NCEP Visiting Scientist Program

NCEP has embarked on a program with the National Science Foundation (NSF) to support the translation of research supported by the Division of Atmospheric and Geospace Sciences (AGS) to operations at NCEP. AGS will provide support to enable the AGS research community to transition the basic research in which they are engaged to use in national operational activities at NCEP. This opportunity would support extended visits by AGS-supported investigators and research groups, including students and post-doctoral researchers to NOAA's NCEP. Support would be awarded in the form of a supplement to an existing NSF award. This opportunity provides AGS PIs an opportunity to advance their NSF-supported research by working closely with environmental scientists at NOAA's NCEP and having access to a wealth of real-time and archived datasets and computational facilities.

More information on the process, along with a *Dear Colleague Letter*, can be found on the NSF website:

http://www.nsf.gov/pubs/2013/nsf13117/nsf13117.jsp?org=AGS

The areas of interest for this program, along with Points of Contact, are shown below:

Name of Sponsor	Organization	Work Phone	Email	Area of Interest	Detailed Description	NCEP Resources
David Bright	NWS/NCEP/AWC	816-584-7204	david.bright@noaa.gov	Ensemble and Probabilistic Research for NextGen: Aviation Weather Applications, Forecasts and Warnings	The NOAA Aviation Weather Testbed (AWT) located at the NOAA/National Weather Service (NWS) Aviation Weather Center (AWC) in Kansas City, seeks a visiting scientist with expertise in ensemble modeling, ensemble applications, and probabilistic forecasting. One of the key strategic objectives of the AWT is to accelerate the realization of advanced weather forecasting for the Next Generation Air Transportation System (NextGen). Under NextGen, advanced probabilistic weather forecasts and warnings are utilized for efficient and optimal decision making. The AWC/AWT is interested in hosting and collaborating with a visiting scientist focused on research to build, develop, and explore ensemble systems for advanced aviation weather prediction and air traffic flow management.This research should include long-range objectives that increase the spatial resolution and lead-time of aviation warnings (SIGMETS), and/or optimize meteorological inputs for Traffic Flow Management (TFM) Decision Support Services (DSS) in the National Airspace System (NAS).Interactions with the Environmental Modeling Center (EMC) and other NWS facilities are encouraged. Visiting scientist research in on one or more of the following areas is desired. - Extraction of high-impact meteorological information (e.g., convective mode, convective porosity, low ceiling and visibility, icing, turbulence) from NOAA ensemble systems. - Exploring reforecast datasets (e.g., ESRL/PSD GEFS Reforecast Version 2) for high-impact aviation-based decision support guidance of ceiling/visibility, icing, turbulence, convection and TFM. - Developing innovative approaches to ensemble data-mining and meteorologist-over-the-loop concepts, such as the calibration and verification of aviation specific variables. - Development and testing of probabilistic tools and visualization for communicating uncertainty to meteorologists and non-meteorologists in the aviation industry. - Implementation and evaluation of the AWT's Ensemble Processor for real-time ensemble analysis, interrogation, and visualization. - Education and research that assists AWC customers and partners in transitioning from a deterministic enterprise into an ensemble-based probabilistic paradigm. - Training NWS forecasters and aviation decision makers on the interpretation and utilization of ensemble systems and probabilistic forecasts. - Active participation in the AWT, including interactions with AWC meteorologists and colleagues in other government and academic facilities. - Related work in the area of ensemble-based probabilistic forecasting for NextGen.	Cubicle and desk space Linux & PC workstation Access to AWC and AWT Servers Storage and archive capability Aviation Weather Testbed (AWT) Facilities Availability of real-time data (models; observations) Availability of WCOSS data and computing system AWC IT & Science Support Interaction with AWC operational environments in Kansas City and at the Air Traffic Control Strategic Command Center (ATCSCC) in Warrenton, VA
David Bright	NWS/NCEP/AWC	816-584-7204	david.bright@noaa.gov	Predicting Meteorological Impacts to Traffic Flow Management in the U.S. National Airspace System	The Aviation Weather Testbed (AWT) at the Aviation Weather Center (AWC) in Kansas City seeks a visiting scientist to perform research on predicting the impacts of weather-related on air traffic flow management (TFM) in the National Airspace System (NAS). NextGen is based on advanced probabilistic weather forecasts for optimal decision making and management of the NAS.This work should focus on NWS operational and planned-operational models and ensemble systems that will allow the AWC to provide state-of-the-art decision support services to the FAA. Emphasis on the utilization of ensemble systems is encouraged.Weather and aviation impacts from the terminal to the en route scale are of interest. The AWC provides its decision support services to the national FAA Air Traffic Control Strategic Command Center (ATCSCC) through the AWC's National Aviation Meteorologists (NAMs), stationed remotely at the ATCSCC.This research should focus on providing the NAMs with state-of-the-art decision support guidance.Convection is the primary driver of NAS TFM issues, but turbulence, icing, ceiling/visibility, and three-dimensional winds at various scales are all critically important. In addition to the NWS model and ensemble systems and observational data, and the full support of the AWT, the AWC also provides partnership agreements with the MITRE Corporation Center for Advanced Aviation System Development (CAASD)	Cubicle and desk space Linux & PC workstation Access to AWC and AWT Servers Storage and archive capability Aviation Weather Testbed (AWT) Facilities Availability of real-time data (models; observations) Availability of WCOSS data and computing system AWC IT & Science Support Interaction with AWC operational environments in Kansas City and at the ATCSCC (Warrenton, VA)

					which is a federally-funded research and development center for the FAA, along with other private and academic partnerships.	
Scott Weaver	NWS/NCEP/CPC	301-683-3434	scott.weaver@noaa.gov	Developing Extended Range Outlooks for U.S Regional Tornadic Activity	The record-breaking U.S. tornado outbreak in the spring of 2011 and the below normal seasons of 2012 and 2013 prompts the need to identify and understand long-term climate signals that may provide subseasonal to seasonal predictability of tornadic activity. Currently, forecast skill beyond 5 days for tornado activity has not been demonstrated. Recent studies indicate that climate variability patterns acting on the intraseasonal-to-interannual timescales are influential in modulating regional U.S. tornadic activity. These include, but are not limited to, the Madden Julian Oscillation (MJO) and El Nino Southern Oscillation (ENSO). For the MJO there are preferential phases that are conducive to increases in tornadic activity over the U.S. in spring, while for ENSO it is the transitional phase as captured by the Trans-Nino index (TNI) that modulates the large scale atmospheric circulation, including an eastward shift of the North American Low-level jet (NALLJ), which supports stronger moisture convergence over the southeast U.S. and coincident increases in tornadic activity there. Furthermore, there is emerging evidence for the role of decadal climate variability (e.g., PDO and AMO) in fostering environmental conditions supportive of tornado activity. Despite this recent progress, our understanding of these connections has not yet achieved a level of maturity commensurate with that necessary to provide probabilistic outlooks. Project Goals and Description of Work: The main goals of this project are: (1) to refine the potential predictive skill provided by the links to known climate variability patterns; (2) to explore other long-term climate signals that may provide additional predictability from intraseasonal to seasonal and longer time scales; (3) to evaluate and potentially improve seasonal forecast skill for U.S. tornado activity in the NCEP Climate Forecast System version 2(CFSv2). With these three goals in mind, our work will be comprised of four tasks: (task-1) establishing meteorological indices for estimating the occurrence of tornadoes; (task-2) exploring climate signals that may provide predictability of U.S. tornado activity; (task-3) analyzing the CFSv2 reforecasts; and(task-4) exploring the potential of an experimental hybrid dynamical-statistical seasonal forecasting system. This work is relevant to the NOAA goals: (Weather-Ready Nation: Society is prepared for and responds to weather-related events, and Climate Adaptation and Mitigation: An informed society anticipating and responding to climate and its impacts) in support of NOAAâ€™s Next Generation Strategic Plan.	Office Space and access to CPC workstations and the IBM machines Tyde/Gyre and related IT support. The VS will aslo be given full access to several NCEP observational and modeling datasets.
Scott Weaver	NWS/NCEP/CPC	301-683-3434	scott.weaver@noaa.gov	The Role of North American Low-Level Jets on the Evolution of Warm Season Regional Drought	Overview: North American drought is among the costliest natural disasters, impacting the U.S economy to the tune of several billions of dollars per year. While there has been significant progress in understanding the large-scale oceanic and atmospheric forcing of North American droughts, these extreme climatic events typically develop and produce impacts on a regional scale, especially during summer. Areas of the U.S. that are most prone to summertime drought include the Great Plains/Midwest, Southeast, and Southwest. These regions are also home to summertime low-level jets, which are the primary instigator in generating both positive and negative regional precipitation anomalies through both robust moisture transports and their convergence/divergence in their entrance and exit regions. Given the critical role that these LLJ's have in generating and focusing regional precipitation anomalies, it is necessary to further understand their variability in the context of recent regional drought/pluvial events over the U.S. in observations, and the simulation and predictability of their characteristics in various climate models. Project Goals and Description of Work: The main goals of the project are (1) Characterize the seasonal variability/trends of North American LLJ's and precipitation impacts in observations and NOAA reanalysis products; (2) Assess the simulation and predictability of NALLJ variability/trends and their direct precipitation impacts in a suite of coupled climate models from the CMIP-5 and National Multi-Model Ensemble archives; (3) Develop a real time bias corrected NALLJ prediction system for use in assisting with U.S. drought monitoring and prediction efforts. With these goals in mind our work will be comprised of 4 tasks: (task-1) Apply advanced statistical techniques to extract the principal variability modes of NALLJ's and their precipitation impacts; (task-2) Relate the influential modes of variability to their underlying sea surface temperature (SST) and atmospheric anomaly patterns; (task-3) Assess the simulation characteristics of NALLJ's in CMIP-5 models under various greenhouse gas forcing scenarios; (task-4) evaluate the skill of NALLJ variability and related precipitation in the reforecasts of the operational National Multi-Model Ensemble (NMME) archive and use this information to bias correct real time monthly and seasonal NALLJ forecasts in the NMME model suite. This work is relevant to the NOAA goals: Weather-Ready Nation (Society is prepared for and responds to weather-related events), and Climate Adaptation and Mitigation (An informed society anticipating and responding to climate and its impacts) in support of NOAAâ€™s Next Generation Strategic Plan.	Office Space and access to CPC workstations and the IBM machines Tide/Gyre and related IT support. The VS will aslo be given full access to several NCEP observational and modeling datasets.
Arun Kumar	NWS/NCEP/CPC	301-683-3385	arun.kumar@noaa.gov	Influence of satellite data on hydrological cycle in climate renalysis	In the Climate Forecast System Reanalysis (CFSR) there was abrupt discontinuity in total precipitable water around 1999 when AMSU data started to be ingested in the analysis. Similar problem with imbalance in hydrological cycle exist in other reanakyses, and are exacerbated by the ingest of new observational platforms. Causes of this discontinuity is likely to be an interaction between model drift during 6-hour forecast that provides the first guess and the observed data, but are not well understood. An active area of research is understanding causes of imbalance in hydrological cycle, and discontinuities.	Office space; IT equipment and IT support; access of NOAA research high performance computing; Access to NCEP climate reanalysis infrastructure; resources of NCEP personnel in interaction with the PI.
Arun Kumar	NWS/NCEP/CPC	301-683-3385	arun.kumar@noaa.gov	Understanding the influence of initialization shocks on ENSO prediction	Imbalances in the ocean analysis generated by an ocean data assimilation system and forecast model's preferred statecreate a large shock in coupled forecast system, and can influence skill of subsequent forecast. What causes initial shock in the prediction of ENSO is of importance to understand?	Office space; IT equipment and IT support; access of NOAA research high performance computing; Access to NCEP ocean data assimilation and coupled forecast system; resources of NCEP personnel in interaction with the PI
Geoff DiMego	NWS/NCEP/EMC	301-683-3764	geoff.dimego@noaa.gov	High Resolution NWP and Data Assimilation	Research and development that supports NCEP's planned progression of reliable and increasingly more accurate forecast guidance from mesoscale through convection-allowing scales down to storm scale.This comes from the NCEP roadmap for converging NAM & RAP. The topics of interest include(but are not restricted to) the following:	(1) Office space, IT equipment and IT support. (2) Compute resources at NOAA RDHPCC computers as appropriate for project.

					(1) four-dimensional data assimilation: a) especially of radar and satellite observationswith at least hourly updating, b) dual dynamic core hybrid ensemble techniques, c) implement a vertical velocity control variable in GSI for use in, and the development of, a high-frequency storm scale data assimilation system, d) develop capabilities to assimilate lightning observations from upcoming GOES-R system with an appropriate observation operator for the GSI, e) severe storm relocation - such a technique may be necessary for misplaced storms in the background (e.g. forecast squall line 15 km too far east) and may require something analogous to hurricane relocationused in GDAS & HWRF, f) investigating ways to efficiently incorporate cross-covariance determined from an ensemble into the deterministic part of the GSI algorithm. (2) improved non-hydrostatic numerical modeling techniques. (3) parameterization of physical processes, e.g. that are scalable i.e. perform well from O(10-20 km) down to O(1 km) - can involve convection, PBL, surface layer, land surface physics, microphysics, radiation, and gravity wave drag+mountain blocking. (4) improved techniques for model evaluation and validation, e.g. work towards a comprehensive cloud verification data set that provides reliable and accurate total cloud coverage, multi-level cloud fractions, column integrated liquid and ice water paths, cloud optical properties, and (when possible) radiative flux estimates. Identify contributions from small cloud-sized and large precipitation-sized hydrometeors. (5) improved techniques applicable to RTMA/URMA: improved quality control schemes e.g. tuning of the non-linear qc internal to the GSI.	
Mike Ek	NWS/NCEP/EMC	301-683-3957	michael.ek@noaa.gov	Land-surface processes and low-level land-atmosphere exchanges	Land-related topics of particular interest include: (1) near-surface aerodynamic conductance and momentum transport (e.g. surface roughness, stability profile functions). (2) the effect of vegetation on surface energy and water budgets (SEWB) (e.g. partition between latent and sensible heat flux). (3) the effect of soil hydraulic and thermal properties on SEWB, and soil water and temperature evolution, including the longer term influence, e.g. the strong inertia of seasonal water and energy storage in the soil. (4) snow thermal conductivity, and the effect of snow layers and patchy snow cover for different surface types on the SEWB, with potentially strong inertia of seasonal snowpack in land-atmosphere interaction. (5) initial land states and surface characterization, which are important for forecasts of SEWB, e.g. vegetation type/fraction, soil type, albedo, surface emissivity, surface temperature, soil moisture, snow cover, burned area (where fire affects land physical properties, land processes and initial conditions).>These improvements will be incorporated into the Noah land model in both the uncoupled (land model only runs) and coupled (with the atmosphere and/or hydrology/streamflow models) settings, and as part of a land data assimilation system (using e.g. remotely-sensed snow cover, soil moisture, land surface temperature, etc).	(1) Office space, IT equipment and IT support. (2) Compute resources at NOAA RDHPCC computers as appropriate for project.
Shrinivas Moorthi	NWS/NCEP/EMC	301-683-3718	shrinivas.moorthi@noaa.gov	Climate Processes and Atmosphere/Ocean /Land/Sealce Coupled Modeling for ISI prediction	To develop a next generation coupled Atmosphere/Ocean/Land/Sealce model for Intra-seasonal, Seasonal and Interannual (ISI) prediction. Research and Development topics of particular interest include: (1) Representation of atmospheric physical processes, both resolved and sub-grid scale, including boundary layer, microphysics, convection, clouds, radiation, aerosols, gravity-wave drag etc. and their interactions with the lower boundary, (2) Coupling of ocean and atmosphere, modeling of physical processes at the air-water interface, ocean model physics, hybrid variational / ensemble data assimilation for the ocean, coupled ocean / atmosphere data assimilation, modeling of the near surface ocean aimed at resolving the vertical structure of the upper few meters and the diurnal cycle. (3) Evaluation of the coupled model forecast skills (validation metrics, MJO etc.) from week 2 to ISI time scale developing verification strategy, post-processing and production generation, multi-model ensembles, etc. (4) Improving Sea-Ice model and sea-ice prediction at ISI time scale. (5) Study the impact of boundary conditions on the atmospheric ISI simulation and predictability (e.g. impact of coupled vs uncoupled SST etc.). (6) Development of ensemble strategy and/or hindcasts for bias correction for ISI time scales. (7) Development of best initialization strategy for the hindcasts and for the real time forecasts.	(1) Office space, IT equipment and IT support. (2) Compute resources at NOAA RDHPCC computers as appropriate for project.
Hendrik Tolman	NWS/NCEP/EMC	301-683-3748	hendrik.tolman@noaa.gov	Marine (coupled) Modeling and Analysis	Broad topics of interest for EMC are: (1) Advanced aspects of coupled marine modeling ocean-wave-ice-atmosphere(-land) interactions, in particular the ocean-atmosphere interface physics. (2) (Coupled) data assimilation and data QC. (3) Ocean model validation metrics (including ensembles). (4) Downscaling. (5) Ecosystems and pollution modeling applications of ocean models. (6) Model physics (e.g. Langmuir mixing, shallow water wave physics). (7) Postprocessing and product generation (e.g., hazardous sea state parameters).	(1) Office space, IT equipment and IT support. (2) Compute resources at NOAA RDHPCC computers as appropriate for project.
Yuejian Zhu	NWS/NCEP/EMC	301-683-3709	Yuejian.zhu@noaa.gov	Ensemble System Strategies	Topics of interest include: (1) Ensemble strategies to improve initial and model uncertainties which include the methodology for the generation of initial perturbations, stochastic physics, and multi-model. (2) Statistical post process to improve probabilistic forecast. (3) Ensemble based detection of cyclogenesis for extended region to improve TS prediction. (4) Prediction and predictability of extremes at extended time scales;	(1) Office space, IT equipment and IT support. (2) Compute resources at NOAA RDHPCC computers as appropriate for project.
John Derber	NWS/NCEP/EMC	301-683-3662	john.derber@noaa.gov	Global Modeling and Data Assimilation	Broad topics of interest for EMC are: (1) Improved data assimilation techniques which are practical for operational use. (2) Improved global microphysics and parameterizations for the 3-15km scales. (3) Direct use of new observation types in variational/hybrid assimilation schemes. (4) Improved initialization/prediction of lake temperatures in global models. (5) Use of cloud impacted radiances in data assimilation.	(1) Office space, IT equipment and IT support. (2) Compute resources at NOAA RDHPCC computers as appropriate for project.

					(6) Balanced initialization of adiabatic processes in data assimilation. (7) Aerosol and trace/constituent gas modeling for NWP. (8) High atmosphere physics and modeling for NWP. (9) Improved validation techniques for use with operational NWP systems.	
Vijay Tallapragada	NWS/NCEP/EMC	301-683-3672	vijay.tallapragada@noaa.gov	Hurricane Modeling	Broad topics of interest for EMC are: (1) Hurricane vortex initialization to reduce the rapid growth of intensity error in early forecast period (0-24hr), either static or dynamic/physical initialization. (2) Development and testing of high resolution hurricane physics suites for multi-scale applications. (3) Advanced diagnostics tools for hurricane models in addition to conventional diagnostics methods. (4) Study of of tropical cyclones rapid intensification (RI) and predictability of RI in HWRF. (5) Advanced quality control and assimilation techniques for aircraft reconnaissance data. (6) Vortex-shear interactions with focus on resilience of model vortex to environmental shear. (7) Downstream applications of HWRF model, with special emphasis on storm related rainfall, flooding, storm surge, hydrology and inundation, through improved land surface representation. (8) Impact of aerosols and/or sea spray on hurricane intensity forecasts. (9) Enhanced techniques for coupling of atmosphere-ocean-wave-land-hydrology.	(1) Office space, IT equipment and IT support. (2) Compute resources at NOAA RDHPCC computers as appropriate for project.
Steven J. Weiss	NWS/NCEP/SPC	405-325-2073	steven.j.weiss@noaa.gov	Analysis and Prediction of Tornadoes, Severe Hail, and Damaging Wind Gusts	Topics of interest include: 1. Use of observing systems to improve analysis of the mesoscale pre-storm and near-storm environments 2. Development of a mesoscale ensemble system using advanced data assimilation techniques for improved analysis and short-term prediction of the environment associated with severe storms; 3. Stormscale ensemble development including research into the impacts of radar data assimilation, scale appropriate IC perturbations, and physics diversity on ensemble performance; 4. Extraction tools for identification of severe weather hazards from model data; 5. Statistical post-processing techniques to create reliable probabilistic hazard information; 6. Temporal focus ranging from the Day 1-3 time frame (SPC Outlook scale) to frequently updated near-term (1-6 hr) forecasts (SPC Watch scale) consistent with emerging continuum of probabilistic threats concept; 7. Promising operationally relevant research may be considered for testing in the Hazardous Weather Testbed annual Spring Forecasting Experiment.	1. Access to operational and experimental NWP model datasets including mesoscale and stormscale ensemble systems 2. Access to SPC and NSSL realtime and archived observational, model, and product datasets 3. Use of SPC and WCOSS computer systems 4. Cubical desk space with networked PC and N-AWIPS/AWIPS2 workstation 5. Software and computing support
David Novak	NWS/NCEP/WPC	301-683-1484	david.novak@noaa.gov	Quantifying Uncertainty	A key challenge facing the forecast community is how to synthesize the vast array of ensemble information into actionable decisions. Thus, this project will develop better techniques to incorporate uncertainty derived from short and medium range ensemble forecasts into the forecast process, and convey this uncertainty to users. This may include research areas such as: -extratropical cyclone tracking (applied to ensembles) -automated frontal detection (applied to ensembles) -extreme forecast indexing (derived from ensembles) Approaches to incorporate the human deterministic information into the final probabilistic forecast are welcome.	Access to operational forecasting systems Access to NCEP and International guidance suite (including ECMWF ensembles) WCOSS Cubical space
Ben Kyger	NWS/NCEP/NCO	301-683-3900	ben.kyger@noaa.gov	Operational Supercomputing	I am interested in more fully utilizing both supercomputers that support NCEP's environmental model guidance mission. One is largely devoted to operations, where reliability is the primary goal. The second system is devoted to development, where high utilization and development efficiency is the primary goal. Many of our model codes were written long ago so there are possible architectural opportunities there. The tools we use to monitor the utilization of both systems are rather crude, so that's an opportunity as well.	The full operational and developmental suite of environmental models, including weather, climate, marine, and space (solar). Both 213 Tflop systems are available for experiments. All environmental data that feeds the models, as well as all output products, are available. The candidate would be a member of a 110 person team within NCEP Central Operations, and would have access to the other members of NCEP as well, including the Environmental Modeling Center and forecast Centers.