CADRE-EPIC data assimilation training workshop

CADRE (Consortium for Advanced Data assimilation Research and Education; ucadre.org) is a multi-university consortium which aims to advance a broad range of data assimilation (DA) related research thrusts while also serving as a source of DA education and training in the broader geoscience community.

CADRE is partnering with NOAA's EPIC (Earth Prediction Innovation Center) to host an annual in-person 3-day training event. Details of the year-1 CADRE-EPIC DA training event can be found below.

If you are interested we invite you to fill out the declaration-of-interest form that can be found at the QR Code to the right.

We will provide more information to those that expressed interest and ask you to fill out a more detailed application form later.

Location: CIRA commons building, Foothill campus, Colorado State University, Fort Collins
Dates: June 4-6 2025 (for year 1 training)
Content: Basic DA methods theory lectures provided by DA experts, and hands-on exercises with toy models culminating in a larger exercise with the UFS-JEDI (Unified Forecast System-Joint Effort for Data assimilation Integration; https://www.jcsda.org/jcsda-project-jedi).
Who should consider applying: Students or professionals with an interest in learning the basic concepts and mathematics associated with DA, and who are interested in applying it to prediction problems in atmospheric and earth system science. Audience members may include undergraduates or grad students completely new to DA; grad students who plan to work in DA, but are just getting started; grad students with experience in DA, but who want to learn JEDI; and NOAA employees and other professionals who want to learn DA and JEDI.
What is unique about this training: What is unique about this training compared to other DA workshops is the culminating experience focused on UFS-JEDI, the DA framework to be used at NOAA and other operational centers. In addition, the instructors are leaders in both DA research and education. Speakers will also include guest lecturers, including DA practitioners from government agencies.

Prerequisite knowledge: No prior experience in DA is needed. Knowledge of computer programming, basic statistics and some linear algebra are recommended. A brief review of the underlying mathematics and statistics can be provided as a pre-read. The workshop is targeted toward graduate students or advanced undergraduates, as well as professionals who seek to expand their knowledge of these topics. Some experience with atmospheric or earth system phenomena and predictability is helpful, but not required.

Format: In order to facilitate a hands-on experience both through presentations and running code, the workshop will be offered in person only.

Number of Participants: The number of participants for Summer 2025 is limited due to space limitations at the venue. Participants will be from the CADRE consortium, from NOAA, and about 35 will be external participants. Note that CADRE plans to offer DA training in 2026 and 2027 as well, so there will be additional options to participate for those unable to attend the first event.

Travel Support: CADRE can provide travel support for up to 30 grad student participants; details to follow.

Draft program:

Day 1:
● Basic Concept of DA
● Introduction to Bayes Theorem and how the different DA methods can be derived
● Kalman and Ensemble Kalman Filter (EnKF) theory and applications, including localization and inflation
● Computer exercise on EnKF
● Variational methods (3- and 4DVar) theory and applications, including adjoints
● Computer exercise on variational methods
● Start large JEDI application
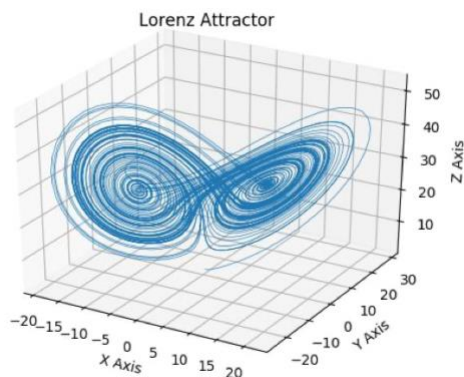
Day 2:
● Hybrid methods (EnKF and Var) theory
● Computer exercise on hybrid methods
● Nonlinear DA methods (Particle Filters, Particle Flow filters)
● Computer exercise on nonlinear DA
● Continue large JEDI application
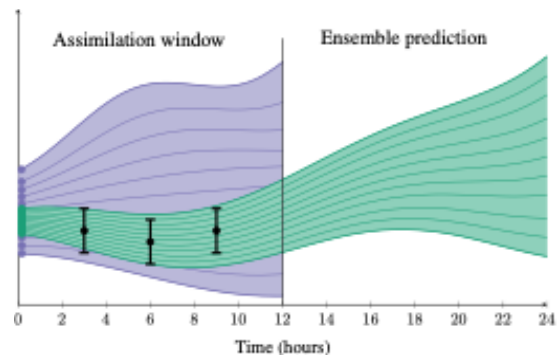
Day 3:
● DA and machine learning theory
● Which method to use when, and which verification metrics to use
● The UFS-JEDI system
● Finish JEDI application

Lorenz Attractor