



**NOAA Research
Earth System Research Laboratory
Boulder, Colorado**

**Global Systems Division
*Science Review***

**November 3 - 5, 2015
David Skaggs
Research Center**



The latest OAR-mandated Science Review for the Global Systems Division was held on November 3 through 5, 2015 at the David Skaggs Research Center in Boulder, Colorado. The Review covered GSD's three areas of expertise in research and development:

- Research Area 1 - Numerical Weather Prediction;
- Research Area 2 - Decision Support; and
- Research Area 3 - Advanced Technologies.

The Global Systems Division (GSD) of the Earth System Research Laboratory (ESRL) is part of National Oceanic and Atmospheric Administration's (NOAA) Office of Oceanic and Atmospheric Research (OAR) within the U.S. Department of Commerce. GSD provides NOAA and the nation with assimilation, modeling, information, decision support, advanced visualization and education tools, and advanced computing systems crucial for analyzing and predicting weather and air quality across a broad spectrum of scales.

The chief NOAA mission goal that currently directs our weather research and development (R&D) efforts is the goal of a "Weather Ready Nation." GSD's also sees opportunity where advances made under this goal can be leveraged by NOAA to address its other mission goals and enterprise objectives in NOAA's Next Generation Strategic Plan.

The activities conducted by GSD help develop operational weather and water services through improvements made to the accuracy and reliability of forecasts produced by numerical modeling and data assimilation systems using advanced computing technologies. Commerce and transportation are enhanced, and public safety and health are improved through informed decision-making and improved scientific understanding by federal agencies, businesses, various public sectors, and private individuals that use these improved services developed at GSD.

GSD is evaluated every five years during a Science Review. A review panel is established composed of national and international experts that evaluate GSD's research, development, and transition activities, including outreach and science education.

The composition of the review panels reflect the diversity of expertise necessary to assess GSD's core competencies: modeling, decision support systems, advanced technologies, and science education and outreach. The reviewers assess the science, technology, their transition to applications, and portfolio management. Per NAO 216-115, the assessment criteria include quality, relevance, and performance. The recommendations of the review panel are provided to OAR Headquarters and a formal response by GSD, along with an implementation plan addressing approved recommendations, is required.

Review Panel for GSD Science Review 2015



Review Panel Chair

Dr. Christa D. Peters-Lidard

Deputy Director for Hydrospheric and Biospheric Science

Earth Sciences Division / Code 610

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Research Areas: Numerical Weather Prediction and Advanced Technologies

Direct Funding Connections: None

Research Collaborations: Weather Research and Forecasting (WRF)-Land Surface Working Group 14; Rapid Update Cycle (RUC) Land Surface Model (LSM) implementation in Land Information System (LIS)

Dr. Christa D. Peters-Lidard is currently the Deputy Director for Hydrospheric and Biospheric Sciences in the Earth Sciences Division at NASA's Goddard Space Flight Center. She was a Physical Scientist in the Hydrological Sciences Laboratory from 2001-2015, and Lab Chief from 2005-2012. She graduated summa cum laude with a B.S. in Geophysics and a minor in Mathematics from Virginia Polytechnic Institute and State University (Virginia Tech) in 1991. She then went on to earn her M.A. and Ph.D. from the Water Resources Program in the Department of Civil Engineering and Operations Research at Princeton University in 1993 and 1997, respectively. Dr. Peters-Lidard was an Assistant Professor in the School of Civil and Environmental Engineering at Georgia Institute of Technology from 1997 to 2001. She is currently the Chief Editor for the American Meteorological Society (AMS) Journal of Hydrometeorology, and an elected member of the AMS Council. She has also served as an Associate Editor for the Journal of Hydrology and Water Resources Research. Her research interests include land-atmosphere interactions, soil moisture measurement and modeling, and the application of high performance computing and communications technologies in Earth system modeling, for which her Land Information System team was awarded the 2005 NASA Software of the Year Award. She is a member of Phi Beta Kappa, and was awarded the Committee on Space Research (COSPAR) Scientific Commission, A Zeldovich Medal in 2004, and the Arthur S. Flemming Award in 2007. She was elected as an AMS Fellow in 2012.

Education:

- Ph.D. Civil Engineering and Operations Research (now Civil and Environmental Engineering), Program in Water Resources, Princeton University, Princeton, New Jersey, January 1997.
- M.A. Civil Engineering and Operations Research, Princeton University, June 1993
- B.S. Geophysics, Summa Cum Laude, Minor: Mathematics, Virginia Polytechnic Institute and State University (Virginia Tech), Blacksburg, Virginia, May 1991.



Dr. Fred Carr

McCasland Foundation Presidential Professor of Meteorology

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Research Area: Numerical Weather Prediction

Direct Funding connections: None

Research Collaborations: None

Dr. Frederick H. Carr is the McCasland Foundation Presidential Professor of Meteorology at the University of Oklahoma. From 1996 until July 2010, he was Director of the School of Meteorology. His research interests include synoptic, tropical and mesoscale meteorology, numerical weather prediction and data assimilation. Dr. Carr has held visiting scientist positions at the National Centers for Environmental Prediction (NCEP), the National Center for Atmospheric Research (NCAR), and NOAA's Forecast Systems Laboratory (1993-4), predecessor to GSD. At the University of Oklahoma, Dr. Carr was responsible for moving the School to the National Weather Center and adding 8 new faculty, including 6 endowed chair positions. He has served as the associate director of the Center for the Analysis and Prediction of Storms. Dr. Carr twice received the President's Outstanding Mentor Award and recently received OU's Regents' Award for Superior Professional and University Service. Dr. Carr is a Fellow of the American Meteorological Society and served as a member of the AMS Council, chair of the AMS Board on Higher Education, editor of *Monthly Weather Review* and subject matter expert for the *Bulletin of the AMS*. He organized and chaired two AMS Named Symposia for Professors Lilly and Krishnamurti. He serves on the Board on Enterprise Communication and the Nationwide Network of Networks Committee of the Board on Enterprise Strategic Topics. He currently is the President-Elect of the AMS. Dr. Carr was named one of the 10 "Founders of COMET", and received COMET's Outstanding Contributions to Professional Training Award. He has served on the NSF Committee of Visitors to evaluate ATM, the North American Observing Systems committee, and External Review Panels to review NOAA's Forecast Systems Laboratory and the Mesoscale Development Laboratory. He served on the National Research Council committee that authored "*Observing Weather and Climate from the Ground Up: A Nationwide Network of Networks*". Dr. Carr just completed a 6-year term on the UCAR Board of Trustees and co-chairs the UCAR Community Advisory Panel for NCEP.

Education:

- B.S., M.S. and Ph.D. degrees in meteorology from Florida State University
- Post-doctoral appointment at SUNY-Albany



Dr. Brad Colman

Director of Science, Climatology

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Fax: None

Research Area: Decision Support

Direct Funding connections: None

Research Collaborations: None

Dr. Brad Colman recently took on the role of the Director of Science - Climatology for The Climate Corporation where he leads a team of statisticians and atmospheric scientists in developing weather, climate, and decision support information for the global agricultural industry. Prior to this appointment he worked for nearly two years on a Microsoft team chartered to grow a new consumer weather service to allow them to deliver weather content across their ecosystem. Prior to his recent jobs in the private sector, Brad enjoyed a long and diverse career with NOAA from which he retired in 2013. At NOAA, he worked at the National Weather Service's forecast office in Seattle Washington from 1990 through 2013 filling the SOO and MIC positions during his tenure. For much of 2012/13 Brad was the Acting Director of the Meteorological Development Laboratory in Silver Spring, MD. Brad also worked for NOAA's Environmental Research Laboratory in Boulder, Colorado, from 1986 to 1990. Dr. Colman also serves as an Affiliate Associate Professor in Atmospheric Sciences at the University of Washington. Dr. Colman has published numerous articles in the scientific journals of the American Meteorological Society and other peer-reviewed journals. He co-edited (with Dr. Tom Potter) a two-volume handbook on Weather, Climate and Water published by Wiley Press. He is a member of the American Meteorological Society and the National Weather Association. Brad was elected Fellow in the AMS in 1996 and has served in a number of different roles within the Society.

Education:

- Massachusetts Institute of Technology, Cambridge, MA: Sc.D., Atmospheric Sciences, 1984.
- Montana State University, Bozeman, MT: B.S., Earth Sciences w/Mathematics Minor, 1977.



Dr. Rebecca E. Morss

Senior Scientist

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Research Area: Numerical Weather Prediction and Decision Support

Direct Funding connections: None

Research Collaborations: None

Dr. Rebecca E. Morss is a Senior Scientist in the Mesoscale and Microscale Meteorology Laboratory at the National Center for Atmospheric Research in Boulder, Colorado. She studies meteorological, socio-economic, and public policy aspects of weather, including floods, hurricanes, and other hazards. Her recent research includes work on the communication and interpretation of hazardous weather risk; use of weather and climate information in decision making; design of meteorological and oceanographic observing networks; and extreme weather in the climate context. Among other activities, she recently served on the National Research Council Committee on Progress and Priorities of U.S. Weather Research and Research-to-Operations Activities, NOAA Science Advisory Board's Environmental Information Services Working Group, and the National Academies Keck Futures Initiative Steering Committee on Ecosystem Services. From 2009-2012, she served as an elected member of the Council of the American Meteorological Society, and she currently serves on the American Meteorological Society Planning Commission. She received a B.A. from the University of Chicago and a Ph.D. in atmospheric science from the Massachusetts Institute of Technology.

Education

- Ph.D., Atmospheric Science, Massachusetts Institute of Technology
- B.A. General and Departmental Honors, Chemistry, University of Chicago.



Tom Fahey

Manager, Meteorology Operations/Customer Center

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Research Area: Decision Support

Direct Funding connections: None

Research Collaborations: None

Mr. Tom Fahey has spent the majority of his career working in Aviation Meteorology at Northwest Airlines & then at Delta Air Lines.

- 1977-1989: Operational Weather Forecaster, Forecast Procedures & Product Developer & Union Representative.
- 1990-Current: Responsible for leading aviation weather forecast teams. Focus has consistently been in 3 areas:
 - Safety: Avoiding En Route Weather Hazard including turbulence, mountain wave activity, volcanic ash, etc.;
 - Efficiency: Developed strategies to assess weather's impact on Air Traffic capacity & airline management of hub airport operations effected by major weather events; and
 - Financial: Sales and marketing of weather products and services.
- 1990's : CAST (Commercial Aviation Safety Team) was initiated by Vice-President Al Gore and I participated in the Turbulence Joint Safety Analysis Team which produced an in depth study of aircraft turbulence encounters.
- 1990's: Chair & Member of the Air Transport Association Meteorology Committee worked with the FAA & National Weather Service to develop a process for supplementing Automated Surface Observation System (ASOS) METARs while further development could be completed to measure variables important to aviation.
- 2000: Accepted on the behalf of Northwest Airlines and the Meteorology Team, the Air Transport World Technology Management Award, for the Northwest Airlines Turbulence Plot System.
- 2001: Received the Aviation Week & Space Technology's Aviation Laurels Award for my role in development of Collaborative Convective Forecast Product (CCFP).
- 2000's: Completed private consulting projects in the areas of Operational Forecasting, Aviation Meteorology Training & Forensic Meteorology. Also built a very well respected aviation weather business, which generated revenue for Northwest Airlines and then Delta (1998-2008 & 2009-2012 respectively).

Co-Chair Ground Deicing Work Group, Weather Sub-Committee where airline industry; FAA; US National Weather Service; & Environment Canada representatives coordinated safety and efficiency weather issues related to aircraft ground de/anti-icing (2006-2009). During integration of Delta and Northwest Airlines, Solar Activity and its effect on radio communications as well as humans was given additional focus and a warning product and procedures were refined (2008-2010). Coordinated with SkyTeam member Airline, KLM & European Authorities to safely restart operations after ash from Eyjafjallajokull Volcano closed down all flights operations to/from northern Europe (April 2010). Represented the International Air Transport Association on ICAO's Int'l Volcanic Ash Task Force which among other accomplishments, clarified airlines' role & responsibility dealing with ash hazards (2010-2012). Recognized by the FAA for 12 years of work in the area of Collaborative Decision Making (CDM), a Government Industry & Research community effort, to address Air Traffic Management related issues (2011). Industry Lead for the CDM Weather Evaluation Team (2006-2011).

Current professional & industry activities are:

- Operational Forecasting Editor: Bulletin American Meteorological Society; and
- Executive Board Member: AMS Commission on Wx & Climate Enterprise, Board on Enterprise Communication, Forecast Improvement Group.

Education:

- Mini M.B., University of St. Thomas, Minneapolis, MN
- M.S. Meteorology, University of Wisconsin, Madison, WI
- B.A. Geology (cum laude), College of St. Thomas, St. Paul, MN



Dr. Oliver Fuhrer

Senior Scientist

Numerical Prediction Division: Development
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Research Areas: Numerical Weather Prediction and Advanced Technologies

Direct Funding connections: None

Research Collaborations: None

Dr. Oliver Fuhrer heads the development team of the numerical prediction division of the Federal Office of Meteorology and Climatology MeteoSwiss, Zurich. He has over 14 years of experience in the fields of high performance computing, regional climate simulation and numerical weather prediction. His team is in charge of both the physical as well as the computational developments effected in the numerical weather prediction toolchain at MeteoSwiss. He has applied and developed parallel software and conducted research starting on vector machines and later on massively parallel architectures at the Swiss National Supercomputing Centre. Dr. Fuhrer acted as a PI or co-PI on several projects within the Swiss High Performance and High Productivity Computing (HP2C) initiative and Platform for Advanced Scientific Computing (PASC) and has had the scientific lead for developing a hardware oblivious and performance portable implementation of the dynamical core of the COSMO model. These efforts have resulted in an implementation of COSMO capable of running production simulations on hybrid architectures. He is also leading the effort to develop the next-generation convection resolving short range numerical weather prediction model.

Education:

- Ph.D., Atmospheric and Climate Science, ETH Zurich, 2005
- M.Sc., Physics, ETH Zurich, 2000
- B.Sc., Physics, University of Cambridge, UK, 1998



Dr. Peter Neilley

Senior Vice President, Global Forecasting Services

The Weather Company (TWC)

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Email: peter.neilley@weather.com

Research Areas: Decision Support and Advanced Technologies

Direct Funding connections: None

Research Collaborations: None to date, but having discussions with ESRL on possible future research collaborations.

Dr. Peter Neilley is Senior Vice President of Global Forecasting Services for The Weather Company, which is headquartered in Atlanta, Georgia. Dr. Neilley is based in Andover, Massachusetts at WSI (a division of The Weather Company), although his responsibilities span the entire Weather Company portfolio. In his role, Dr. Neilley is responsible for the research and development of next-generation weather and forecasting technologies that drive weather-related content for the company. He formerly also managed the real-time forecasting operations at the company's forecasting centers in Atlanta, Georgia; Andover, Massachusetts; Birmingham, United Kingdom; and Dallas, Texas, but has recently given up these responsibilities to focus on R&D interests. Before joining TWC, Dr. Neilley was a scientist at UCAR's National Center for Atmospheric Research, pursuing research and development interests in the fields of mesoscale weather forecasting, wind and turbulence forecasting, and automated weather forecasting using machine-learning techniques. There, Dr. Neilley was the principle scientist in the development of DICAST, a multi-model ensemble based weather forecasting system based on various applications of machine-learning theory that drives forecast products used by literally billions of people and businesses worldwide. In his role of director of TWC's forecasting R&D, he directs the entire research and development group, whose accomplishments include the establishment of a numerical weather prediction group and the world's first operational implementation of the WRF model and the first operational implementation in convective allowing and global configurations. Dr. Neilley has a bachelor's degree in meteorology from McGill University, and master's and PhD degrees in meteorology from the Massachusetts Institute of Technology. While at McGill, he was named a University Scholar of Great Distinction. He was awarded the Jules Charney Memorial Scholarship at MIT. From 2006 to 2008 Dr. Neilley was a member of the American Meteorological Society's Committee on Weather Analysis and Forecasting and then chaired the committee from 2008 to 2012. Currently, Dr. Neilley is a member of the AMS Board on Data Stewardship, and the AMS Committee on Open Environmental Information Services. In addition, he is a member of NOAA's NWS Science Advisory Board Environmental Information Services Working Group, a member of the UCAR Community Advisory Committee for NCEP (UCACN), and the recently formed UCACN Modelling Advisory Committee (UMAC) to provide a comprehensive technical review of the NCEP Production Suite.

Education:

- Ph.D. Meteorology, Massachusetts Institute of Technology 1990.
- M.S. Meteorology, Massachusetts Institute of Technology, 1984.
- B.S. Meteorology, McGill University, 1982.



Beginning the First Morning



More from the First Morning



Kevin Helping OAR Deputy Director Steve Fine Check In



Review Chair – Dr. Christa Peters-Lidard of NASA-Goddard



Jenn in Pre-Review Discussion with the NWS's Dave Michaud



Kevin, Sandy, and Steve Prior to the Review Starting



Sandy Welcomes All!



More Pre-Review Greetings and Renewing Acquaintances



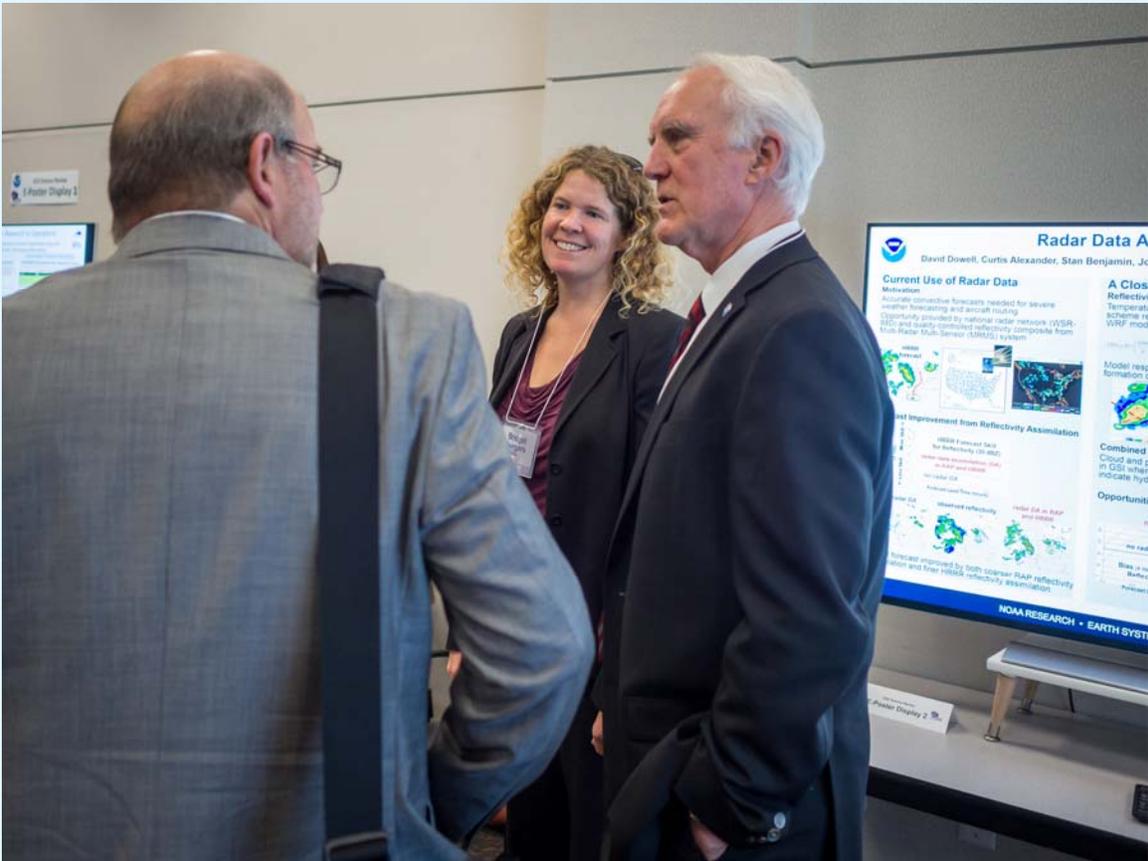
Kevin Welcomes All As Well!



Great Review Room Layout



More Meet-and-Greets Prior to the Review Kicking Off



And Still More Meet-and-Greets Prior to Starting



Stan and Zoltan are Primed and Ready!



We're Primed and Ready As Well!



CIRA's Sher in "Pre-Game" Discussions



A Meeting of CIRA and CIRES – Christian and Curtis



Tim, Melinda, and Zoltan are Ready to Begin



Jenn Opens The Proceedings



Steve, Sandy, and Stan in Concentrated Attention



Focus, Concentration, and Attention



Scott with ITS Information



Kevin's Tremendous 60 Minute Opening Presentation



Listening to Kevin's Opening Presentation



Attentive Listeners



Penny Reporting on the Administrative/Budget Side of the Review



Concentration!



The Master of Ceremonies!



More from Kevin's 60 Minute Opening Presentation



Still More From Kevin's 60 Minute Opening Presentation



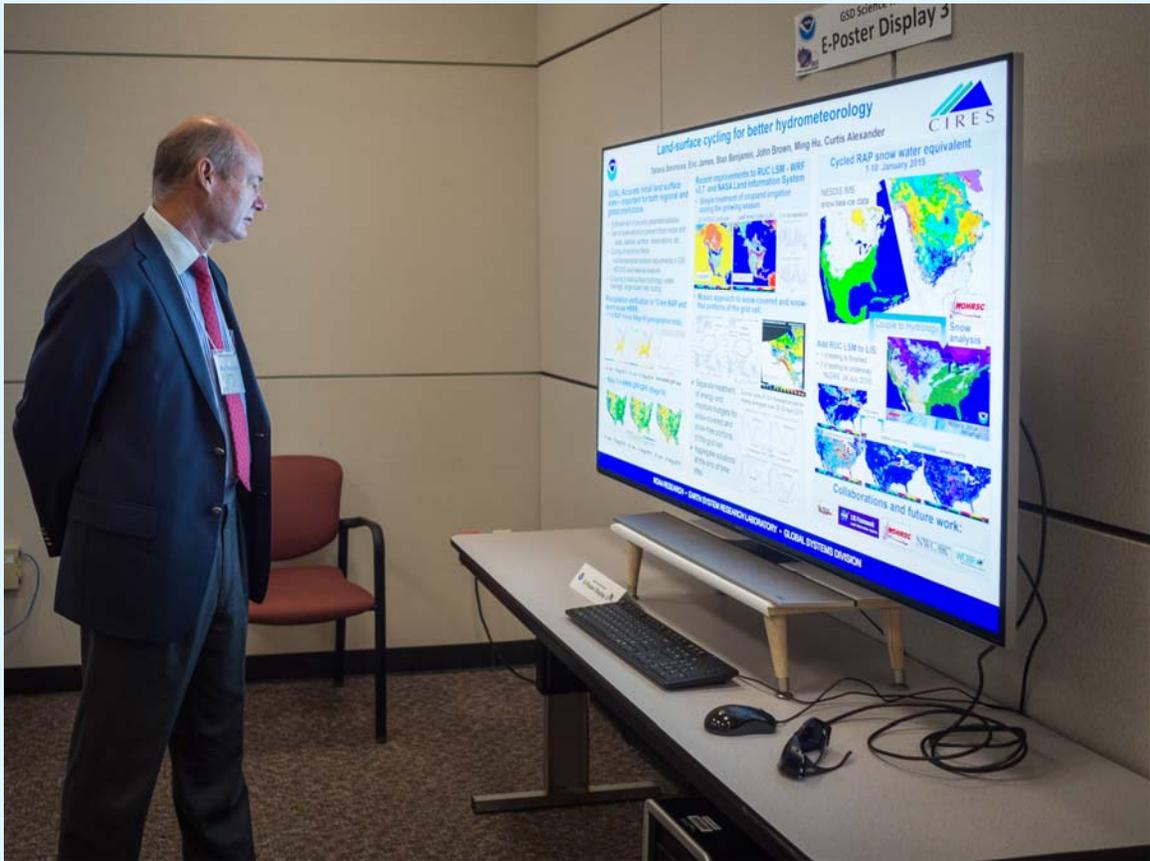
Jenn Fills In With Background and Review Management Topics



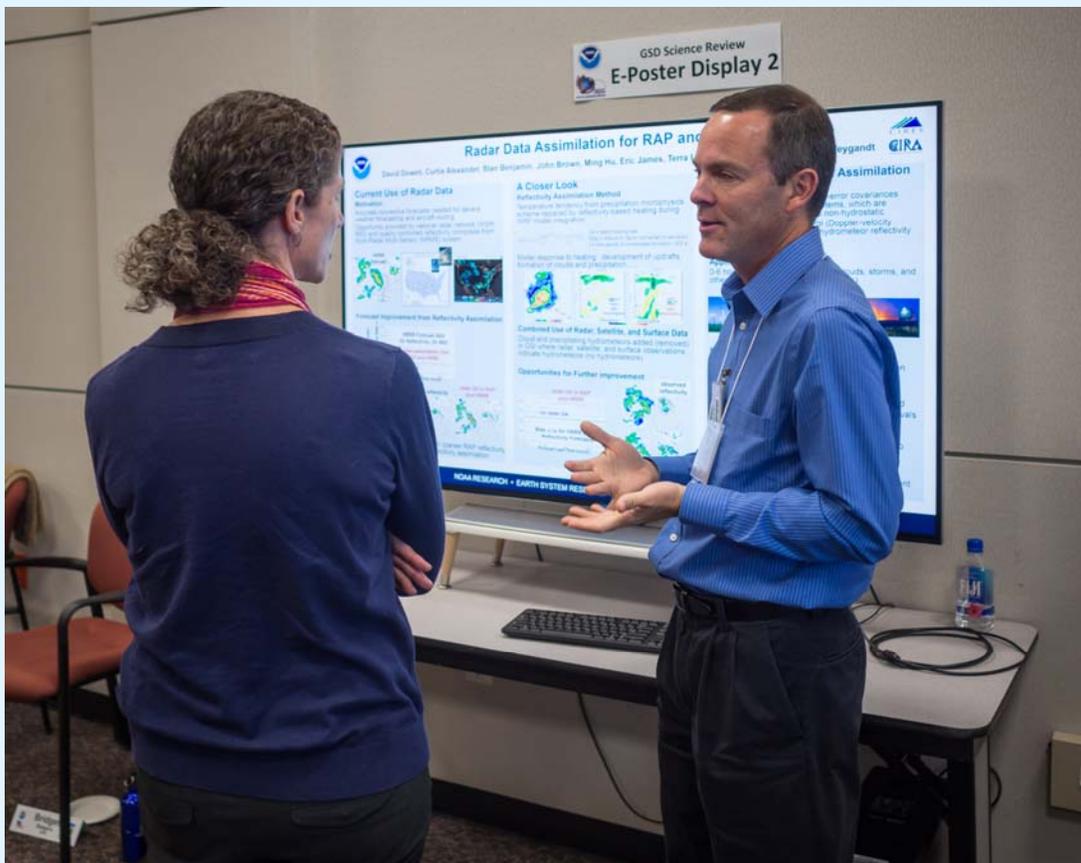
See Previous Caption!



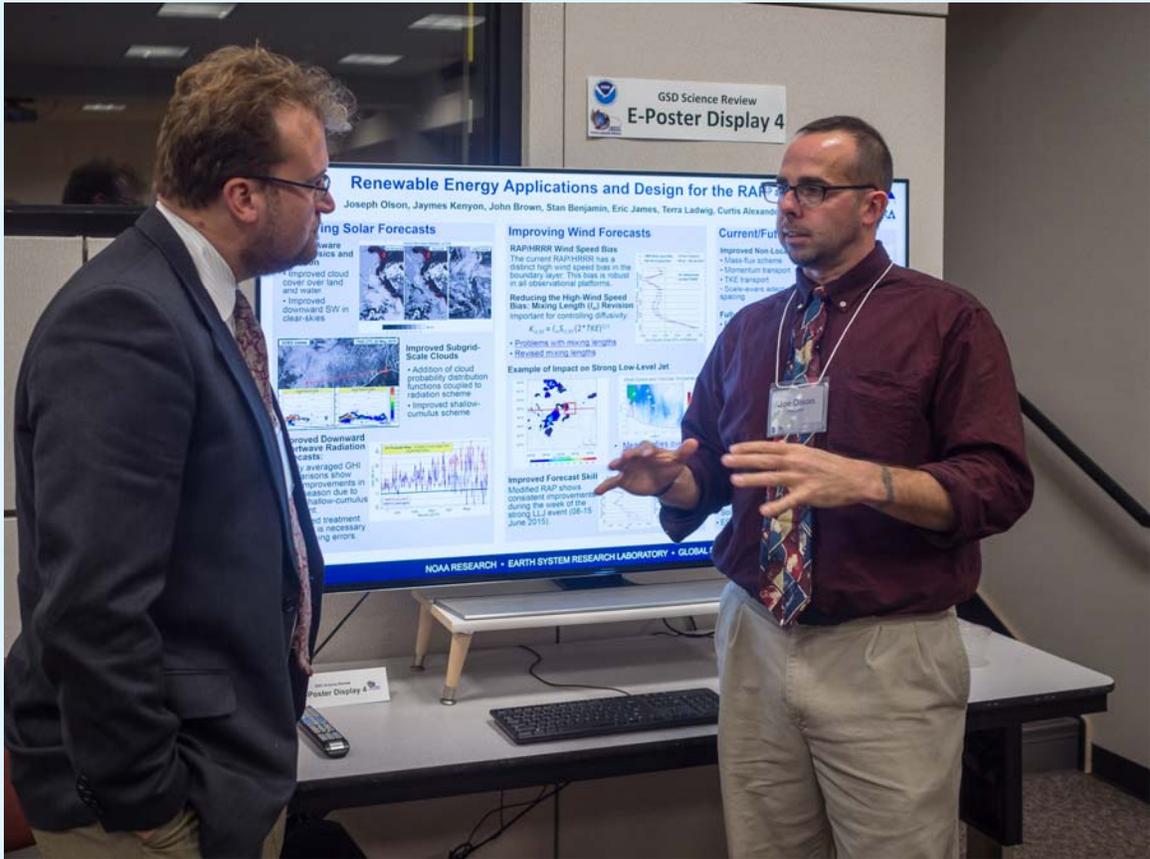
Kevin...And The Whole Picture



One of Our Outstanding E-Posters Presented at the Review



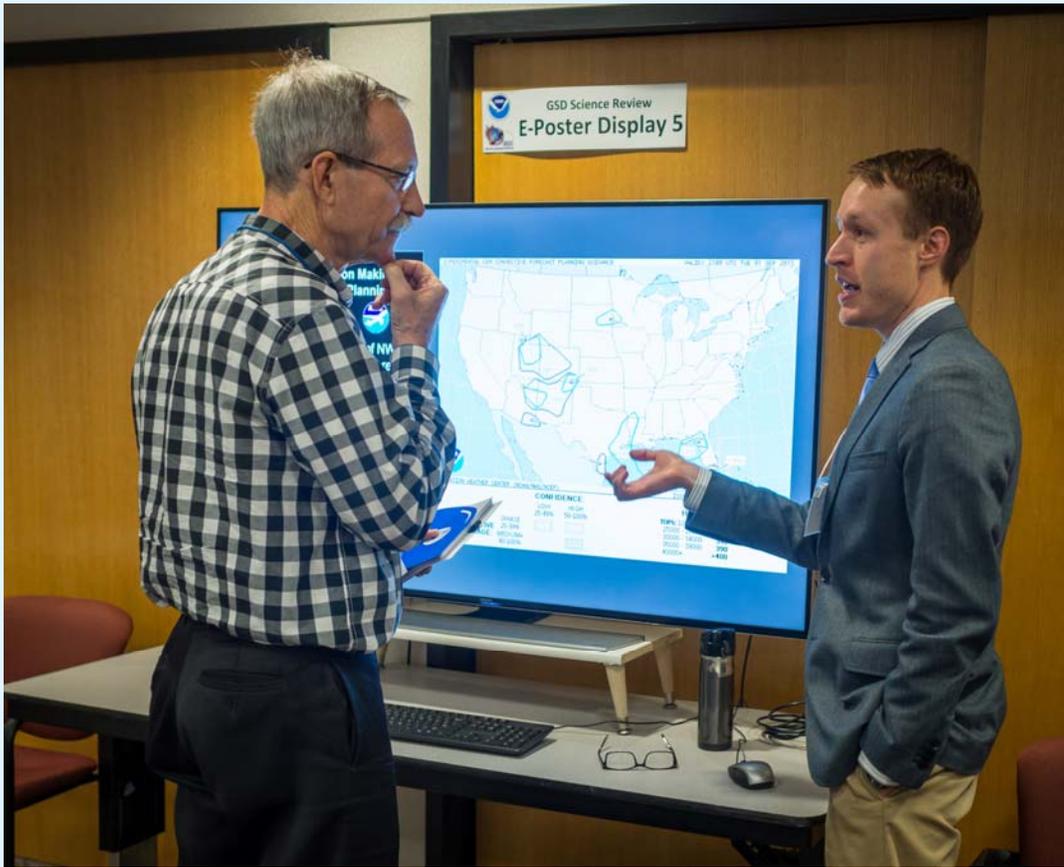
Another of Our Outstanding E-Posters Presented at the Review



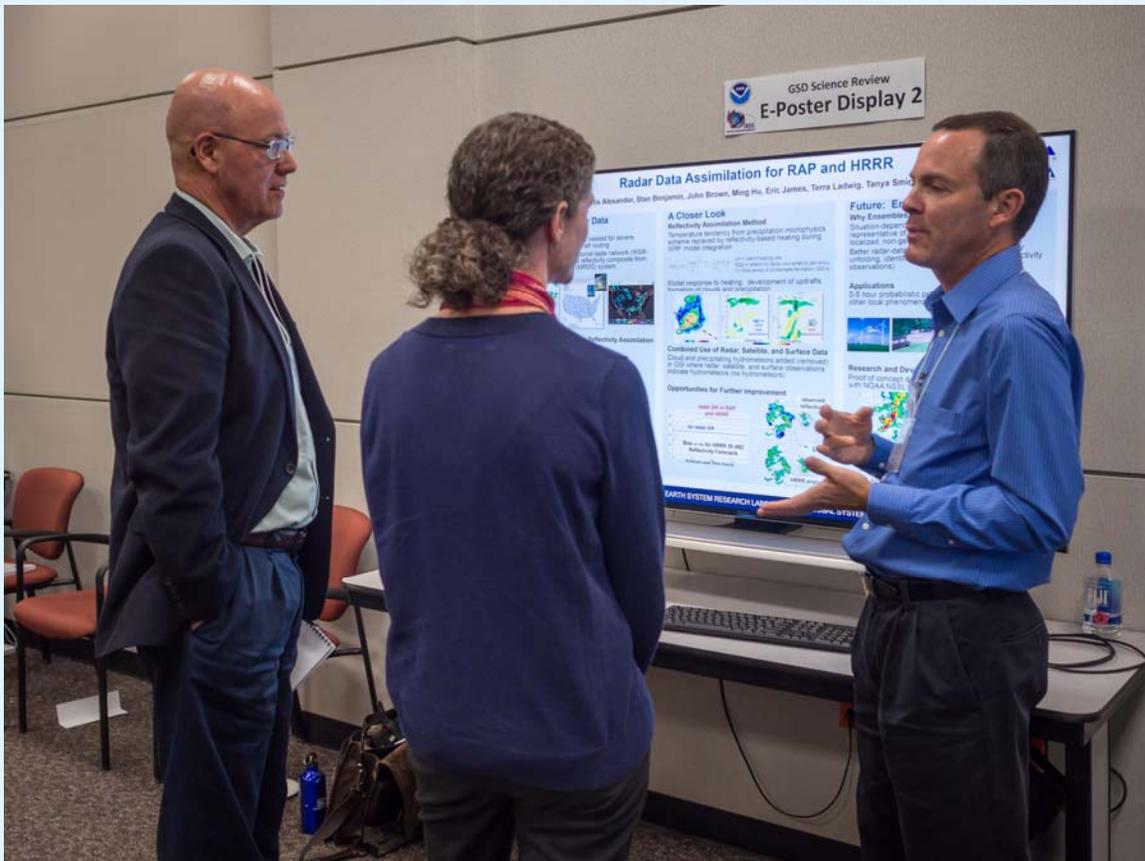
Yet Another of Our Outstanding E-Posters Presented at the Review



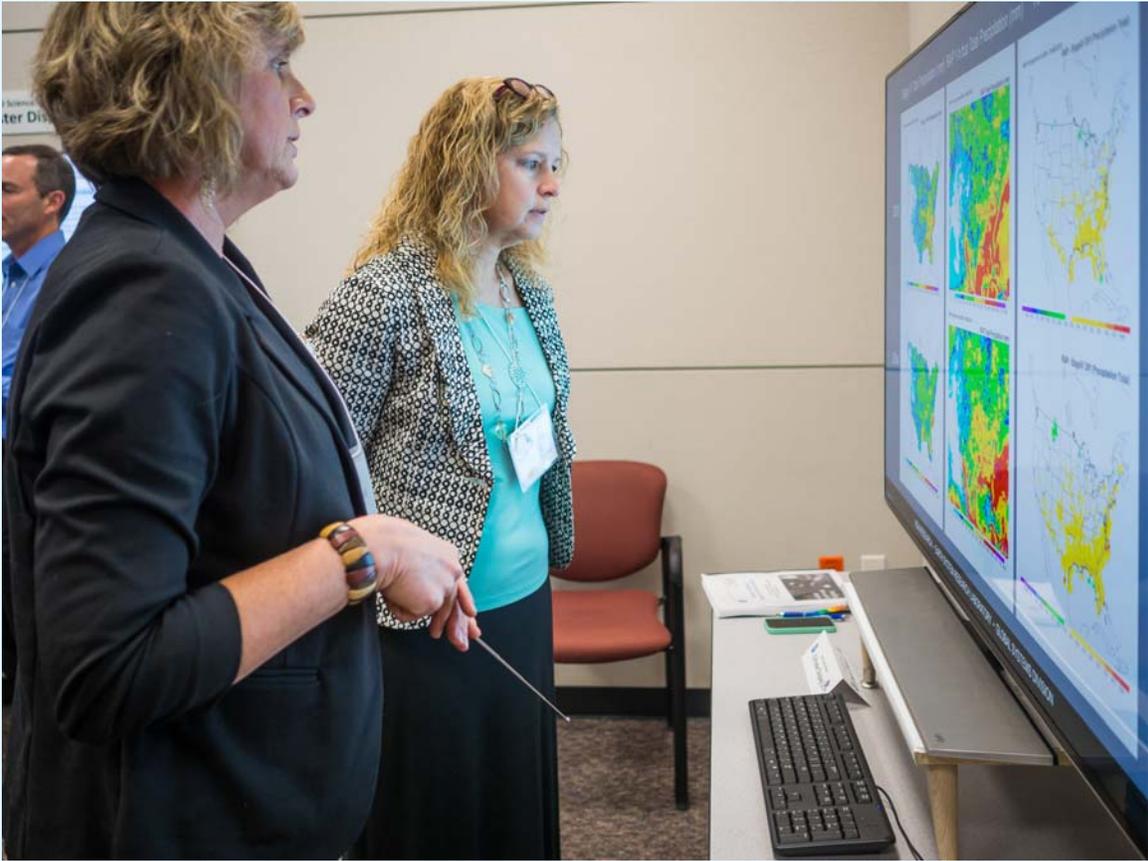
Still Another of Our Outstanding E-Posters Presented at the Review



Concentrated E-Poster Discussion - Jaymes and Panel Member Tom Fahey



David, his E-Poster, and Panel Members Brad Colman and Rebecca Morss



E-Poster Engagement - Tanya and Panel Chair Christa Peters-Lidard



Stan, Curtis, and Panel Member Fred Carr in E-Poster Discussion



More E-Poster Engagement – David and Panel Member Rebecca Morss



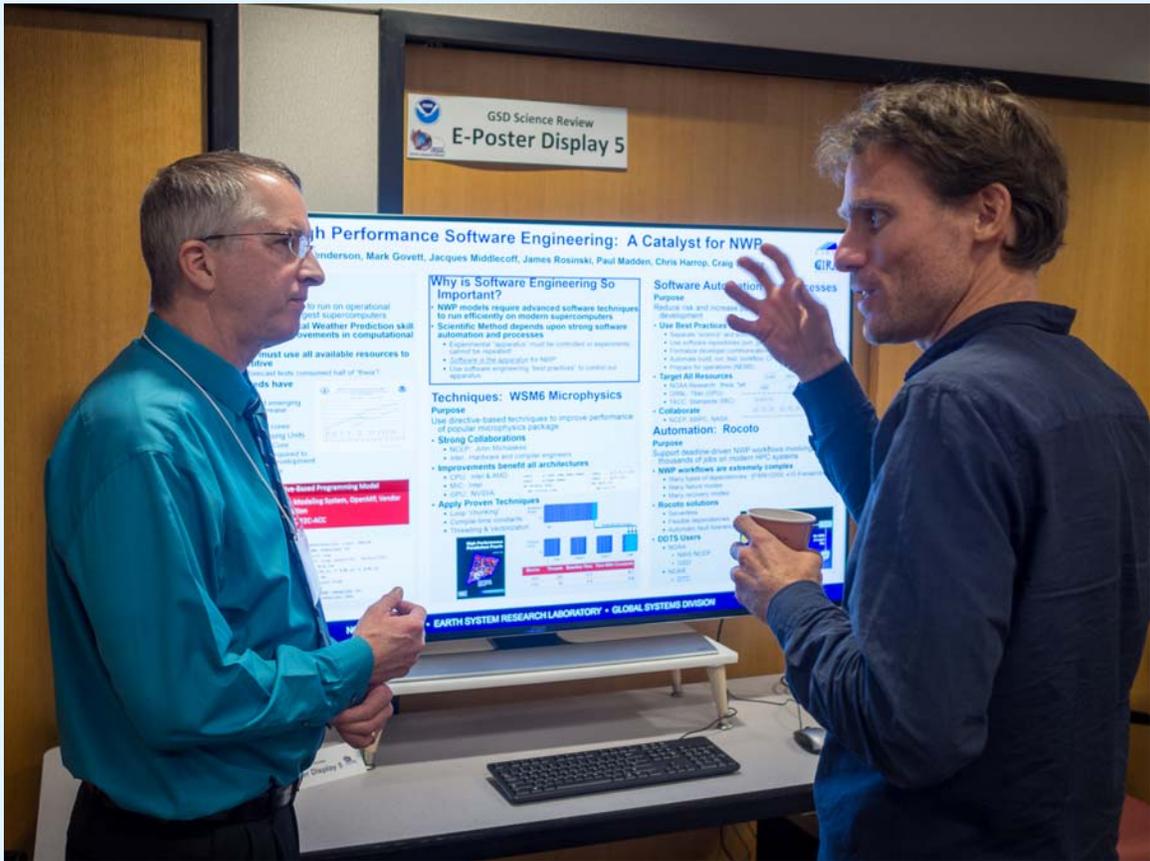
Joe to Panel Members Brad Colman and Peter Neilley, Plus Melinda



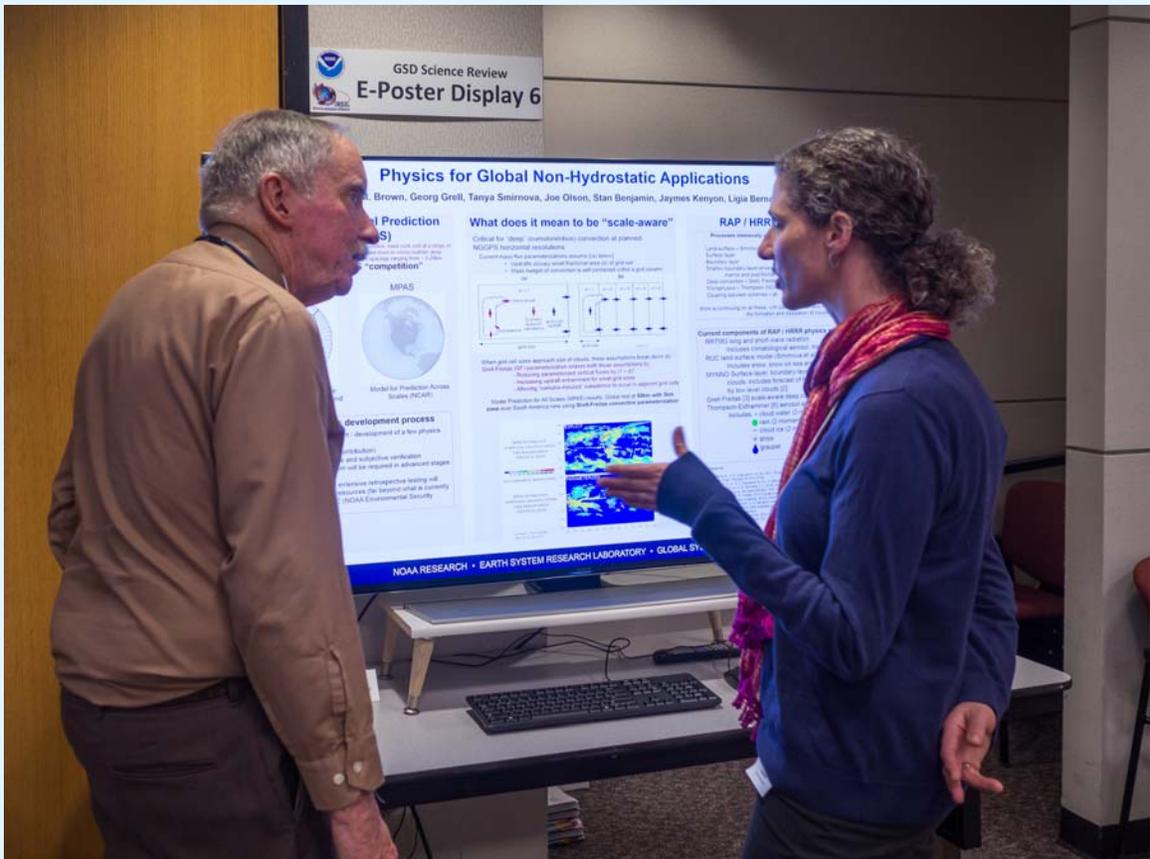
Much More from Joe



Curtis Displaying the Zoomed Area Feature of His E-Poster



Tom and Panel Member Oliver Fuhrer in Intense Discussion



John and Panel Member Rebecca Morss Discuss His E-Poster



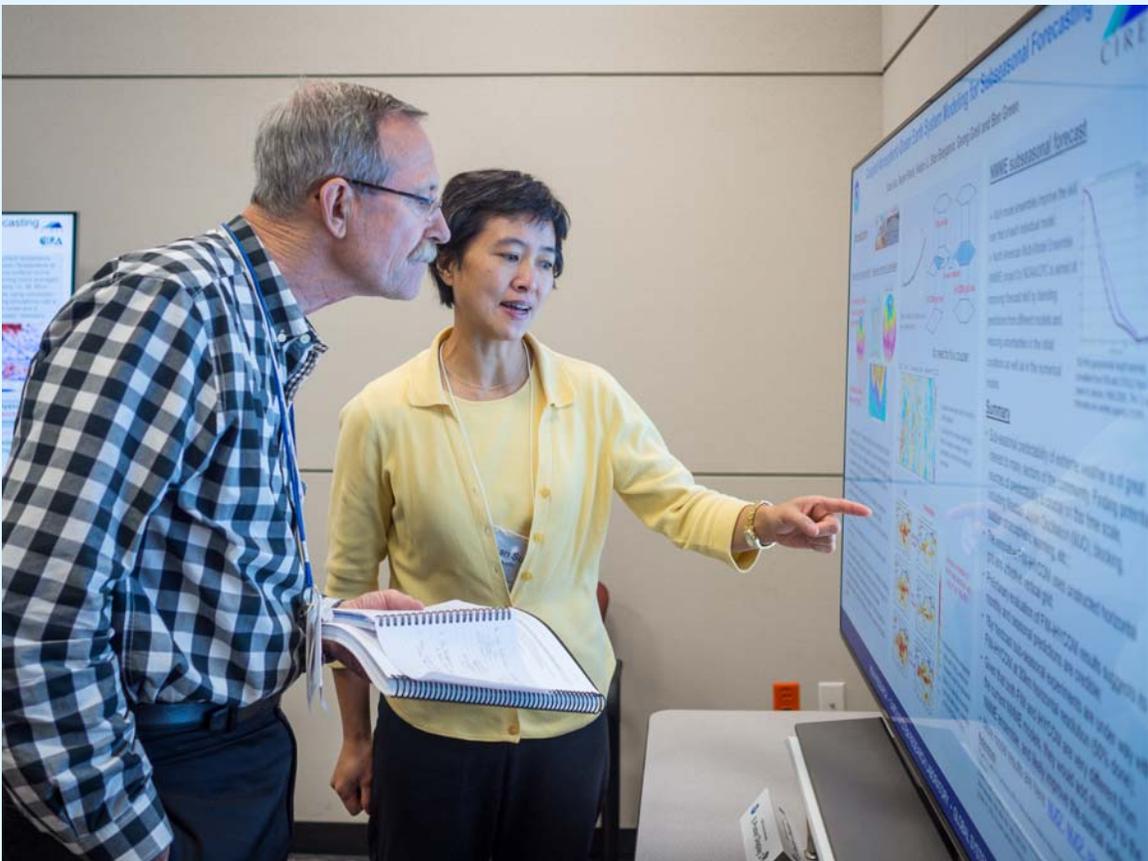
Jin and Sandy “Double Team” Panel Member Peter Neilley



Jin and Sandy Continue The “Double Team”



Georg Explains to Panel Chair Christa Peters-Lidard Via His E-Poster



Shan Explains to Panel Member Tom Fahey Via Her E-Poster



On a Break with Mark, John, and the NWS's Dave Michaud



Facing the Panel's Inquiries – Tom, Jin, Shan, John, Georg, and Stan



Steve and the Panel Discuss His LAPS/All-Sky Camera Research



Scott Gives the Panel the Lowdown on GSD's Information Technology



More From Scott to the Panel on GSD's Information Technology



Still More From Scott to the Panel on GSD's Information Technology



Scott's Great GSD Information Technology Show Goes On



And Still More From Scott's GSD Information Technology Show



The Panel With Steve and Kevin Discuss GSD's Information Technology



Into the Depths of GSD's Information Technology Show – GA405



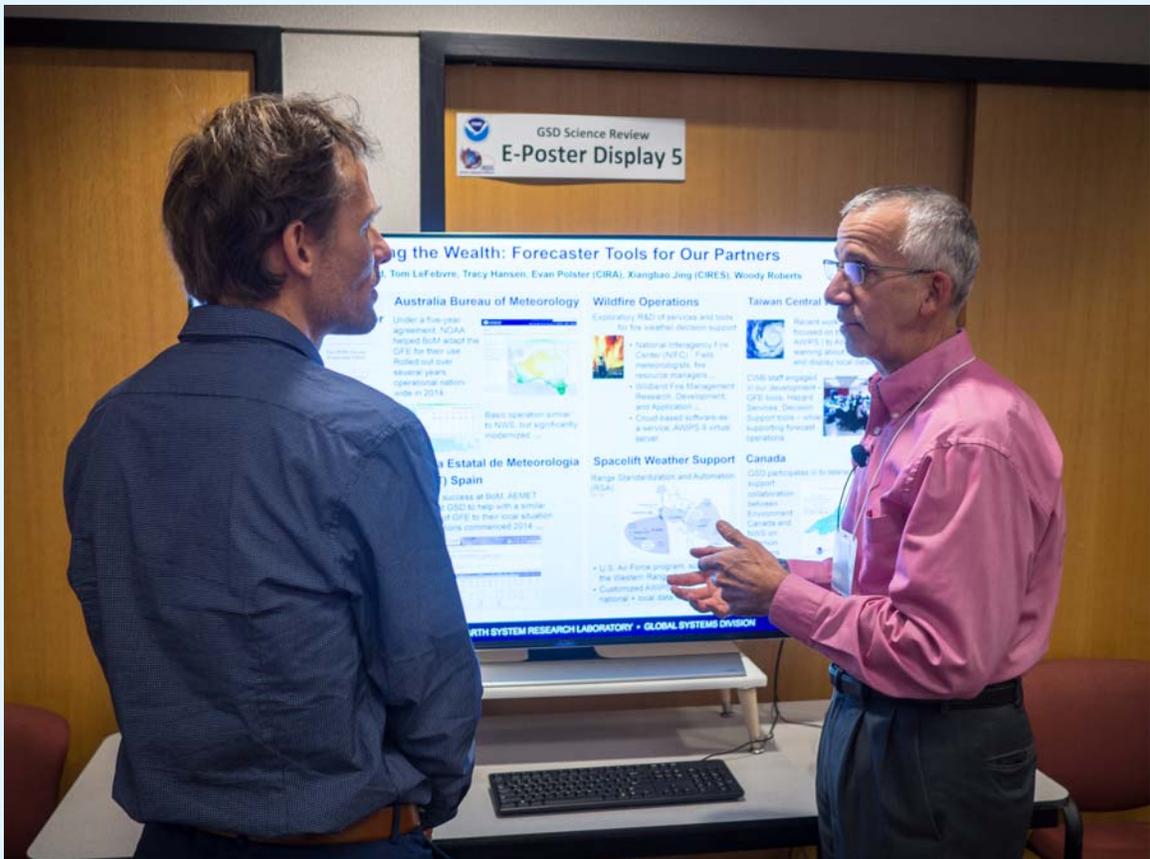
Panel Member Tom Fahey in Discussions With Tracy



Panel Member Peter Neilley and Another Great GSD E-Poster



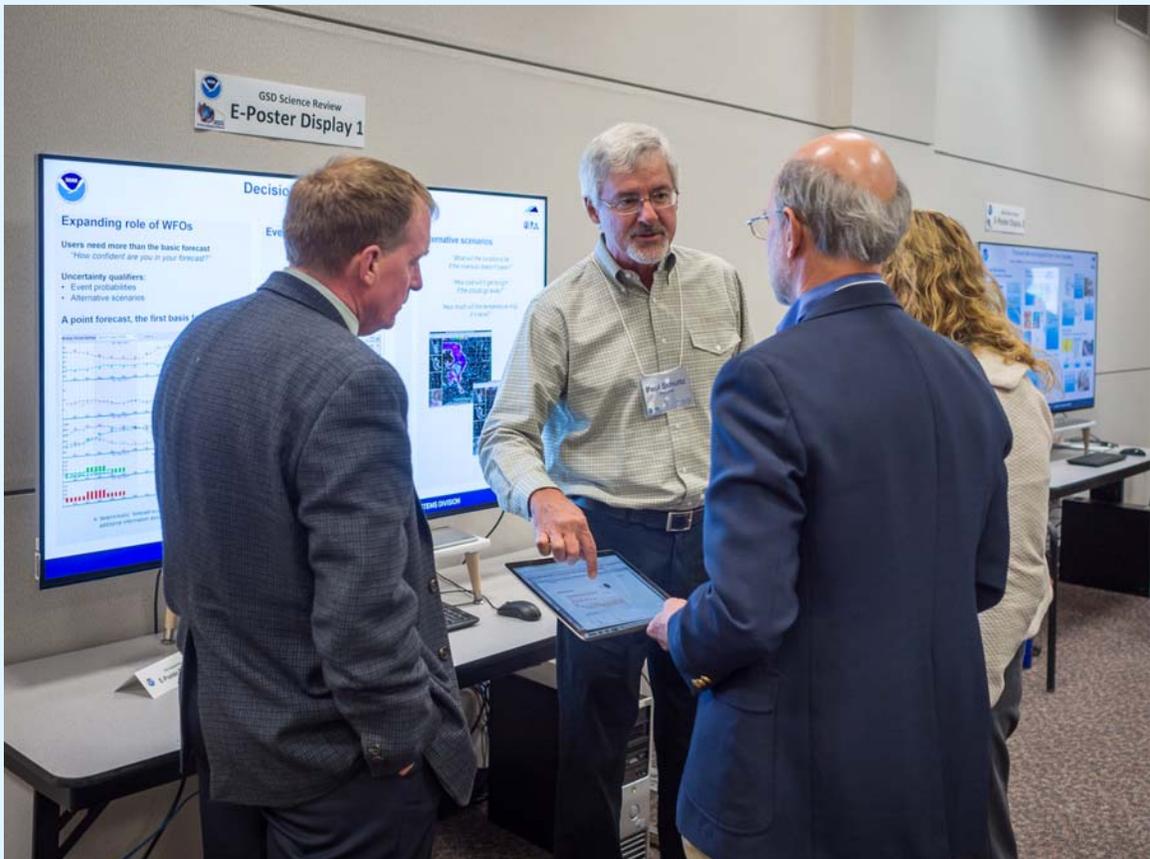
A Very Animated Kevin With Panel Member Brad Colman



A Very Emphatic Joe With Panel Member Oliver Fuhrer



Review Anchor Jenn Deep in Concentration



Paul and Stan With Panel Members Peter Neilley and Christa Peters-Lidard



Review Break Featuring Sher



CIRES' Waleed Abdalati Deep In Thought



Eric, Panel Chair Christa Peters-Lidard, and the Oculus Rift



More With Eric, Panel Chair Christa, and the Oculus Rift



Mark's Intensity Captured By the Lens



Greg's Intensity Captured With Panel Member Tom Fahey



Science On a Sphere® Informs, Educates, and Captivates All



We Said...Science On a Sphere® Informs, Educates, and Captivates All



Again - Science On a Sphere® Informs, Educates, and Captivates All



You Know The Story



Science On a Sphere's® Information, Education, and Captivation Never Ends!



Beth's Expert Driving, Navigation, and Presentation is a Great Addition



Beth's Attentive Audience is in the Palm of her Hands



Curious Panel Member Tom Fahey Comes In For a Closer Look



Something Displayed On The Sphere Has Ed's Full Attention



Shilpi Takes Over The Presentation Duties

