



Supplement of

Overcoming barriers to enable convergence research by integrating ecological and climate sciences: the NCAR–NEON system Version 1

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Introduction

Three supplementary figures and two tables included that are not central to the manuscript text but provide useful information for readers.

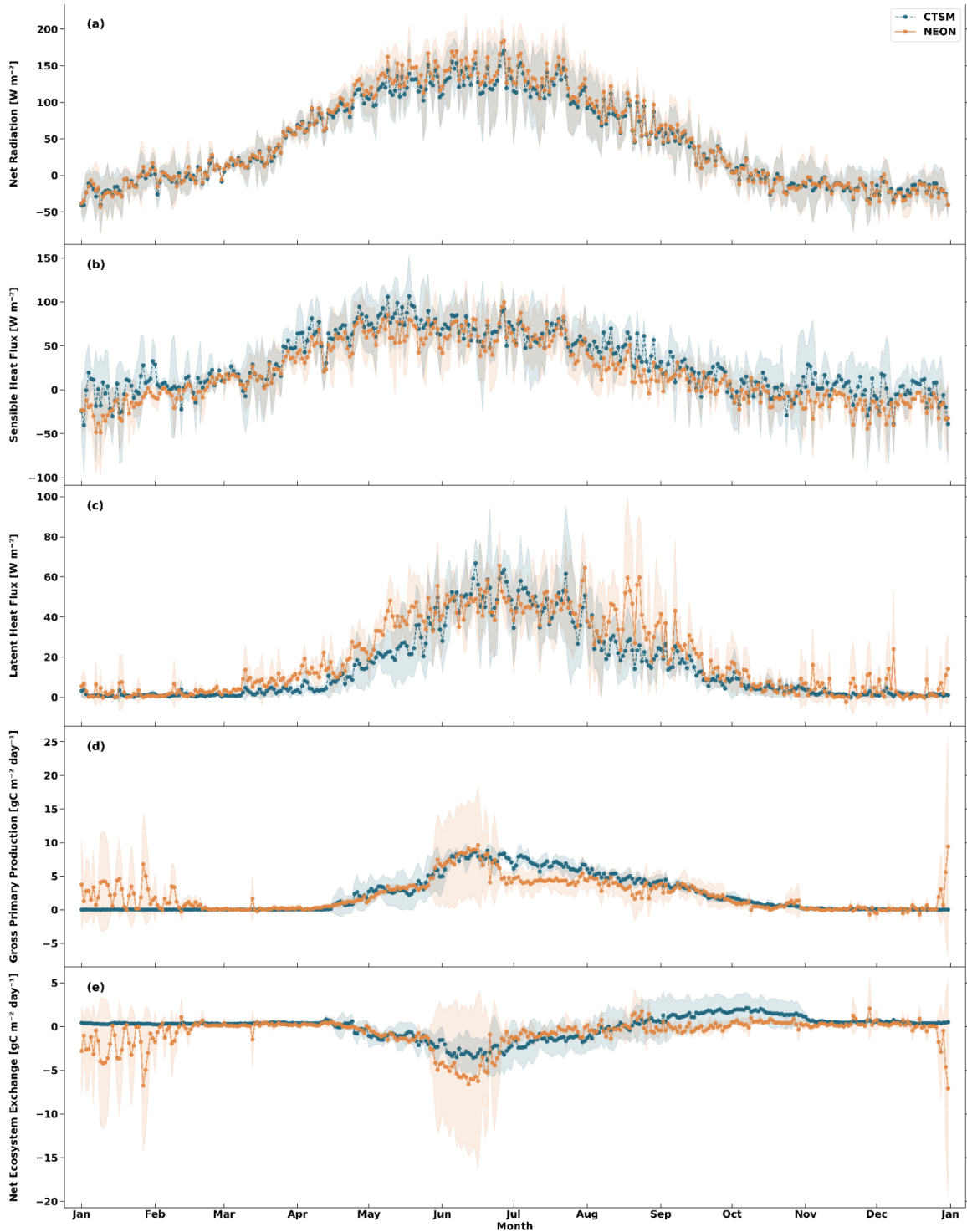


Figure S1. Climatology of daily mean NEON measurements (orange) and CTSM simulations (blue) at the Delta Junction in Alaska (DEJU). Points show the daily mean (a) net radiation; (b) sensible heat flux; (c) latent heat flux; (d) gross primary production (GPP); and (e) net ecosystem exchange (NEE). Shading shows the standard deviation of daily average data for 2018-2021.

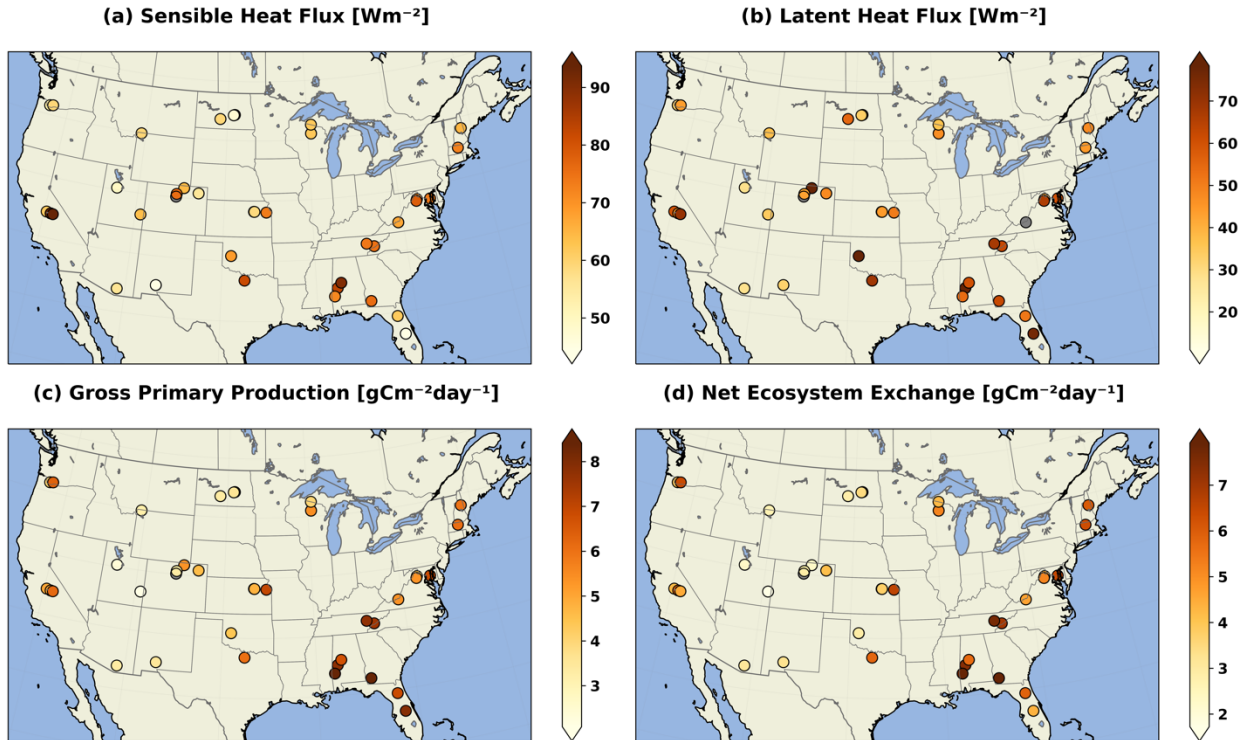


Figure S2. Maps showing location of NEON sites in the conterminous United States and annual root mean square error (RMSE) of fluxes that are simulated by CTSM for: (a) sensible heat flux ($W m^{-2}$); (b) latent heat flux ($W m^{-2}$); (c) gross primary production (GPP, $gC m^{-2} day^{-1}$); and net ecosystem exchange (NEE, $gC m^{-2} day^{-1}$) over the observational record (2018-2021), unless otherwise noted in Table S2.

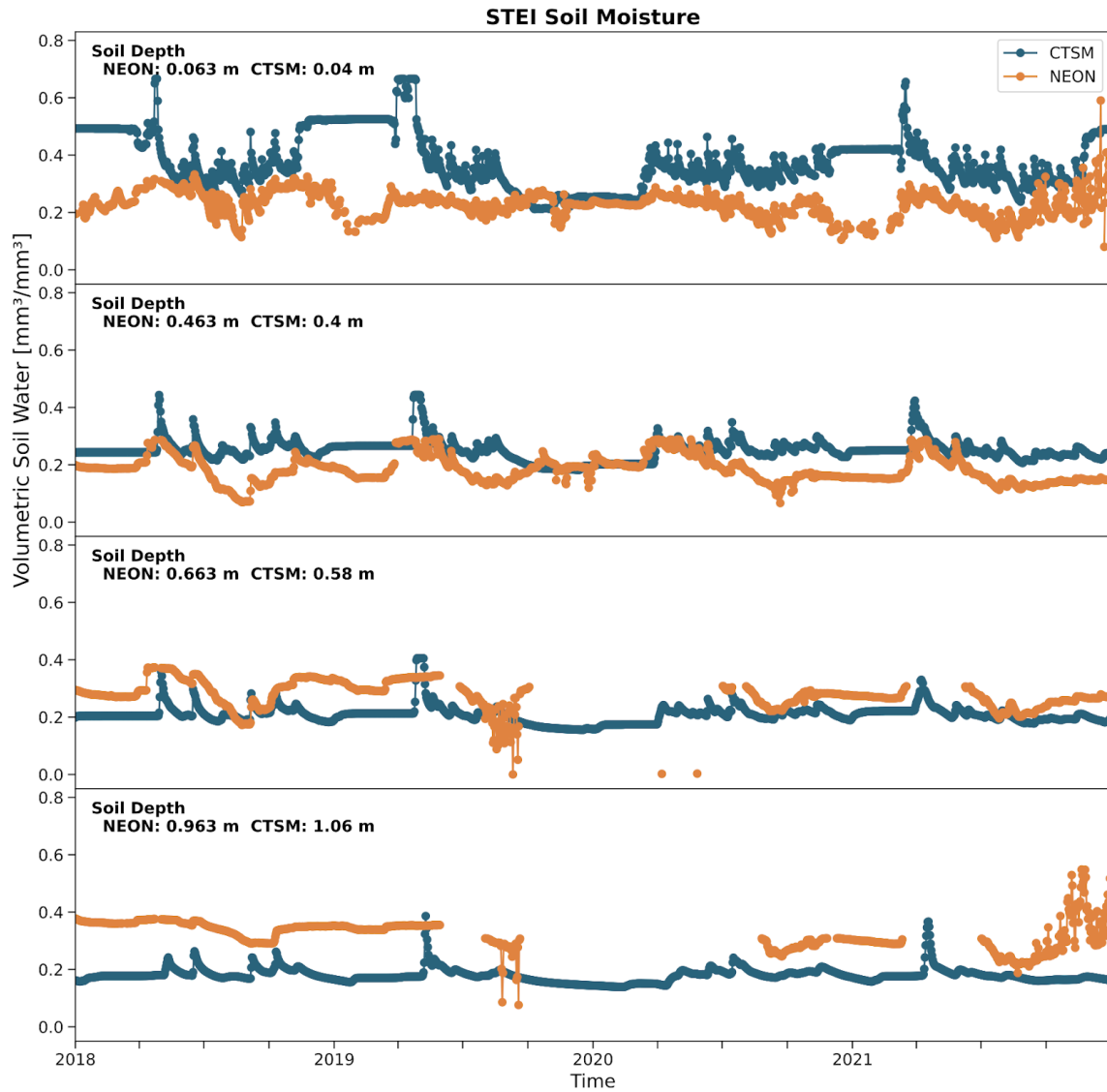


Figure S3. Time series of volumetric soil moisture profiles that are simulated by CTSM simulations (blue) and measured by NEON (orange) at different depths at the Steigerwaldt Land Services site in Wisconsin (STEI) from 2018-2021.

Table S1. NEON site IDs, site names, domain, latitude, longitude, dominant plant functional type (PFT) used in CTSM, and run status indicating whether simulation data are available on NEON’s public bucket (see Table 2). All transient simulations ran from 2018-2021 unless otherwise noted. Sites without a complete calendar year of NEON input data were not able to be initialized and have no model data for comparison and at time of publication will not run in the NCAR-NEON system.

NEON Site ID	Site Name	NEON Domain	Lat	Lon	Dominant PFT*	Run Status
BART	Bartlett Experimental Forest	1	44.06516	-71.28834	7	Completed
HARV	Harvard Forest & Quabbin Watershed	1	42.53562	-72.17562	7	Completed
BLAN	Blandy Experimental Farm	2	39.033698	-78.041788	7	Completed
SCBI	Smithsonian Conservation Biology Institute	2	38.89209	-78.13764	7	Completed
SERC	Smithsonian Environmental Research Center	2	38.89124	-76.55884	7	Completed
DSNY	Disney Wilderness Preserve	3	28.12919	-81.43394	14	Completed
JERC	The Jones Center At Ichauway	3	31.19608	-84.46647	1	Completed
OSBS	Ordway-Swisher Biological Station	3	29.68819	-81.99345	1	Completed
GUAN	Guanica Forest	4	17.96882	-66.86888	6	2019-2021
LAJA	Lajas Experimental Station	4	18.02184	-67.07608	14	2019-2021
STEI	Steigerwaldt-Chequamegon	5	45.5076	-89.5888	7	Completed
TREE	Treehaven	5	45.49266	-89.58748	7	Completed
UNDE	University of Notre Dame Environmental Research Center	5	46.23391	-89.537254	7	Completed
KONA	Konza Prairie Agroecosystem	6	39.10828	-96.61044	19	Completed
KONZ	Konza Prairie Biological Station	6	39.1007	-96.56227	14	Completed
UKFS	University of Kansas Field Station	6	39.04168	-95.20495	7	Completed
GRSM	Great Smoky Mountains National Park	7	35.68839	-83.50185	7	Completed
MLBS	Mountain Lake Biological Station	7	37.37783	-80.52425	7	2018-2019
ORNL	Oak Ridge	7	35.964128	-84.282588	7	Completed
DELA	Dead Lake	8	32.54092	-87.80341	7	Completed
LENO	Lenoir Landing	8	31.8531	-88.16103	7	2021-2021
TALL	Talladega National Forest	8	32.95106	-87.3941	1	Completed
DCFS	Dakota Coteau Field Site	9	47.15919	-99.11251	13	Completed
NOGP	Northern Great Plains Research Laboratory	9	46.76846	-100.91832	13	Completed
WOOD	Chase Lake National Wildlife Refuge	9	47.12833	-99.23907	13	Completed
CPER	Central Plains Experimental Range	10	40.81297	-104.74455	14	Completed

RMNP	Rocky Mountains	10	40.27707	-105.54524	1	Completed
STER	North Sterling	10	40.45984	-103.03008	19	Completed
CLBJ	Lyndon B. Johnson National Grassland	11	33.40143	-97.56725	7	Completed
OAES	Marvin Klemme Range Research Station	11	35.41062	-99.06044	14	Completed
YELL	Yellowstone National Park	12	44.95597	-110.54196	1	2019-2021
MOAB	Moab	13	38.25136	-109.38882	14	2018-2020
NIWO	Niwot Ridge	13	40.05236	-105.58324	12	Not run, input data gaps
JORN	Jornada Experimental Range	14	32.59052	-106.84377	14	Completed
SRER	Santa Rita Experimental Range	14	31.91068	-110.83549	9	Completed
ONAQ	Onaqui	15	40.1776	-112.45245	9	2018-2019
ABBY	Abby Road	16	45.762378	-122.329672	1	Completed
WREF	Wind River Experimental Forest	16	45.81637	-121.95838	1	2019-2021
SJER	San Joaquin Experimental Range	17	37.107117	-119.733	13	2019-2021
SOAP	Soaproot Saddle	17	37.03269	-119.2621	1	Completed
TEAK	Lower Teakettle	17	37.006472	-119.005758	1	2019-2021
TOOL	Toolik Field Station	17	68.66045	-149.370128	1	2020-2021
BARR	Utqiagvik	18	71.281711	-156.650219	12	2019-2021
BONA	Caribou-Poker Creeks Research Watershed	19	65.15333	-147.50194	2	Completed
DEJU	Delta Junction	19	63.87983	-145.74765	2	Completed
HEAL	Healy	19	63.8798	-149.21539	12	Completed
PUUM	Pu'u Maka'ala Natural Area Reserve	20	19.55309	-155.31731	4	Not run, input data gaps

* PFT codes used in CTSM, See Lawrence et al. 2019 for a full list

Trees: 1=Needleleaf Evergreen Temperate, 2=Needleleaf Evergreen Boreal, 4=Broadleaf Evergreen Tropical, 6=Broadleaf Deciduous Tropical, 7=Broadleaf Deciduous Temperate,

Shrubs: 9=Broadleaf Evergreen Temperate

Grasses: 12=C3 arctic grass, 13=C3 grass, 14=C4 grass,

Crops: 19=Rainfed Spring Wheat

Table S2 Summary of NEON site mean annual temperature (MAT), mean annual precipitation (MAP), and gross primary production (GPP). Due to gaps in the observational estimates, mean annual GPP is reported for the full time series simulated by CTSM at each NEON site. All results are for 2018-2021 unless noted otherwise in Table S2. Precipitation values marked with an asterix (*) have at least two years of what appear to be anomalously high or low mean annual precipitation values compared to nearby sensors from other networks and therefore need further investigation.

NEON Site ID	MAT (°C)	MAP (mm y ⁻¹)	GPP (gC m ⁻² y ⁻¹)	NEON Site ID	MAT (°C)	MAP (mm y ⁻¹)	GPP (gC m ⁻² y ⁻¹)
BART	7.7	1213	1127	WOOD	4.9	403	524
HARV	8.5	1405	1153	CPER	9.5	827*	856
BLAN	13.1	1299	1400	RMNP	5.1	320	497
SCBI	13	1159	1458	STER	9.8	182	302
SERC	14.3	1193	1411	CLBJ	17.7	835	1281
DSNY	22.6	1370	2808	OAES	15.7	1264	820
JERC	20	1416	2674	YELL	2.4	521	749
OSBS	21.3	1419	2650	MOAB	11.6	137	173
GUAN	26.3	558	622	NIWO	-0.1	1025	
LAJA	25.5	983	2786	JORN	16.9	131	239
STEI	5.7	660	1109	SRER	20.4	329	360
TREE	5.8	511	922	ONAQ	10.5	238	277
UNDE	5.1	784	1028	ABBY	10.1	2043	1906
KONA	13.3	770	854	WREF	10	1885	1966
KONZ	12.9	617	1158	SJER	18.5	663*	1069
UKFS	12.9	947	1272	SOAP	14.9	610	1771
GRSM	14.5	1170	1620	TEAK	9.6	216*	967
MLBS	9.6	1754	1248	TOOL	-5.6	483	380
ORNL	15.3	1397	1473	BARR	-8.7	28*	262
DELA	18.6	1351	1453	BONA	-1.7	395	893
LENO	18.6	1272	1657	DEJU	-0.7	216	816
TALL	18.1	1329	2520	HEAL	-0.6	208*	964
DCFS	4.9	389	711	PUUM	13.3	2029	
NOGP	6.1	120*	56				