Supporting Information for

**Overcoming barriers to enable convergence research by
integrating ecological and climate sciences: The NCAR-NEON system**

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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.
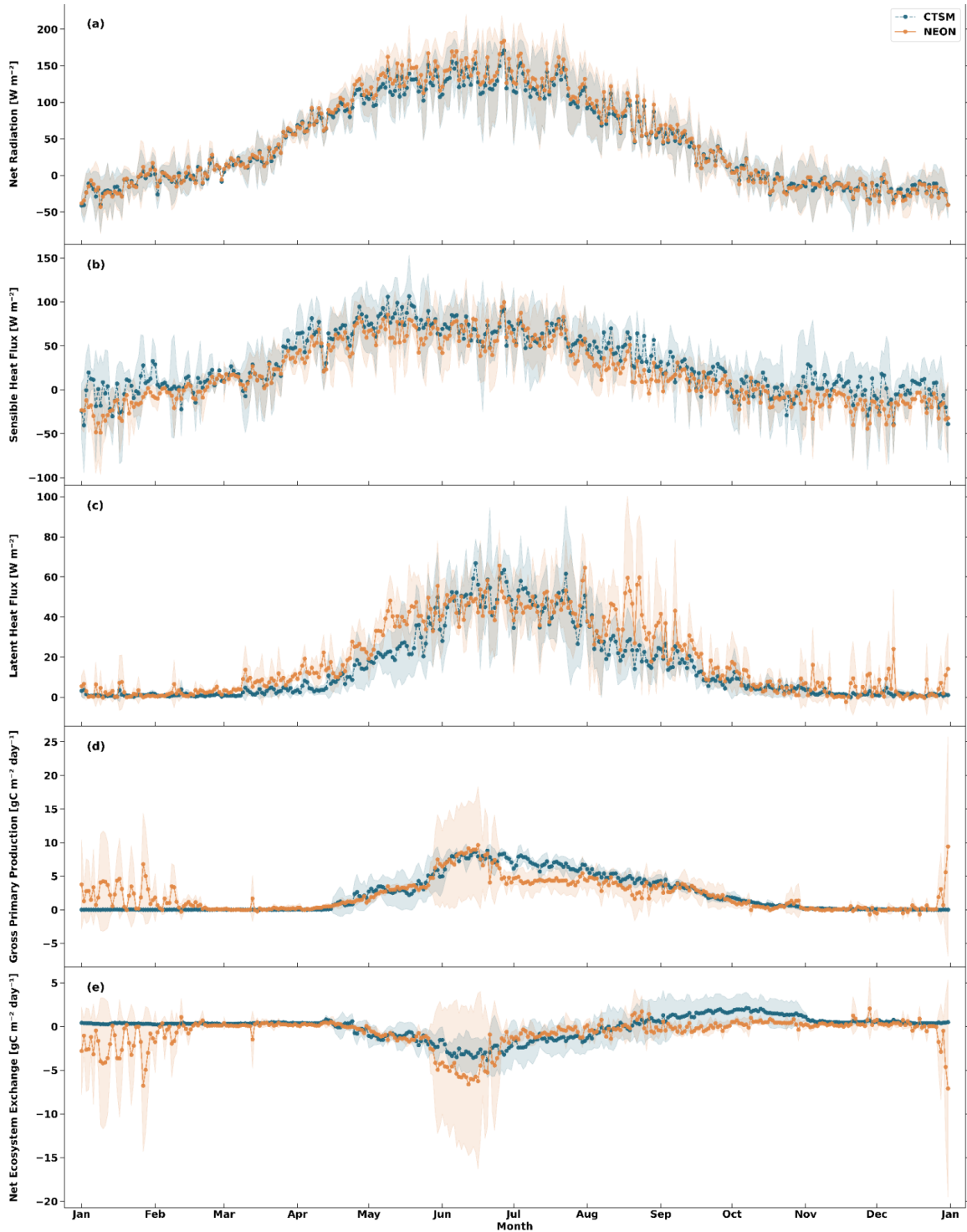
**Figure S1.** Climatology of daily mean NEON measurements (orange) and CTSM simulations (blue) at the Delta Junction in Alaska (DEJU). Points show the daily mean (a) net radiation; (b) sensible heat flux; (c) latent heat flux; (d) gross primary production (GPP); and (e) net ecosystem exchange (NEE). Shading shows the standard deviation of daily average data for 2018-2021.
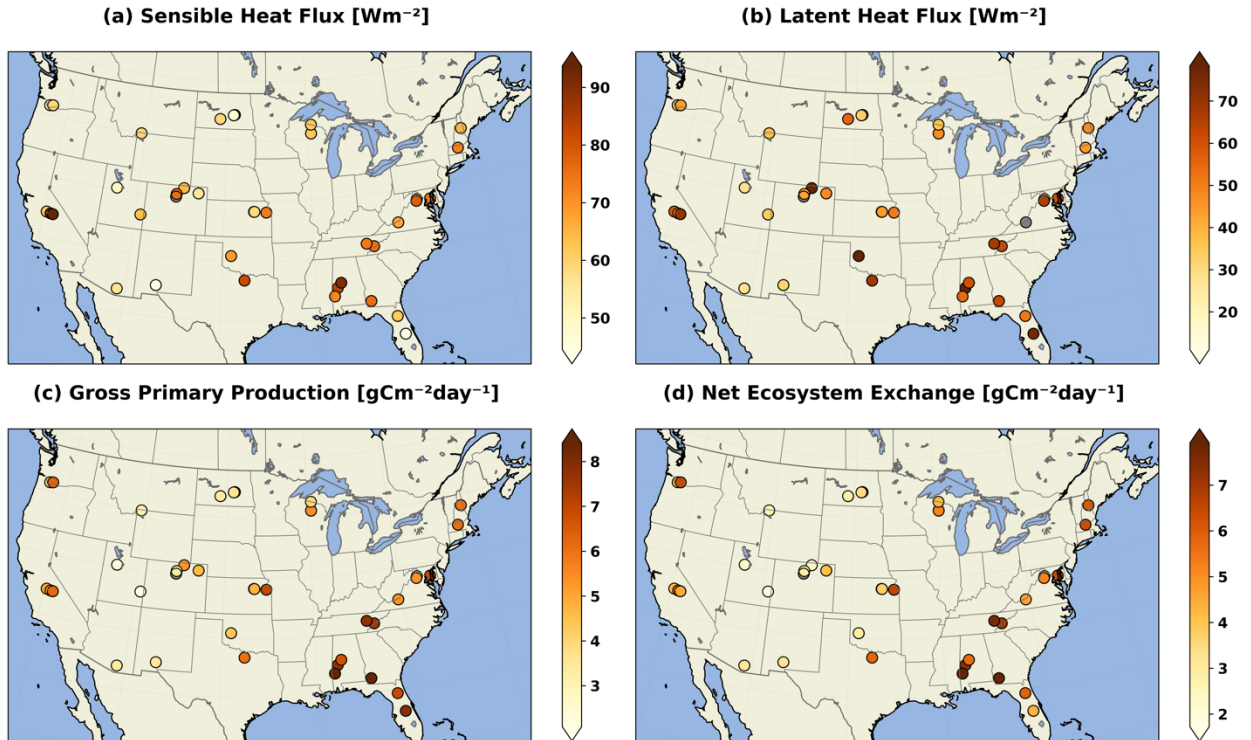
**Figure S2.** Maps showing location of NEON sites in the conterminous United States and annual root mean square error (RMSE) of fluxes that are simulated by CTSM for: (a) sensible heat flux (W m$^{-2}$); (b) latent heat flux (W m$^{-2}$); (c) gross primary production (GPP, gC m$^{-2}$ day$^{-1}$); and net ecosystem exchange (NEE, gC m$^{-2}$ day$^{-1}$) over the observational record (2018-2021), unless otherwise noted in Table S2.
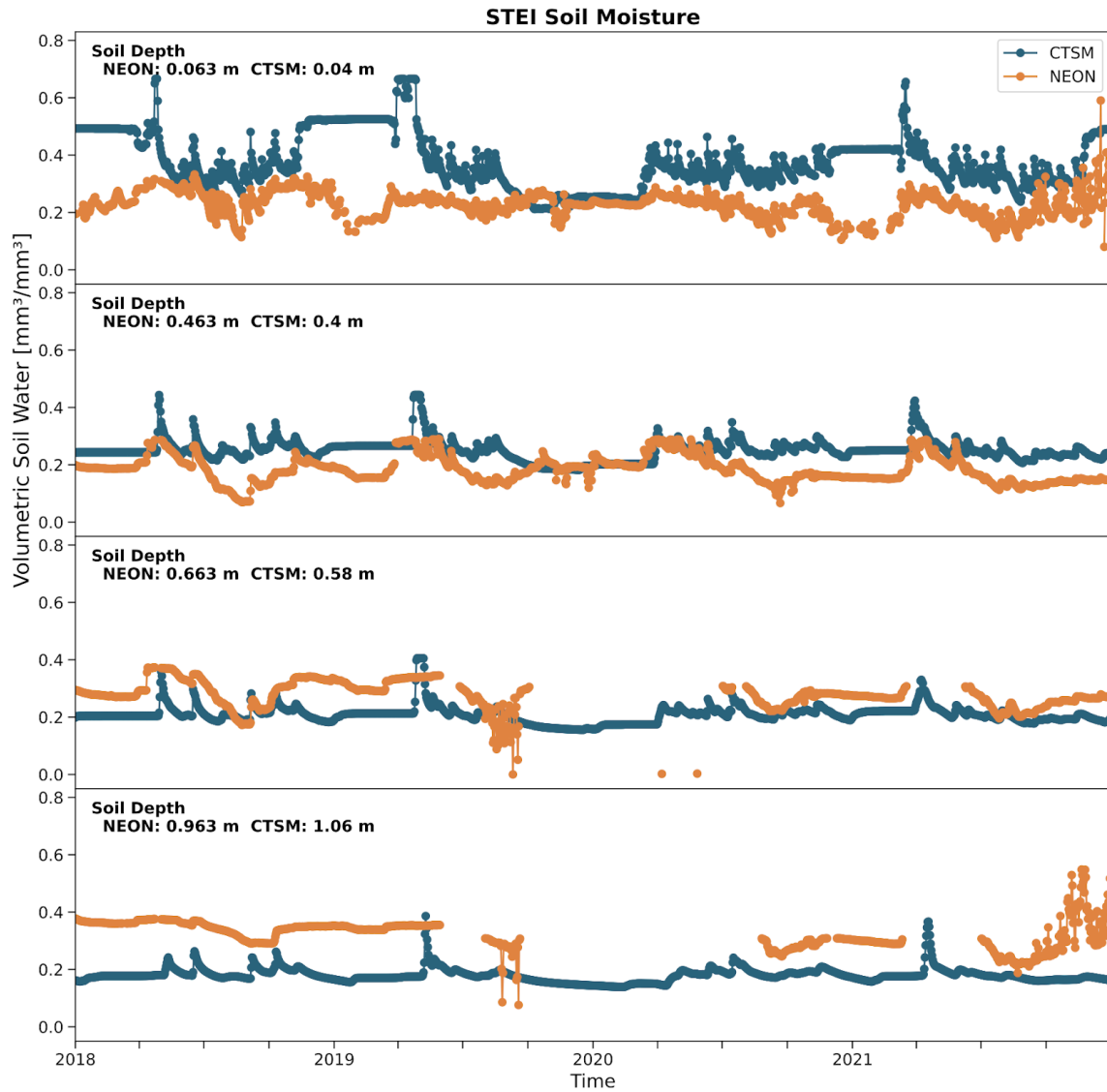
**Figure S3.** Time series of volumetric soil moisture profiles that are simulated by CTSM simulations (blue) and measured by NEON (orange) at different depths at the Steigerwaldt Land Services site in Wisconsin (STEI) from 2018-2021.

**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 | Utqiaġvik | 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⁻²y⁻¹) | NEON Site ID | MAT (°C) | MAP (mm y⁻¹) | GPP (gC m⁻²y⁻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 | | | | |