

E3SM Energy Exascale Earth System Model

U.S. DEPARTMENT OF ENERGY · OFFICE OF SCIENCE

Postdoctoral Opportunities in E3SM

JOIN OUR TEAM

Four new positions at Los Alamos, Sandia, Oak Ridge, and Brookhaven

The Energy Exascale Earth System Model (E3SM) project is excited to announce four upcoming postdoctoral positions. They offer a unique opportunity to conduct cutting-edge research at the intersection of Earth system modeling, exascale high-performance computing, machine learning (ML), and super intelligence (SI, previously referred to as artificial intelligence, AI).

ABOUT E3SM

E3SM is the U.S. Department of Energy's flagship Earth system model, built to run efficiently on DOE's leadership supercomputers.

It is a fully coupled model of the atmosphere, ocean, sea ice, land, rivers, land ice, and human systems, built by about 100 scientists and engineers at DOE national laboratories and universities. E3SM is known for technological innovation: it won a 2023 Gordon Bell Prize and has practiced open development since 2018.

Current focus

- Seasonal-to-decadal (S2D) prediction, 3 months to 10 years ahead, for energy and water security.
- High-resolution global simulations of the extreme events that disrupt energy supply, demand, and infrastructure.
- Transformative technology (exascale, SI, and quantum), including SI emulators for ensembles of fine-scale simulations.

OPEN POSITIONS

Los Alamos NATIONAL LABORATORY

1

OCEAN · POLAR · ML · S2D

Neural Ocean Mixing for Earth System Predictability

Host: LANL · **Partners:** ANL and PNNL

Research objectives: Develop a hybrid physics–ML ocean turbulence closure for E3SMv5's OMEGA-SWIFT marine model. The postdoc will build multi-agent workflows to design and run ocean Large Eddy Simulations (LES), used to train a data-driven vertical-mixing closure that improves simulated marine memory and seasonal-to-decadal (S2D) predictability.

Mentors: Kat Smith (primary mentor, kmsmith@lanl.gov), Olawale Ikuyajolu, and Luke Van Roekel (LANL)

Sandia National Laboratories

2

ATMOSPHERE

Atmospheric Physics Emulator Architecture for Hybrid-Embedded Training

Host: SNL

Research objectives: Develop novel data-driven atmosphere process models in E3SM for high-resolution, multi-year simulations. The postdoc will use a new differentiable, exascale E3SM atmosphere model to train neural parameterizations "in the loop" with the dynamical core, advancing mass and energy budget conservation, interpretability, and stability over long integrations.

Mentors: Peter Bosler (primary mentor, pabosle@sandia.gov) and Andy Salinger (SNL)

OPEN POSITIONS (CONTINUED)

OAK RIDGE National Laboratory

3

LAND

Land–Atmosphere Interactions and Terrestrial Predictability

Host: ORNL · **Partners:** LBNL

Research objectives: Investigate the relative contributions of local land–atmosphere interactions and remote teleconnections to S2D predictive skill. The work will diagnose terrestrial predictability signals (soil temperature, snowpack, water storage, vegetation dynamics) in coupled simulations, benchmark them against observational metrics, and test them with ELM-FATES.

Mentors: Dan Ricciuto (primary mentor, ORNL, ricciuto@ornl.gov) and Ryan Knox (co-mentor, LBNL)

Brookhaven National Laboratory

4

S2D PREDICTION

ML-Based Bias Correction and S2D Ensemble Calibration

Host: BNL · **Partners:** LLNL and PNNL

Research objectives: Diagnose lead-time- and state-dependent S2D prediction errors and create data-efficient, adaptive spatiotemporal ML-based postprocessing and bias-correction workflows. The work will improve probabilistic S2D ensemble calibration, correct systematic and learnable prediction biases, and preserve multivariate consistency in initialized seasonal-to-multiyear E3SM predictions.

Mentors: Wuyin Lin (primary mentor, BNL, wlin@bnl.gov), Shaocheng Xie (LLNL), and Shixuan Zhang (PNNL)

WHO SHOULD APPLY

We are looking for candidates with the following qualifications:

- A recent or upcoming Ph.D. in Earth system science, applied mathematics, computer science, or a related field.
- Experience with numerical modeling, scientific computing, or machine learning.
- Programming skills (for example Python, Fortran, C++, or Julia) and an interest in high-performance computing.
- Enthusiasm for working in a collaborative, multi-laboratory team.

WHY JOIN E3SM?

As an E3SM postdoc, you will have the opportunity to:

- Work alongside about 100 scientists and engineers across DOE national laboratories and universities.
- Run simulations on DOE's leadership-class exascale supercomputers.
- Contribute to an openly developed model used by a broad research community.
- Help build the next generation of hybrid physics–SI Earth system models (v4 in 2028, v5 in 2031).

HOW TO APPLY OR INQUIRE

Official job postings will appear soon on each laboratory's careers portal. In the meantime, prospective candidates and collaborators are encouraged to contact the mentors listed with each position for more information.

Scan to explore E3SM:

e3sm.org **GitHub** **Docs** **Data**

e3sm.org
github.com/E3SM-Project
docs.e3sm.org
docs.e3sm.org/e3sm_data_docs
e3sm.org/news/newsletter-archive

Sponsored by DOE Office of Science, Biological and Environmental Research (BER) program.