WKML brings geospatial data visualization within reach of the Fortran-using scientist, with minimal effort. More information, including additional examples, documentation on the API, sample codes, and access to the WKML library code, is available at http://web.esc.cam.ac.uk/xml/kml.html. For examples of the visualizations that can be created through WKML, please visit the electronic supplement to this *Eos* issue (http://www.agu.org/eos_elec/).

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A Forum for Evaluating Forecasts of the North American Monsoon

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The North American Monsoon (NAM) system is an annual weather pattern that brings summer rains to the dry regions of the United States southwest and northwestern Mexico. Broader effects are that NAM exerts substantial control on the warm-season climate over North America and is responsible for the occurrence of many high-impact weather and climate events such as floods and droughts. The North American Monsoon Experiment (NAME) [*Higgins et al.,* 2005] was developed and implemented in an effort to improve the low prediction skill of intraseasonal and seasonal forecasts of NAM behavior.

As a logical follow-on to NAM diagnostic and modeling activities, the NAME research and operational seasonal prediction communities have developed the NAME Forecast Forum (NFF), whose aim is to consolidate and assess, in real time, the performance of intraseasonal and seasonal monsoon forecasts and to make these forecasts available to a range of regional stakeholders. This forum, developed and implemented in the 2008 NAM season, shows that forecasts predict weather patterns moderately well but do not fully capture monsoon extent and magnitude.

Time Line for the NAME Forecast Forum

Because a goal of the NFF is to link NAM monitoring and forecasting activities to societal applications such as energy, water resources, and wildland fire management, the NFF operates on a time line (Figure 1a) compatible with a NAM societal impacts annual decision calendar developed by *Ray et al.* [2007], which identifies important seasonal decision-making periods related to agricultural, wildland fire, and water resources management.

Forecasts are made by several prediction centers for the principal NAM season (June-July-August-September (JJAS)), during which time NFF monitoring products are updated regularly with observational data. The NFF contains two primary forecast cycles, January-February-March and April-May-June, providing both "long-lead" (6- to 9-month) and "short-lead" (0- to 6-month) forecasts. The different lead times help scientists assess forecast skill as functions of forecast lead time. Understanding the relationship between forecast lead time and forecast skill is important to risk management in sectors that rely on water resources.

Evaluation of Forecasts Submitted During 2008

During 2008, the NFF received forecasts from leading modeling/prediction centers, including NASA Goddard Space Flight Center (NASA/GSFC), the University of California, San Diego's Experimental Climate Prediction Center (ECPC), the U.S. National Oceanic and Atmospheric Administration (NOAA) National Centers for Environmental Prediction's Climate Prediction Center (NCEP/CPC), and the Servicio Meteorológico Nacional (SMN) of Mexico. The modeling centers based in the United States provided daily precipitation forecast data from coupled atmosphere-ocean-land models,

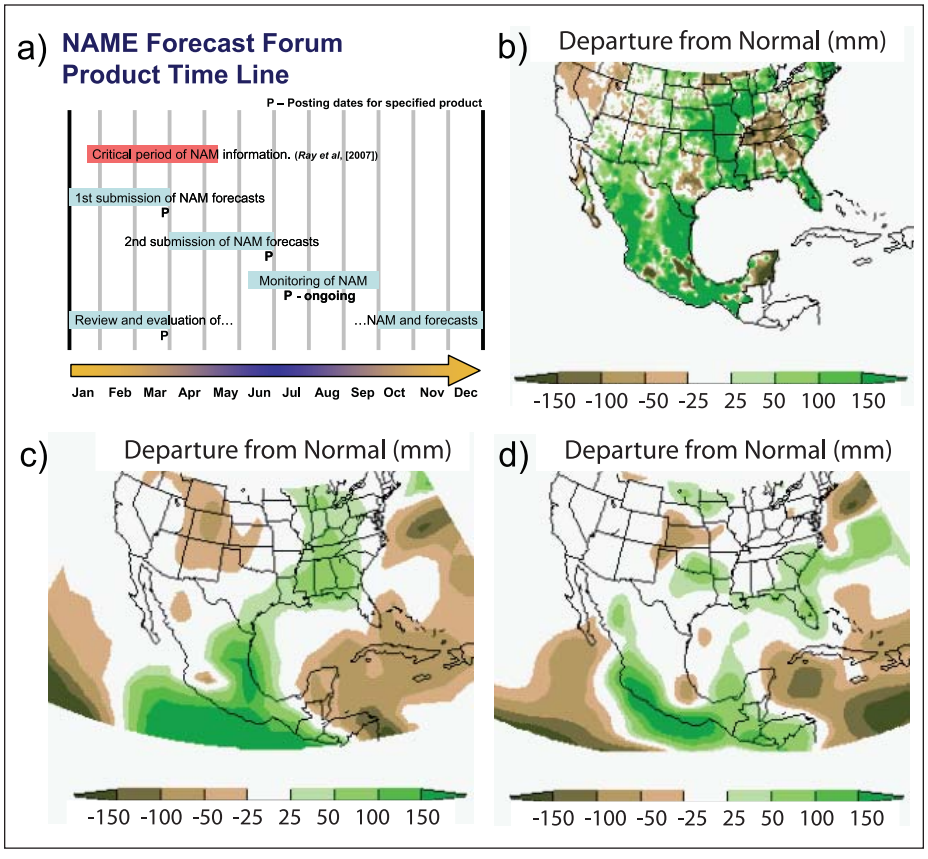

Fig. 1. (a) A yearly time line for the North American Monsoon Experiment's Forecast Forum (NFF), including the critical period of North American Monsoon decision-making information, based on that of Ray et al. *[2007]. (b) Map of the U.S. National Oceanic and Atmospheric Administration (NOAA) Climate Prediction Center's Unified Rain Gauge Dataset observed precipitation anomalies, measured in millimeters (mm). From this, comparisons can be made to NFF-contributed forecast precipitation anomalies from 1 April 2008 using models from (c) the NOAA National Center for Environmental Prediction (Climate Forecast System model) and (d) the NASA Goddard Space Flight Center (Coupled General Circulation Model, Version 1).*

and SMN submitted monthly regional and national precipitation forecasts developed using an analog clustering technique described by *Englehart and Douglas* [2009]. Where possible, forecast values are translated into anomaly forecasts by removing the long-term model forecast climatology.

A sample analysis was conducted on results from the 2008 NAM season focusing only on precipitation spatial anomaly structures as forecasted by the NASA/GSFC model (Coupled General Circulation Model Version 1 (CGCMv1)) and the NCEP model (Climate Forecast System (CFS)). Data from the SMN show that in terms of all-Mexico averaged rainfall, 2008 exhibited the highest seasonal total rainfall since 1941. Areas of higher than normal rainfall, as depicted by the NCEP/CPC Unified Rain Gauge Dataset (URD), covered large fractions of eastern, western, and southern Mexico; the southwestern United States; and portions of the Mississippi River valley (Figure 1b).

In general, maps of JJAS accumulated rainfall anomalies from the April initialization of the NASA/GSFC and NCEP models show that while the models possess some skill in predicting regional precipitation anomalies, they did not predict the full extent and magnitude of monsoon precipitation. The NCEP model (Figure 1c) successfully captured the above-normal rainfall in eastern Mexico, and to a lesser degree in southern Mexico. The NCEP model also forecasted an interesting dry pattern over the U.S. intermountain west and wet pattern over the eastern Mississippi valley, similar to the climatological dry/wet pattern found in observations. However, the model had shifted these patterns farther east than what was observed. The NASA/GSFC model (Figure 1d) successfully captured high-rainfall anomalies in southern Mexico, a weak rainfall extending in a band northward through western Mexico, and some of the above-average rainfall events along the Gulf Coast and Florida. However, both the NASA/GSFC and NCEP models failed to capture above-normal rainfall in Arizona and New Mexico and, in general, underestimated the magnitude of the observed anomalies. Neither model captured the correct anomaly structure over the U.S. Great Plains. Though not pictured, monthly anomaly forecasts created by SMN did consistently predict above-normal, all-Mexico rainfall, although the magnitudes of the forecasted anomalies underestimated those of the observed anomalies.

Future Plans

Work is under way to improve and expand the forecast synthesis efforts being developed under the NFF. One emphasis will be to build an archive of NAM model forecast performance from which changes in model performance can be monitored through each subsequent year. For 2009, model forecasts also will be assessed in their capability to depict additional aspects of NAM including monsoon onset date and the statistics of various transient events affecting the NAM region.

Full details on the NFF and forecast products, including regionalized daily accumulation time series for real-time assessments of all models, are available through NFF's global monsoon monitoring Web page (http://www.cpc.ncep.noaa.gov/products/Global_Monsoons/American_Monsoons/NAME/index.shtml). Additionally, NFF welcomes contributions of both empirical (statistical) and dynamical forecasts from a variety of sources. Persons or groups interested in submitting forecasts or in obtaining NFF products are encouraged to visit the Web site and contact the NFF organizers.

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NEWS

McNutt to be Nominated to Lead U.S. Geological Survey

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U.S. President Barack Obama announced on 9 July his intention to nominate Marcia McNutt as director of the U.S. Geological Survey (USGS) and science advisor to the Secretary of the Interior. McNutt, who served as AGU president from 2000 to 2002, currently is president and chief executive officer of the Monterey Bay Aquarium Research Institute, in Moss Landing, Calif.

"Scientific information from the U.S. Geological Survey is crucial to solving the most important problems facing society—finding sufficient supplies of fresh water and clean energy and providing accurate information that allows citizens to prepare intelligently for climate change. I look forward to leading such a respected institution at this critical time," McNutt said.

Interior Secretary Ken Salazar noted, "Not only does [McNutt] offer sterling academic credentials, but she also has worked in the field as chief scientist on many oceanographic expeditions and has been involved in government as chair of the President's Panel on Ocean Exploration convened by President Clinton. Her experience will be valuable in leading the government's premiere scientific agency."

—RANDY SHOWSTACK, Staff Writer