuration uses 57-level vertical resolution, a model top of 10 mb, an upgraded convection scheme (New KF), an upgraded microphysics scheme (WSM-5), an upgraded planetary boundary layer scheme (YSU PBL), and a coupled/unified land surface model (NOAH LSM). WRF provides an advanced 3D-variational assimilation system with further advancement in 4D-varational assimilation in the future. The 16th WS has implemented the dynamic/adaptive time stepping capability to reduce latency to users. Additionally, they plan to implement soon the digital filter initialization scheme to eliminate spurious non-physical high frequency waves in the early forecast hours. The 16th WS intends also on utilizing direct radiance assimilation from NPP/JPSS/DMSP/METOP satellites. The 16th WS is laying the blueprints to execute very high resolution modeling down to 1 km, and is exploiting WRF to leverage the growing usefulness of limited area ensemble forecasting. Finally, there are plans over the next two years to fully couple WRF, LIS, and

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the CDFS-II system.

The 16th WS is working with universities, NCAR, NCEP and other centers to improve capabilities of data assimilation in AFWA's Models. NCAR is helping them to transition from a WRF analysis system to a Gridpoint Statistical Interpolation (GSI) system used by NCEP (a 2+ year project). Additionally, the 16th WS is working with AFWA to identify and prioritize satellite data requirements for the next 25 years based on satellite launch date and availability, planned mission support, projected availability of data, and current and future capabilities of the AFWA modeling suite.

Ensemble Modeling: The 16th WS has collaborated with FNMOC, NOAA, NSSL, NASA, NCAR, NPS, and the University of Washington to develop and test fine-scale ensembles. Results were published and presented to the Undersecretary of Defense for Science and Technology as a "success story of the week". Over CONUS, the 16th WS has combined its runs with NCEP's Short Range Ensemble Forecast (SREF) to create a 31-member mesoscale ensemble. The squadron plans also to leverage the United Kingdom Met Office "Unified Model" to generate additional (non-WRF) mesoscale ensemble members for locations around the globe.

The 16th WS has combined global ensemble prediction models from three outside agencies (NCEP GFS, Navy NOGAPS, Canada's GEM). The 58 member, three-center ensemble generates over 100 different forecast products. The mesoscale ensemble currently is limited to WRF members (10) run at AFWA, except over CONUS. It is working to implement global and mesoscale ensembles into operations by late 2010. Once in operations, 16 WS will continue to develop post-processing calibration for ensembles to refine/improve the capability for the end user. In addition, at least six more members will be added to the mesoscale ensemble to increase dispersion.

The 16th WS believes algorithms are the linchpin to making ensembles useful for military operations. Physically-based algorithms are currently being used to diagnose high-impact event probabilities such as heavy snow, significant tornadoes, large hail, and supercells within a certain radius (Fig. 4). These algorithms may be calibrated using datasets in regions with sufficient observations (e.g., CONUS).

Finally, the 16th WS dedicates a verification team to examine numerical and statistical weather models run at AFWA, and model data that AFWA receives from other agencies. As an example, the 16th WS has partnered with the 25th OWS at Davis-Monthan AFB and the University of Arizona (UA) to analyze output it uses operationally from the UA Atmospheric Sciences Department's high-resolution (1.8 km) WRF simulations, a key tool during monsoon season across the desert southwest of the U.S. As another example, verification is performed on all ensemble forecast members. Statistics are generated for the ensemble mean forecast and the forecasted probabilities. Skill scores and attribute and dispersion diagrams are calculated showing performance of the ensemble probability forecasts and the amount of spread being obtained from the various ensemble members.

In summary, the 16th WS and AFWA deliver timely, relevant and accurate weather information to support the full spectrum of military and humanitarian operations. Its success depends upon its close ties to, and collaborations with, its numerous R&D partners.

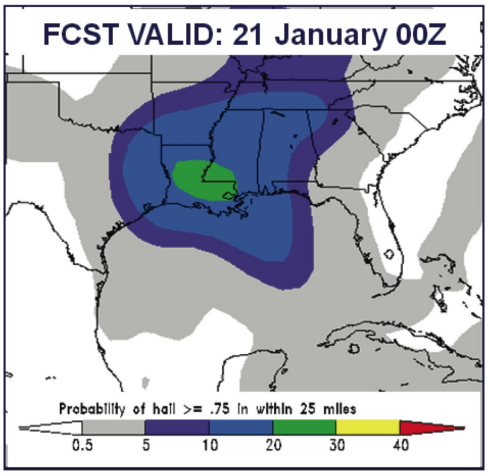

Fig. 4 – A 42-hour probability forecast of hail greater than or equal to 0.75 inches within 25 nautical miles from the global ensemble valid 21 January 2010 00Z.

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

* Assistant Professor in regional climate modeling, Dept. of Geography and Earth Sciences, Univ. of North Carolina at Charlotte, USA. Contact: Dr. Matthew Eastin (mdeastin@uncc.edu)

* Two tenure-track faculty positions in climate sciences, School of Earth and Atmospheric Sciences (EAS) at the Georgia Institute of Technology, Atlanta, USA. More info: http://www.eas.gatech.edu/node/964

* Two postdoctoral research scientist positions in extratropical cyclones and climate change (Refs: RS10050; RS10051), University of Reading, UK. More info: http://www.reading.ac.uk/about/jobs/

* Postdoctoral position in estimation and representation of model error covariances in data assimilation, CNRM/GAME (Météo-France/CNRS), Toulouse, France. Contact: Loïk Berre (Loik.Berre@meteo.fr)

* Postdoctoral research fellow positions in climate research, Centre for Australian Weather and Climate Research, Aspendale, Victoria, Australia. More info: http://www.csiro.au/careers

* Postdoctoral research fellow in modeling air quality and climate interactions on regional scales (Ref.: 001282), Centre for Atmospheric and Instrumentation Research, University of Hertfordshire, UK. More information: http://www.herts.ac.uk/jobs/home.cfm

* Postdoctoral position in LES/Boundary Layer Meteorology-Modelling, Karlsruhe Institute of Technology, Garmisch-Partenkirchen, Germany. Contact: Dr. H.P. Schmid (HaPe.Schmid@kit.edu).

* Postdoctoral researcher in global aerosol-climate interactions, University of Oxford, Oxford, UK. Contact: Dr Philip Stier (philip.stier@physics.ox.ac.uk)

* Tenure-track assistant professor in climate science (Ref.: #558552), Northern Arizona University, USA. More info: http://hr.nau.edu/

* Postdoctoral Position in Climate Dynamics, Lamont-Doherty Earth Observatory of Columbia University, USA. More info: http://academicjobs.columbia.edu

* Vilhelm Bjerknes fellow in earth system physics, ICTP, Trieste, Italy. More info: https://onlineapps.ictp.it/ENTER/APPLICANT/EF10.mhtml

* Lecturer in Climate/Atmospheric Physics, Department of Physics and Astronomy, University of Canterbury, Christchurch, New Zealand. Contact: Dr. Adrian McDonald (adrian.mcdonald@canterbury.ac.nz)

* Professorship in Meteorology, Faculty of Physics, Ludwig-Maxmimilians-University, Munich, Germany. Contact: Dr. Bernhard Mayer (Bernhard.Mayer@dlr.de)

* Tenure-track assistant professor, Department of Geography and Geology, University of Wisconsin-Whitewater, Whitewater, Wisconsin, USA. Contact: Dr. Dale Splinter (splinted@uww.edu)

* Postdoctoral researcher in coupled weather-hydrology modeling for air quality, ecosystem and climate applications, EPA/NERL, Research Triangle Park, North Carolina, USA. Contact: Dr. Robin L. Dennis (Dennis.Robin@epa.gov)

* Postdoctoral fellowship in airborne meteorology, Institute for Climate and Atmospheric Science, University of Leeds, UK. Contact: Professor Douglas Parker (d.j.parker@leeds.ac.uk)

* Research associate and postdoctoral fellow positions in climate change and seasonal forecasting, Climate System Analysis Group (CSAG), University of Cape Town, South Africa. More info: http://www.csag.uct.ac.za

* Postdoctoral position in spatial quality control of precipitation data, Meteo-France, Toulouse, France. Contact: Anne-Laure Gibelin (anne-laure.gibelin@meteo.fr)

* Postdoctoral research fellow in diagnosing the physical mechanisms regulating rainfall over Australia, Monash University, Melbourne, Australia. Contact: Professor Michael Reeder (michael.reeder@monash.edu)

* Research scientist in large eddy simulation and mesoscale models, Center for Wind Energy Research, ForWind, Oldenburg University, Germany. Contact: Dr. Gerald Steinfeld (gerald.steinfeld@forwind.de)

* Postdoctoral position in atmospheric chemistry modeling, Meteo-France, Toulouse, France. Contact: Virginie Marecal (virginie.marecal@meteo.fr)

* Postdoctoral visiting fellowships at CIRES, Colorado, USA. More info: http://cires.colorado.edu/collaboration/fellowships

* Postdoctoral researcher in atmospheric chemistry and physics, Laboratoire de Météorologie Physique, Université Blaise-Pascal, Clermont-Ferrand, France. Contact: Karine Sellegri (K.Sellegri@opgc.univ-bpclermont.fr)

* Assistant Professor in atmospheric science, University of Wyoming, USA. More information: http://wwweng.uwyo.edu/info/WyoExcelChair/

* Assistant Professor of Atmospheric Sciences, Department of Earth and Atmospheric Sciences at the University of Nebraska-Lincoln. Contact: Dr. Merlin Lawson (mlawson@unl.edu)

* UCAR visiting scientists program - NOAA climate and global change postdoctoral fellowship program, USA. More info: http://www.vsp.ucar.edu/cgc/

* UCAR visiting scientists program - PACE fellowship program, USA. More information: http://www.vsp.ucar.edu/pace/

* Assistant professor (tenure-track) position in atmospheric and oceanic sciences, Department of Atmospheric and Oceanic Sciences, University of Wisconsin-Madison, USA. More information: http://www.aos.wisc.edu

* Tenure track position in mesoscale or dynamical meteorology, University of Massachusetts Lowell, USA. More info: http://jobs.uml.edu

* Tenure-track assistant professor of earth sciences - climate modeling, Department of Earth Sciences, College of Letters, Arts & Sciences, University of Southern California, USA. Contact: Karen Young (kayoung@usc.edu)

* Postdoctoral fellowships in atmospheric sciences, Earth Observatory of Singapore, Nanyang Technological University, Singapore. More info: http://www.earthobservatory.sg/careers

Interdisciplinary

* Postdoctoral researcher in ocean modeling, Los Alamos National Laboratory, USA. More info: http://public.lanl.gov/ringler/files/BER_PD_Ocean.pdf

* Full-time Scientist in water and carbon cycle (Ref.: 9874), Jet Propulsion Laboratory, CA, USA. More info: https://careerlaunch.jpl.nasa.gov/

* Analyst or senior analyst (Group Leader) in Meteorological Applications Section (Ref: AP10-30),ECMWF, UK. More info: www.ecmwf.int/newsevents/employment/en/

* Postdoctoral researcher in terrestrial ecosystems and anthropogenic activities (Ref.: 25036), Lawrence Berkeley National Laboratory, CA, USA. More info: http://careers.crijob.com/lbnlcareers/

* Associate research scientist in modeling of the global methane cycle, Columbia University and NASA/Goddard Institute for Space Studies, New York, USA. More info: http://academicjobs.columbia.edu/

* Postdoctoral position in numerical methods, Meteorological Research Division of Environment Canada, Canada. Contact: Martin Charron (Martin.Charron@ec.gc.ca)

* Postdoctoral research fellowship in interconnections of ethical, scientific, social, and economic aspects of geoengineering proposals, Penn State University, Pennsylvania, USA. More info: http://rockethics.psu.edu/

* Postdoctoral fellowship in interdisciplinary geosciences, Department of Geology and Geophysics, Yale University, USA. More info: https://-academicjobsonline.org/ajo/yale/G&G

* Research positions in climate, aquatic and atmospheric science, Research Center for Environmental Changes, Academia Sinica, Taipei, Taiwan. More info: http://www.rcec.sinica.edu.tw/tw_recruitment_pi_en.html

Student Opportunities

* Ph.D. position in atmospheric circulation and Arctic sea ice, Department of Meteorology, Stockholm University, Sweden. More info: http://www.su.se/english/about/vacancies/phd-studies

* Ph.D. scholarship in solar radiation and energy (Ref.: 2010/815), Australian National University, Canberra, Australia. More info: https://recruitment.csiro.au/

* Ph.D. position in formation of secondary organic aerosol (SOA) from tree emissions, IEK-8 Troposphere, FZ-Jülich, Jülich, Germany. Contact: Dr. Astrid Kiendler-Scharr (A.Kiendler-Scharr@fz-juelich.de)

* Ph.D. positions in climate change and climate system, Climate System Analysis Group (CSAG), University of Cape Town, South Africa. More info: http://www.csag.uct.ac.za

* Ph.D. position in local precipitation extremes, Faculty of Applied Sciences, TU Delft, Delft, Netherlands. More info: http://www.msp.tudelft.nl/applications

* Ph.D. position in field and laboratory investigations of soot particles using aerosol mass spectrometry, ETH Zurich, Institute for Atmospheric and Climate Science, Zurich, Switzerland. Contact: Dr. Berko Sierau (berko.sierau@env.ethz.ch)

* NSF IGERT fellowship in polar environmental change, Dartmouth College, USA. More information: http://www.dartmouth.edu/~igert/

* Ph.D. positions in marine and atmospheric chemistry, Rosenstiel School of Marine and Atmospheric Science, University of Miami, USA. More info: http://www.rsmas.miami.edu

Schools

WAVACS-COST Winter School - Water vapour in the climate system

Venice, Italy. 6-12 February 2011.

http://www.isac.cnr.it/wavacs/school-2011

Conferences

// AGU Fall Meeting 2010 //

San Francisco, CA, USA 13-17 December 2011.

http://www.agu.org/meetings/fm10/

// ESF-COST High-Level Research Conference on Extreme Environmental Events //

Cambridge, UK, 13 - 17 December 2010.

http://www.esf.org/conferences/10345

// AMS 91st Annual Meeting //

Seattle, WA, USA, 23 - 27 January 2011.

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

// AGU Chapman Conference on Atmospheric Gravity Waves and Their Effects on General Circulation and Climate //

Honolulu, Hawai 28 February – 4 March 2011.

http://www.agu.org/meetings/chapman/2011/ccall/

// AGU Chapman Conference on Climates, Past Landscapes, and Civilizations//

Santa Fe, New Mexico, USA 21 – 25 March 2011

http://www.agu.org/meetings/chapman/2011/ecall/

// EGU General Assembly 2011 //

Vienna, Austria, 3 – 8 April 2011.

http://meetings.copernicus.org/egu2011/

// International Symposium on weather radar and hidrology //

Exeter, UK, 18 – 21 April 2011.

http://www.wrah2011.org/

// 11th Conference on Polar Meteorology and Oceanography //

Boston, MA, USA, 2 - 4 May 2011.

http://ams.confex.com/ams/11Polar/oasys.epl

// XXV IUGG General Assembly //

Melbourne, Australia, 28 June – 7 July 2011.

http://www.iugg2011.com/

U.S. Global Change Research Program

Now soliciting proposals for the use of the Climate Simulation Laboratory (CSL, http://www.cisl.ucar.edu/csl/) computing facilities, beginning April 1, 2011, and continuing through June 30, 2012. The deadline for submitting proposals is December 1, 2010.

More information:

https://www2.cisl.ucar.edu/sites/default/files/2010-09_CSL_Announce.pdf

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