Welcome!

Welcome to the AIMES Land DA Working Group's 5th Annual Land DA Community virtual workshop! The key goals of this workshop are to continue building a global land DA community and to share knowledge on the technical challenges that we're all facing.

We look forward to seeing you on Monday, October 27th!

-- The AIMES Working Group on Land Data Assimilation

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Updated September 25, 2025

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10:30 am	Implementing Snow Temperature Analysis in the Global Forecast System (GFS)	*Yanjun Gan* CIRES, CU Boulder & NOAA PSL
10:40 am	Advanced Arctic Terrestrial Data Assimilation: Integrating DVM-DOS-TEM with NCAR DART for Enhanced Ecological Modeling	*Chu-Chun Chang* Woodwell Climate Research Center
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This session takes place from 10:00 – 12:00 EDT on Tuesday, October 28, 2025.

TUESDAY, October 28, 2025		
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11:05 am	**KEYNOTE** Towards the Assimilation of Atmospheric CO_2 Concentration Data in a Land Surface Model using EnVar	*Simon Beylat* LSCE/CNRS
11:20 am	Constraining turnover processes in Terrestrial Biosphere Model by using L-/P-band backscatter – Xu Shan, Max Planck Institute for Biogeochemistry	*Xu Shan* Max Planck Institute for Biogeochemistry
11:30 am	**KEYNOTE** Parameter Perturbation Experiments with the Community Land Model	*Daniel Kennedy* NSF NCAR
11:45 am	Celebrating 5 Years of the Land DA Community ● Common bottlenecks in DA frameworks ● Priorities for community collaboration	
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5th Annual Land DA Workshop

Virtual Workshop: Abstract Booklet

Towards the Assimilation of Atmospheric CO_2 Concentration Data in a Land Surface Model using Ensemble Variational Methods

Simon Beylat[1], Nina Raoult[2], Cédric Bacour[3], Natalie Douglas[4], Tristan Quaife[4], Vladislav Bastrikov[5], Peter J. Rayner[6], and Philippe Peylin[7]

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A comprehensive understanding and an accurate modelling of the terrestrial carbon cycle, are of paramount importance to improve projections of the global carbon cycle and more accurately gauge its impact on global climate systems. Land Surface Models, which have become an important component of weather and climate applications, simulate key aspects of the terrestrial carbon cycle such as photosynthesis and respiration. These models rely on parametrisations that require careful calibration. In this study we explore the assimilation of atmospheric CO_2 concentration data for parameter calibration of the ORCHIDEE Land Surface Model using an EnVarDA (also referred to as 4DEnVar), an adjoint-free ensemble-variational data assimilation method. By circumventing the challenges associated with developing and maintaining tangent linear and adjoint models, the EnVarDA method offers a very promising alternative. Using synthetic observations generated through a twin experiment, we demonstrate the ability of the EnVarDA to assimilate atmospheric CO_2 concentrations for model parameter calibration. We then compare the results to a VarDA method that uses finite differences to estimate tangent linear and adjoint models, which reveal that the EnVarDA is superior in terms of computational efficiency and fit to the observations as well as parameter recovery. Finally, we present some results obtained using the EnVarDA method in assimilating real observations of in situ measurements of atmospheric CO_2 concentration.

10:00 AM to 12:00 PM Eastern Daylight Time (EDT)

Identifying Key Regions for Improving Carbon Flux Simulation by Assimilating SMAP Data: A Two-System Coupling Strength Approach

Yuhui Wu[1], Prof. Hui Lu[1]

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The coupling between soil moisture (SM) and Gross Primary Productivity (GPP) is a critical land-atmosphere interaction, yet its representation in Earth system models is a major source of uncertainty. While data assimilation of satellite SM can improve GPP simulations, its effectiveness varies greatly by region. A key challenge is the lack of a robust global map of SM-GPP coupling strength to guide these efforts, largely due to significant, often cross-correlated, errors in observational data.

This study addresses this gap by extending the novel Two-System Method—a framework proven effective at reducing error impacts in SM-Evapotranspiration coupling estimates—to diagnose the global SM-GPP coupling strength. By integrating multiple independent data pairs from remote sensing (including SMAP) and machine learning products, our approach produces a more reliable estimate of coupling strength than traditional methods. A Land Data Assimilation System (LDAS) is then used to independently validate our findings.

The resulting global map of SM-GPP coupling strength will identify hotspot regions where carbon uptake is most sensitive to soil moisture. We hypothesize these are the regions where assimilating SMAP SM will yield the most significant improvements in GPP simulations. This work provides a crucial diagnostic to guide more targeted and efficient data assimilation strategies, ultimately enhancing the carbon cycle fidelity in Earth system models.

10:00 AM to 12:00 PM China Standard Time (CST)

Towards Satellite-based Crop Data Assimilation Using AquaCrop in NASA's Land Information System Framework

Gabriëlle De Lannoy[1], Louise Busschaert[1], Michel Bechtold[1], Niccolò Lanfranco[1,2], Shannon de Roos[1,3], Zdenko Heyvaert[1,4], Jonas Mortelmans[1], Samuel A. Scherrer[1], Maxime Van den Bossche[1,5], Sujay Kumar[6], David M. Mocko[6,7], Eric Kemp[6], Margarita Garcia-Vila[8], Lee Heng[9], Pasquale Steduto[10], and Dirk Raes[1]

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This poster introduces the open-source AquaCrop v7.2 model as a new process-based crop model within NASA's Land Information System Framework (LISF) v7.5. Through three diverse showcases, we demonstrate the current capabilities of AquaCrop in the LISF, along with topics for future development. First, coarse-scale crop growth simulations with various crop parameterizations are performed over Europe. Second, ensembles of coarse-scale simulations over Europe are created by perturbing meteorological forcings and soil moisture. The third showcase aims at improving fine-scale agricultural simulations using an ensemble Kalman filter. Specifically, the crop state is updated, using fine-scale canopy cover satellite data, over winter wheat fields in the Piedmont region of Italy. The state updating is beneficial for the intermediary biomass estimates, but leads to only small improvements in yield estimates, due to the strong model (parameter) constraints, and limitations in the assimilated satellite observations and reference yield data. The showcases highlight pathways to improve the current constraints in the crop model and observations, and to advance future crop estimates, e.g. through crop parameter updating and multi-sensor and multi-variate data assimilation.

10:00 AM to 12:00 PM Eastern Daylight Time (EDT) - Virtual Poster

Advanced Arctic Terrestrial Data Assimilation: Integrating DVM-DOS-TEM with NCAR DART for Enhanced Ecological Modeling

Chu-Chun Chang[1], Elchin Jafarov[1], Helene Genet[2], Ruth Rutter[2], Dogukan Teber[1], Brendan Rogers[1], Valeria Briones[1], Tobey Carman[2], Trevor Smith[1], Joshua Rady[1], Benjamin Maglio[2], Sue Natali[1]

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Rapid environmental change in the Arctic, such as rising temperatures, permafrost thaw, and shifting vegetation, demands accurate ecological forecasting, yet substantial uncertainties in carbon projections persist. We present TEM-DART, the first terrestrial/ecological data assimilation (DA) system purpose-built for Arctic ecosystems, integrating field observations, remote sensing, and process-based modeling to reduce uncertainty in terrestrial carbon balance and improve predictability of permafrost dynamics and carbon cycling.

Our framework couples the Dynamic Vegetation Model–Dynamic Organic Soil Terrestrial Ecosystem Model (DVM-DOS-TEM) with the NCAR Data Assimilation Research Testbed (DART). Building on earlier single-site investigations, we implement multi-site experiments at the Bonanza Creek LTER (black spruce forest) and the Arctic LTER, located near Toolik Field Station (tundra), representing distinct high-latitude ecotypes. An improved workflow executes fully sequential assimilation cycles over 110 years, enabling continuous integration of observations and rigorous uncertainty propagation.

At Bonanza Creek, assimilating MODIS leaf area index (LAI) and above-ground biomass reduces errors in carbon pool simulations by up to 90%, with improvements cascading to unobserved components via model covariances. At Toolik, a posterior outlier identification scheme in DART used with adaptive inflation substantially enhances filter stability and performance in the tundra system.

Future work: We will expand testing with additional real-world observations, including MODIS LAI time series and independent measurements from LTER flux towers and field campaigns, and scale from point-based experiments to high-resolution, spatially explicit data assimilation to capture landscape heterogeneity and enable regional mapping of Arctic carbon dynamics.

10:00 AM to 12:00 PM Eastern Daylight Time (EDT)

SINDBAD model-data integration framework for terrestrial carbon-water processes

Sujan Koirala[1], Tina Trautmann; Hoontaek Lee; Lazaro Alonso; Fabian Gans; Felix Cremer; Bernhard Ahrens; Markus Reichstein; Martin Jung; Nuno Carvalhais

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Terrestrial ecosystem processes tightly link carbon, energy and water (C-H2O) cycles across different spatial and temporal scales. Yet, uncertainties in modeling these linkages and biosphere-climate feedbacks are large. In this study, we introduce SINDBAD model-data integration framework for terrestrial ecosystem C-H2O processes. We demonstrate the relevance of modularity to test hypotheses and parameterizations across scales. At the global scale, we find that using observation-based vegetation indexes in a simple hydrological model enhances simulations of monthly runoff and terrestrial water storage variations. At the regional scale, employing vegetation fraction data from geostationary satellites in photosynthetically-coupled water-carbon model significantly improves the simulation of gross primary productivity variability. At the ecosystem scale, a model linking C-H2O fluxes and states, by prognostically coupling primary productivity and tran- spiration alongside root allocation to soil water uptake, shows additional benefits from remote sensing observations of carbon states, even on top of eddy covariance measurements. With the examples, we demonstrate that with appropriate data and observational constraints, an across-scale approach underpins hypothesis testing on understanding of terrestrial C-H2O processes. However, a direct comparison across different scales reveal that model-observation discrepancies, at a given scale, are quantitatively comparable to differences among observations and observation-based products. To address this, we extend SINDBAD to simultaneously learn parameterizations at the local-scale while enabling the seamless application of the same model globally. To do so, we combine local-scale observations to machine learn the relationship of model parameters with ecosystem functional properties. We find that such hybrid framework perform comparably to in-situ parameter inversions, but their capability to generalize parameters are still limited especially of those ecosystem processes for which observations are limited.

10:00 AM to 12:00 PM Eastern Daylight Time (EDT)

Towards Understanding Inter-Annual Variation of Model Parameters Across Diverse Climate-Vegetation Sites

Ranit De[1,2], Nuno Carvalhais[1,3,4]

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A persistent challenge in models simulating carbon fluxes, such as gross primary productivity (GPP), is that inter-annual variability (IAV) is currently not well-represented, and models tend to underestimate peak GPP and misrepresent onset and offset of vegetation activity. This challenge can also be attributed to temporally fixed model parameters. We explore the strength of such assumptions with a simple light use efficiency (LUE) model, which includes environmental sensitivity functions for radiation, temperature, cloudiness, vapor pressure deficit, and soil water supply. Each of these functions includes several parameters needing calibration. The experiments focus on inverting parameters of each specific environmental sensitivity function varying per year at a time, while for parameters from all other functions, fixed optimum values were simultaneously inverted for all years. These exercises were conducted for a large set of eddy-covariance sites. For a site with 10 years of observations, such calibration translates into a total of 99 parameters, which includes a set of nine fixed plus nine varying parameters per site-year, the later related to soil water supply and drought stress. The same exercise was conducted for GPP's sensitivity to temperature, radiation, etc. These results challenge the existing perspective on temporally static parameterizations, reflecting the need to statistically learn them from observations. Notably, in this process, we missed a consensus or quantification on parameter uncertainty for temporally-varying parameters, where, under stringent constraints, equifinality is likely to occur. Moreover, we performed 50,000 sequential model evaluations (iterations) with our experimental setup, which is time- and computationally-intensive. These computational demands scale up with higher number of sites, site-years, and temporally-varying parameters. Developing optimizers with parallel function evaluation capabilities, and addressing parameter uncertainty can aid us testing further experimental setups to better link the temporal variability in model parameters with missing processes, and thus the representation of IAV of carbon fluxes.

10:00 AM to 12:00 PM Eastern Daylight Time (EDT)

Improved Forecasting of Land Processes using the Data Assimilation Research Testbed (DART)

<u>Brett Raczka</u>[1], Xueli Huo[2], John Lin[2], Jiameng Lai, Zhenqi Luo, Ying Sun, Jeff Anderson

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The land surface is a critical part of the earth system as processes related to carbon, water, energy and nitrogen cycling have important implications for climate, forest health, air quality, water availability and seasonal atmospheric forecasting. Despite advances in land surface modeling, performance skill is limited because of errors related to initial and boundary conditions, model structure, and parameters. Here we use ensemble data assimilation within the Data Assimilation Research Testbed to improve the representation of land surface processes. We employ a variety of novel land observations including leaf area, solar-induced fluorescence (SIF), soil moisture and snow to improve the representation of the land carbon sink across the Western US and sub-Saharan Africa. We discuss the methodological challenges of implementing the model updates when assimilating snow and SIF observations and discuss the added benefit of each for representing carbon processes.

10:00 AM to 12:00 PM Eastern Daylight Time (EDT)

Implementing Snow Temperature Analysis in the Global Forecast System (GFS)

Yanjun Gan[1,2], Clara Draper[2]

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Accurate numerical weather prediction (NWP) relies on reliable initialization of all Earth system components, particularly the land surface, which strongly influences atmospheric processes through energy and moisture exchanges. In previous work with NOAA's Global Forecast System (GFS), a coupled land–atmosphere Ensemble Kalman Filter (EnKF) was used to introduce soil moisture and soil temperature analyses by assimilating standard atmospheric observations along with screen-level temperature and humidity. However, because snow insulates the soil from the atmosphere, this approach did not update soil states beneath snow. The present study investigates whether the coupled land–atmosphere EnKF can be extended to include snow temperature analysis. In this approach, the EnKF assimilates standard atmospheric observations and screen-level variables, and updates the atmosphere, uppermost-layer snow temperature, soil temperature, and soil moisture, aiming to produce physically consistent land surface analyses. A set of experiments is conducted to evaluate the benefits of incorporating snow temperature analysis into the GFS framework.

10:00 AM to 12:00 PM Eastern Daylight Time (EDT)

What is the value of assimilating multiple data streams in improving water and carbon cycles in the Western US?

Xueli Huo xueli.huo@asu.edu, Brett M Raczka, Lewis Kunik, Jeffrey L Anderson and John C Lin
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Land surface models often show biases in simulating terrestrial carbon and water cycles, limiting their ability to diagnose and predict Earth system processes. Data assimilation (DA) can improve model performance, yet few land DA studies integrate multiple observations to jointly constrain both cycles. The value of assimilating novel satellite data, such as solar-induced fluorescence (SIF), also remains uncertain. These challenges are particularly pronounced in the Western U.S., where heterogeneous topography, vegetation, and intensified disturbances like wildfires complicate simulations.

To address this, we used the Data Assimilation Research Testbed (DART) with the Community Land Model (CLM) to assimilate satellite-derived leaf area index (LAI), SIF, and snow water equivalent (SWE). We conducted single- and multi-observation DA experiments to assess their effectiveness in improving CLM gross primary productivity (GPP) forecasts. Assimilation substantially reduced model–observation mismatches for LAI, SWE, and SIF. Among them, LAI proved most effective in aligning simulated GPP with an independent benchmark (Fluxcom-X). SWE assimilation corrected premature spring snowmelt and improved soil moisture, though its carbon impacts were limited to C3 arctic grasses and evergreen forests in the Rockies and Pacific Northwest. Incorporating SIF reduced leaf nitrogen in shrubs and grasses across the Southwest, improving LAI and GPP simulations.

Our findings suggest that combining DA with models incorporating explicit topography and soil constraints could further enhance carbon and water cycle representations. While SIF assimilation showed promise, careful treatment of leaf nitrogen adjustments is needed, potentially through direct nitrogen observations or ensemble smoothing techniques. The approaches demonstrated here, including snow repartitioning and SIF sub-models, are transferable to other mechanistic land surface models and have broader applications for drought monitoring and seasonal climate forecasting.

10:00 AM to 12:00 PM China Standard Time (CST)

Mapping the North American Terrestrial Carbon Cycle: A Process-based Reanalysis Using State Data Assimilation (SDA)

Dongchen Zhang zhangdc@bu.edu
Qianyu Li; Zhenpeng Zuo; Shashank Ramachandran; Shawn Serbin; Cameron Webb; Michael Dietze;

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North America is the second largest C source on the planet, therefore accurately assessing C sinks across the continent is essential for C accounting, management, and ultimately mitigating climate change. State data assimilation (SDA) offers a method for harmonizing observations with terrestrial biosphere modeling, resulting in both a robust accounting of multiple sources of uncertainty and their overall reduction. In this study, we employed the SDA framework to harmonize multiple field and remotely sensed data streams over pre-selected 8,000 locations, along with their associated spatiotemporal uncertainties, within a hybrid structure that combines process-based modeling, hierarchical Bayesian inference, and machine learning. While each observation only tells a partial story about the dynamics of the entire C cycle, the combination of global networks (SoilGrids), spectral (MODIS and Landsat), and Microwave (SMAP) helps constrain the analysis of major C and water stocks through space and time. Machine learning is used both to identify and correct systematic errors in the process model (SIPNET) and interpolate the pre-selected locations to the gridded North American scale, making it computationally feasible to generate continental ensemble maps of the major C and water budgets for each year. The results show that we accurately estimate the C and water pools, compared to the assimilated data streams and additional observations from GEDI, ICESat-2, FIA, and the ISCN network, and that the uncertainties for each variable were reduced compared to either observations or models alone. Ultimately, SDA will facilitate global C MRV through accurate and precise C cycle estimations, along with the corresponding spatiotemporal uncertainties.

10:00 AM to 12:00 PM Eastern Daylight Time (EDT)

Integrating Remotely-Sensed Agricultural Management into Scalable GHG Modeling Workflows

Sarah Kanee[1] skanee@bu.edu, Charlotte Malmborg[1], Katherine Anne Rein1, Xinyuan Ji[1], Matthew Kim[1], Nooriya Baxamusa[2], Chris Black[3], David LeBauer4, Michael Dietze[1]

[1]Boston University Earth and Environment, [2] Cornell University, [3] Pools and Fluxes LLC, [4]The LeBauer Approach

Accurate biogeochemical modeling of croplands requires temporally resolved, spatially explicit information on crop management practices that influence carbon (C) and nitrogen (N) cycling. As part of the PEcAn multi-model workflow, this project develops a modular system to generate model-ready cropland management inputs (e.g., planting, harvest, irrigation, tillage, fertilization) for process-based models, demonstrated here using the SIPNET model to simulate the carbon budgets of California's croplands. The planting and harvest workflow uses the Harmonized Landsat and Sentinel (HLS) Phenology product to initialize vegetation pools at planting and prescribe carbon removal and residue inputs at harvest. Plant C and N pools at planting are derived from trait data, while harvest fractions are compiled from agronomic guidelines. The irrigation workflow combines CHIRPS 0.05° resolution satellite precipitation and OpenET evapotranspiration in a simple cumulative water budget model to estimate daily irrigation demand and runoff. Tillage is detected using the Normalized Difference Tillage Index (NDTI), derived from HLS shortwave infrared bands, with thresholds and smoothing windows calibrated using literature benchmarks and logistic regression. Fertilizer and crop amendment information are compiled to support ensemble simulations of application timing, amount, and C:N ratios. All inputs are tracked at the parcel level and formatted to initialize statewide ensemble model runs, supporting annual greenhouse gas inventories and scenario-based projections. While current efforts focus on generating robust, scalable inputs, the ultimate goal is full data assimilation of crop management practices to enable dynamic updating of biogeochemical models and improve predictions of cropland carbon and nitrogen dynamics.

10:00 AM to 12:00 PM Eastern Daylight Time (EDT) - Virtual Poster

Optimising Soil Moisture Assimilation Strategies for Improved Hydrological Predictions in JULES model

Visweshwaran Ramesh[1] v.ramesh@reading.ac.uk, Elizabeth Cooper and Sarah Dance

University of Reading, NCEO, UKCEH and University of Reading, NCEO

Accurate soil moisture representation in land surface models is vital for advancing hydrological forecasting capabilities. However, persistent discrepancies between model estimates and in-situ observations constrain their predictive reliability. Our work explored three assimilation scenarios: state estimation, parameter estimation, and a novel joint state-parameter estimation approach, implemented for the first time in the Joint UK Land Environment Simulator (JULES) model. State estimation involved updating the initial soil moisture conditions, while parameter estimation optimised the Cosby Pedotransfer Function (PTF) constants, which govern soil hydraulic behaviour. These scenarios were applied using the Ensemble Variational (EnVar) hybrid assimilation technique. The results demonstrate that joint state-parameter assimilation enhances the accuracy of soil moisture estimates, improving the average Kling Gupta Efficiency (KGE) values from 0.33 to 0.72 across different soil characteristics. While joint assimilation showed good improvements across 16 selected UK sites, a key limitation was identified. The impact time of state estimation was restricted to 3–6 months, reducing long-term forecast reliability.

To address this, we are developing a coupled assimilation strategy. Soil moisture initial conditions are updated more frequently, every three months, while parameter estimation is carried out over a one-year window. This approach enables JULES to capture short-term variability more effectively. At the same time, it preserves long-term hydrological consistency by structurally improving the model through parameter optimisation. Preliminary results suggest that this combined strategy supports a more stable and reliable soil moisture product over the forecast period. The resultant framework enhances the current JULES data assimilation setup and has the potential to support UKCEH and the Met Office in their operational hydrological outlook programmes.

10:00 AM to 12:00 PM Eastern Daylight Time (EDT)

Advancing Uncertainty Characterization and Regionalization of CLM5 for Hydrologic Predictions Across the United States

Hongxiang Yan*, hongxiang.yan@pnnl.gov, Ning Sun, Hisham Eldardiry, Travis Thurber, Patrick Reed, Daniel Kennedy, Sean Swenson, and Jennie Rice

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Hydrologic parameter uncertainties in large-scale land models within Earth System Models (ESMs) remain a major challenge for accurately predicting water storage in the land surface and water fluxes, which in turn affect ESMs' ability to simulate water, energy, carbon, and nutrient cycles. While deterministic calibration using global optimization methods is common in hydrology, the computational cost of these approaches makes them rarely feasible for large-scale land surface models with hundreds of parameters, such as the Community Land Model (CLM), and limits their ability to address parametric uncertainties. To address these challenges, we present a diagnostic model evaluation coupled with a Monte Carlo regionalization framework for parameterizing CLM. The framework first employs global sensitivity analysis to identify dominant parameters controlling different hydrologic processes (e.g., surface water, snow, evapotranspiration, groundwater) across diverse climate regimes of the Conterminous United States (CONUS). We then perform diagnostic evaluations using multiple hydrologic processes and signatures to determine the key parameters within each cluster. Benchmark ensembles quantify the sensitivity of 15 critical hydrologic parameters across 28 performance metrics and five meteorological datasets. These analyses reveal strong regime dependence: parametric uncertainty dominates low-flow predictions, whereas the choice of forcing primarily controls high flows and seasonal transitions. Their interaction significantly influences estimates of flood and drought severity, highlighting the importance of jointly evaluating both sources. To improve predictions in ungauged domains, we introduce an ensemble-based hybrid regionalization approach that integrates parameter regionalization with streamflow signature constraints. Applied at 1/8° resolution (~50,000 grid cells), this method produces spatially distributed behavioral parameter ensembles that preserve subregional heterogeneity and substantially enhance CLM5's skill in reproducing extremes and long-term water balance.

10:00 AM to 12:00 PM Eastern Daylight Time (EDT)

Constraining turnover processes in Terrestrial Biosphere Model by using L-/P-band backscatter

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An improved representation of the carbon and water cycle dynamics in terrestrial ecosystems underpins a large uncertainty reduction in modeling Earth system dynamics. The climate sensitivity of ecosystem processes controls land-atmosphere interactions and the overall atmospheric carbon uptake and release dynamics across scales. Local and Earth observations of vegetation dynamics are key for the evaluation of our understanding and support the quantification of process representation in model development. Previous research has shown the importance in undermining equifinality using multi-variate observation constraints, focusing water and carbon fluxes and stocks.

Long-wavelength radar backscatter provides unique insights into the dynamics of plant water and carbon dynamics when compared to optical EO products, as such, embeds the potential for constraining various parameters controlling local climate vegetation responses. In this study, we present an approach for assimilating Earth observation backscatter data in a terrestrial ecosystem model to improve estimates of vegetation parameters turnover rates. Among others, we focus on the information content of L-band ALOS PALSAR data in constraining vegetation dynamics at selected FLUXNET sites, where carbon and water fluxes and stocks are observed. Using a radar observation operator, a standard radiative transfer model, we design a model-data integration experiment to investigate the benefits of multiple backscatter observations versus unique above ground biomass to constrain model parameters.

The experimental setup focuses on the trade-off between information content from backscatter and uncertainties from observation operators versus sparse above ground biomass observations to constrain parameters controlling leaf and wood pool dynamics in vegetation. Current results indicate that the assimilation improves the estimation of aboveground biomass and constraints on turnover rates for both foliage and woody pools. Ultimately, data sparsity and availability exert control on model performance and prior model uncertainty on parameter constraints. Ultimately, this study highlights the potential of L-band backscatter to enhance vegetation carbon cycle modeling, emphasizes the added value of the upcoming ESA BIOMASS mission, and underscores the importance of integrating vegetation water dynamics into carbon models.

10:00 AM to 12:00 PM Eastern Daylight Time (EDT)