Day 1

Time (MDT)	Instructor	Topic
8:15	-	registration
8:45	Xuguang Wang and Jan Ising	Introduction to the workshop (+ housekeeping/RoB)
9:00	Steve Greybush	Basic Concepts of DA
9:30	Jon Poterjoy	Introduction to Bayes' theorem and connections to modern data assimilation
10:30	-	break
11:00	Steve Greybush	Kalman and Ensemble Kalman Filter (EnKF) theory and applications, including localization and inflation
12:00	Steve Greybush	Q&A on EnKF
12:15	-	lunch
13:30	Peter Jan van Leeuwen and Steve Greybush	Computer exercise on EnKF
14:30	Jong Kim, Kris Booker, and Edward Snyder	Start JEDI Land DA application: overall session intro, system setup, and prerequisite library installation
15:30	-	break
16:00	Kris Booker and Edward Snyder	Setting up the JEDI environment: Spack Stack, JEDI Bundle, Containerization
17:00	-	Close, with reminder on knowledge check

Day 2

Time (MDT)	Instructor	Topic
9:00	Kayo Ide	Variational methods (3- and 4DVar) theory and applications, including adjoints
10:00	Kayo Ide	Q&A on variational methods and knowledge check
10:15	-	break
10:45	Peter Jan van Leeuwen and Kayo Ide	Computer exercise on variational methods
12:00	-	lunch
13:00	Xuguang Wang	Hybrid DA methods
13:45	Xuguang Wang	Q&A on hybrid DA methods
14:00	Peter Jan van Leeuwen and Aaron Johnson	Computer exercise on hybrid DA
14:45	-	break
15:15	Chan-Hoo Jeon and Gillian Petro	Continue JEDI Land DA application: workflows structure review and configuration management tools
16:15	Chan-Hoo Jeon and Gillian Petro	Interactive session to run JEDI Land DA workflow system
17:15	-	Close, with reminder on knowledge check

Day 3

Time (MDT)	Instructor	Topic
9:00	Jon Poterjoy	Nonlinear DA methods (Particle Filters, Particle Flow filters)
10:00	Jon Poterjoy	Q&A on nonlinear DA and knowledge checks
10:15	-	break
10:45	Peter Jan van Leeuwen and Jon Poterjoy	Computer exercise on nonlinear DA
11:45	-	lunch
12:45	Peter Jan van Leeuwen	Data assimilation and machine learning
13:45	Ming Hu	The UFS-JEDI system science and status: Regional Modeling
14:30	Cory Martin	The UFS-JEDI system science and status: Global Modeling
15:15	-	break
15:45	Clara Draper	The UFS-JEDI operational system and science status: Land Surface
16:30	Chan-Hoo Jeon and Jong Kim	Summary of JEDI Land DA application: post-processing analysis experiment outputs
17:30	Xuguang Wang	closing and adjourn

Instructors and support team

Xuguang Wang

Lead Principal Investigator and Director of CADRE

Professor, Robert Lowry Chair Professor and Presidential Research Professor, School of Meteorology, University of Oklahoma

Dr. Xuguang Wang obtained her B.S. in Atmospheric Science from Beijing (Peking) University, China, and her Ph.D. in Meteorology from the Pennsylvania State University. Dr. Wang is currently a Robert Lowry Chair Professor and Presidential Research Professor of the School of Meteorology at the University of Oklahoma (OU). She leads the Multiscale Data Assimilation and Predictability (MAP) lab at OU. Her research ranges from developing novel methodologies and theories for data assimilation and ensemble prediction to applying these methods for global, hurricane, and convective-scale numerical weather prediction systems that assimilate a variety of in-situ and remote-sensing observations. The data assimilation research and development by the OU MAP team have been adopted by multiple US NOAA NWS operational modeling systems, including GFS, HRRR, HWRF, RRFS, and HAFS. Dr. Wang is also excited about cultivating the next-generation workforce in data assimilation. So far, she has directly advised numerous graduate students and postdocs during her tenure at OU. Dr. Wang also takes community scientific leadership roles such as serving as a co-lead of the observation and data

assimilation task team to perform US Congress-mandated Priorities for Weather Research (PWR) study, a member of the NOAA Science Advisory Board (SAB) Environmental Information Services Working Group (EISWG), a member of the WMO WWRP Predictability, Dynamics and Ensemble Forecasting working group, and Co-lead of the data assimilation team of the NOAA Hurricane Forecast Improvement Program (HFIP).

Jan Ising

Jan Ising is the Data Assimilation Consortium Manager supporting the Data Assimilation Consortium project in WPO's Earth System Research and Modeling division. Prior to joining the WPO, Jan worked in the private sector as a Lead Numerical Modeling Scientist. His expertise lies in numerical weather prediction, data assimilation, model verification, fire weather, and GIS. Jan holds a B.S in Meteorology and a minor in Mathematics from the University of North Carolina at Charlotte, a M.S in Physics with a focus on Atmospheric Science from North Carolina Agricultural and Technical State University, and a graduate certificate in Geographic Information Systems from North Carolina State University. For his Masters thesis, Jan investigated the Effects of Density Current, Diurnal Heating, and Local Terrain on the Mesoscale Environment Conducive to the Yarnell Hill Fire out of which came 2 publications in peer reviewed journals. In his previous role, Jan worked with a GPU-accelerated numerical weather prediction model. Jan led, developed and investigated workflows and customer projects for fire weather, data assimilation, and model verification. In his free time, Jan enjoys snowboarding, amateur weather photography, and spending time with family.

Steve Greybush

Associate Professor of Meteorology, The Pennsylvania State University

Dr. Steven J. Greybush is an Associate Professor in the Department of Meteorology and Atmospheric Science and a Co-Hire of the Institute of Computational and Data Sciences (ICDS) at the Pennsylvania State University. His research applies computational techniques such as computer simulations, data assimilation, ensembles, and machine learning to studying the weather of the earth and Mars, from snowstorms and other extreme weather to dust storms. He obtained his undergraduate degrees in meteorology and computer science from Penn State, and an M.S. and Ph.D. in Atmospheric and Oceanic Science from the University of Maryland. His team produced the first ensemble reanalysis of the Martian atmosphere, which provides hourly maps of temperatures, wind, surface pressure, and dust across Mars for a period of over a decade. He leads the executive team for the Penn State Center for Advanced Data Assimilation and Predictability Techniques (ADAPT), and is a member of the multi-university Consortium for Advanced Data Assimilation Research and Education (CADRE).

Kayo Ide

Associate Professor, University of Maryland

Prof. Ide's research interests concern dynamics of atmosphere and oceans, including data assimilation and scientific prediction, transport and mixing, and the variability of the atmosphere and oceans.

Peter Jan van Leeuwen

Professor in Data Assimilation and Nonlinear Dynamics, Colorado State University.

Dr Van Leeuwen obtained three BSc's in Physics, Astrophysics, and Physical Chemistry from the University of Leiden, Netherlands, an MSc in the physics of the Early Universe at the University of Amsterdam, Netherlands, and his PhD in Coastal Fluid Dynamics from the Technical University Delft, Netherlands. He was Professor in Data Assimilation at the University of Reading, United Kingdom, leading the 35-scientists strong Data Assimilation Research Centre (DARC). During this time he was head of the Data Assimilation Theme in the National Centre for Earth Observation (NCEO), and later Interim Director of NCEO. He currently leads a group of 6 PhD students and two postdocs. His research ranges from the physics of the Early Universe via coastal ocean waves, the global ocean circulation, geophysical fluid dynamics and data assimilation, to cloud physics. Specifically, he co-developed the Ensemble Kalman Filter and Smoother, and developed (local) efficient Particle Filters and Particle Flow Filters, and he worked on all aspects of data assimilation, including representation errors and how to estimate and use them in the ECMWF system, model error estimation, synchronization, randomized preconditioners for variational methods, machine learning in nonlinear data assimilation and more, and is co-author on two data-assimilation books. He also derived an analytical expression for cloud-droplet autoconversion to rain droplets and confirmed this expression using parameter estimation and machine learning, and derived a first complete uncertainty quantification for deep learning. His research group works on new data-assimilation methods for highly nonlinear systems, and uses these to understand the ocean circulation, Hurricane rapid intensification, and to estimate new parameterizations in coupled ocean-atmosphere models. The group also works on high-resolution air-sea interactions in the tropics, understanding the nonlinear causal connections in stratocumulus clouds, and identifying the basic physics of cloud organization into sugar, flower, and gravel clouds structures.

Jon Poterjoy

Associate Professor, University of Maryland.

Dr. Jonathan Poterjoy is an Associate Professor at the University of Maryland, where he serves as the Graduate Program Director for the Department of Atmospheric and Oceanic Science. His research focuses on improving numerical modeling and data assimilation for Earth system prediction. He obtained his academic training in meteorology and atmospheric science, earning a Ph.D. in Meteorology from Pennsylvania State University, where he specialized in ensemble-based data assimilation techniques to enhance forecast accuracy.

Dr. Poterjoy has contributed to advancing ensemble Kalman filter (EnKF) approaches, four-dimensional variational (4DVar) methods, localized particle filters (PFs), and hybrid data assimilation frameworks. His research has emphasized applications in high-impact weather events—such as hurricanes and mid-latitude cyclones—and has explored ways to optimize predictive skill within operational forecasting systems. His present research focuses on bridging new data assimilation theory to large applications, using mathematical developments in state and parameter estimation and machine learning.

In addition to his technical contributions, Dr. Poterjoy has mentored numerous graduate students and early career scientists. He regularly serves on committees and panels aimed at bridging gaps between meteorological research and operational forecasting and currently serves as an associate editor for the American Meteorological Society, American Geophysical Union, and Royal Meteorological Society.

Zhaoxia Pu

Professor of Atmospheric Sciences, University of Utah

Dr. Zhaoxia Pu is a professor of atmospheric sciences, a fellow of the American Meteorological Society and the Royal Meteorological Society, and a member of the NOAA Science Advisory Board. Her research focuses on improving the prediction of high-impact weather and extreme events. Her areas of interest include numerical weather prediction, data assimilation, numerical modeling, and predictability, with specific expertise in satellite and radar data assimilation, mesoscale severe weather systems, Earth system modeling, coupled land-atmosphere data assimilation, observing system simulation experiments, targeted weather observations, atmospheric boundary layers over complex terrain, and the application of artificial intelligence and machine learning in numerical weather prediction (NWP) and climate forecasting.

Dr. Pu has extensive experience collaborating with NOAA, NASA, DOE, ONR, and NSF. She has authored over 130 peer-reviewed journal articles and participated in more than ten major field programs. Dr. Pu has also served on numerous national and international science teams, advisory boards, review panels, and editorial boards.

Kris Booker

Kris leads the NOAA EPIC Platform Team. He worked for NOAA previously as an undergraduate student. He holds a Bachelor of Science in Meteorology from the University of Oklahoma with a minor in Management of Information Systems. Prior to joining Tomorrow.io as a DevOps Engineer, he was a Senior Systems Engineer at Perforce Software and has worked for various private weather companies (Vaisala, Universal Weather & Aviation) during his 20-year career. Kris is an avid aviation enthusiast and aspiring private pilot.

Clara Draper

Physical Scientist, NOAA PSL, Modeling and Data Assimilation Division

Dr. Draper's research is focused on coupled land/atmosphere data assimilation. Her current work is focussed on upgrading the land data assimilation used in NOAA's operational global weather forecasting systems. This includes upgrading the snow data assimilation scheme, introducing NOAA's first global soil moisture and soil temperature analysis, improving the assimilation of conventional temperature and humidity observations, initialization of land states for seasonal forecasting, and improving the representation of land model uncertainty in ensemble forecasts.

Chan-Hoo Jeon

Dr. Chan-Hoo Jeon is a code manager at the NOAA Earth Prediction Innovation Center (EPIC). He is the main developer of the UFS land-DA workflow. He also incorporated the smoke and dust capability of the Rapid Refresh Forecast System (RRFS) into the UFS Short-Range Weather (SRW) App. Before joining the EPIC team, he worked for the NOAA Environment Modeling Center (EMC). He developed the Online-CMAQ workflow which was transferred to the NOAA operational model for air quality modeling (AQM) at EMC. He started his professional career in the U.S. Naval Research Laboratory at Stennis Space Center (NRL-SSC). He worked on improving the accuracy of the U.S. Navy's global ocean forecast model (HYCOM) at NRL-SSC. He received a Ph.D. in Civil Engineering from the University of Texas at Austin. He developed a multiphase flow solver to simulate debris flows for his Ph.D. degree.

Ming Hu

Physical Research Scientist, NOAA/OAR/GSL

Dr. Ming Hu received his PhD in Meteorology from the University of Oklahoma in 2005. Dr. Hu joined NOAA/GSL in 2007 and has been working on developing the regional convective allowance high frequency cycling data assimilation system for operational applications since then. He is a major contributor to the NOAA operational Rapid Refresh (RAP) and High Resolution Rapid Refresh (HRRR) prediction systems. Currently, Dr Hu leads the development of the Rapid Refresh Forecast System (RRFS) and the development of applying JEDI to the RRFS application.

Aaron Johnson

Research Scientist and Adjunct Assistant Professor, University of Oklahoma

Dr. Aaron Johnson received his B.S in Meteorology from Valparaiso University in 2009 and received his M.S. and PhD in Meteorology from the University of Oklahoma in 2011 and 2014, respectively. His research interests include predictability and perturbation growth in convection-allowing ensemble forecasts, assimilation of all-sky infrared radiance observations, land-atmosphere coupled data assimilation, and leveraging machine learning tools to improve both data assimilation and numerical weather prediction.

Jong Kim

Dr. Jong Kim works as a lead code manager and product owner for the NOAA EPIC program to support the UFS Weather Model and application releases. Over more than the past two decades, Jong has served at NOAA, NASA, and DOE lab in multiple roles, leading the projects for the development of the Coupled Earth System Modeling and Data Assimilation, and High-Performance Computing Applications. He has led various NOAA Unified Forecast System (UFS) projects including UFS Weather Model Development, Marine Reanalysis Project, Short-Range Weather Forecast Applications, and Noah-MP Land Data Assimilation System Development. Jong spent about 12 years as a lead software engineer for the Global Modeling and Assimilation Office (GMAO) at NASA. His early career includes a computational scientist position at the Mathematics and Computer Science Division of the DOE Argonne National Lab. He has a Ph.D. in Chemical Engineering from the University of Utah.

Cory Martin

Dr. Cory Martin is a Physical Scientist in the Data Assimilation and Quality Control Group at the NOAA NWS National Centers for Environmental Prediction (NCEP) Environmental Modeling Center (EMC). His primary responsibilities are to aid in the transition of operational data assimilation systems to the Joint Effort for Data assimilation Integration (JEDI) framework and to help coordinate land surface and atmospheric composition data assimilation, primarily for global forecasting applications. He has a BS in atmospheric sciences from The Ohio State University and a MS and PhD in atmospheric and oceanic science from the University of Maryland, College Park.

Gillian Petro

Gillian Petro is a code manager at the Earth Prediction Innovation Center (EPIC). She has a background in technical writing and user support and has worked with several Unified Forecast System codebases, including the Land Data Assimilation System and the Short-Range Weather Application. Gillian brings a diverse range of experience to the EPIC Program thanks to her

previous work for the National Institute of Standards and Technology (NIST), Baltimore City Public Schools, and the American University Law Review. Gillian received an M.S. in Data Analytics from University of Maryland Global Campus and a J.D. from American University Washington College of Law. Outside of work, she enjoys running (roads and trails!) and directs a choir.

Edward Snyder

Senior Software Engineer - NOAA EPIC, Raytheon

Eddie graduated from the University of Oklahoma in 2015 with a bachelor's degree in meteorology. He has spent nearly a decade in the private meteorology sector employed in various roles. Throughout this time, he was a business-to-business and business-to-customer support specialist, a forensic meteorologist team lead, and a meteorological developer. He helped migrate on-premises workflows to AWS and automated manually intensive jobs using Python and AWS services. Currently, he is a member of the EPIC Software Integration Team where he helps develop, support, and test the UFS Weather Model and its applications.

Yongming Wang

Research Scientist, University of Oklahoma

Dr. Yongming Wang is a Research Scientist at the MAP lab of the School of Meteorology, University of Oklahoma. He holds a Ph.D. in Meteorology from Ocean University of China and specializes in data assimilation and atmospheric modeling. His research encompasses developing novel data assimilation methods, advancing our understanding of convective storm processes, and improving operational forecast accuracy. His current foci include advancing/developing data assimilation methods within the U.S. next-generation operational data assimilation system, JEDI, and developing artificial intelligence (AI)-based cost-effective ensemble-based data assimilation. With extensive experience in interdisciplinary research, Dr. Wang is dedicated to bridging theoretical advancements and practical applications in meteorology.