Flux 101

Conceptual Overview

- Flux theory
- What you can do with flux data
- Where you can find flux data

- In general flux sites measure
 - Carbon, water, energy fluxes
 - Meteorology/environmental conditions
- At one spatial location with high temporal frequency (30 minutes)



















Example time series data set from the 2009 study period, including (a) photosynthetically photon flux density (PPFD) and vapor pressure deficit (VPD), (b) spatially unscaled cohort ET flux estimates, and c) simulated ET using both spatial scaling methods with observed eddy covariance estimates.



Cumulative annual Lake Mendota sums of water (a) and CO_2 (b) flux for 2012-2017 with annual sums noted.



a) Daily gap-filled NEE of carbon dioxide from 2012-2017, blue periods indicating periods of ice overage, with the average nonmissing day 71% gapfilled. Positive NEE indicated carbon flux from the lake to the atmosphere. b) Red shows one degree bin averaged NEE and standard deviation



Wavelet Coherence of CO₂ Flux and Air Temperature

Morlet wavelet coherence plot of net CO_2 flux and air temperature 0.9 for 2012-2016 with Jan 1st of each year labeled. Phase arrows 0.8 in black represent the time lag 0.7 between CO_2 flux and air temperature with right facing 0.6 arrows showing in-phase time 0.5 series, left facing arrows anti-0.4 nijuBej phase time series, upward facing arrows shows temperature 0.3 leading flux while a downward 0.2 facing arrow shows flux leading temperature. Arrows only shown 0.1 where the coherence is greater than or equal to 0.7. Cone of influence shown in white.

Assumption 1: Turbulent Atmosphere



Assumption 2: Footprint



Assumption 2: Footprint





Ke Xu, Stefan Metzger, Ankur R. Desai, Upscaling tower-observed turbulent exchange at fine spatio-temporal resolution using environmental response functions, Agricultural and Forest Meteorology

Assumption 2: Footprint



Ke Xu, Stefan Metzger, Ankur R. Desai, Upscaling tower-observed turbulent exchange at fine spatio-temporal resolution using environmental response functions, Agricultural and Forest Meteorology

Assumption 3: Flux Partitioning





Hour

Assumption 4: Gap Filling





Assumption 4: Gap Filling

Alfalfa



Assumption 4: Gap Filling

Alfalfa



- Fluxnet 2015
 - 1991-2015
- Global data from multiple flux networks



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	Return to fluxnet.flux	data.org
	General Site Information	
Site ID:	US-Sta	Baroll
Site Name:	Saratoga	Wheatland
Tower Team:	PI: Brent Evens - & DEEvens@uwyo.adu> - University of Wyoming PI: Else Prendal encode (Zensetaring) encode (Zensetar	Ramfins Fort Steller (3) Rock From Churg
Latitude:	41.3966	Rocks Wamsutter «Creston Sinclair Elk Mountain ®
Longitude:	-106.8024	Red Desert Boster
Elevation (m):	2069	
Network	AmeriFlux	Medicine Bow
IGBP:	OSH (Open Shrublands)	Riverside "Nationali Forest
Mean Annual Temperature (degrees C)	5.1	Baggs
Data Products:	FLUXNET2015 Dataset	Service and the service of the servi
Data Availability:	FLUXNET2015: 5 years (Duration: 2005 - 2009)	Pedfeather III
Data Downloads to Date:	FLUXNET2015: 333 unique downloads	Clark Walden
Description:	Sagebrush steppe ecosystem	Surbeam Bow Routh Fort Co
Site image(s):	No images.	Go gle Hayden (a) National Forests Map data C2018 Google Terms of Use Report a map error
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- Ameriflux
 - 1991-2017
- As name implies, focuses on American sites





Home / Sites / Siteinfo / US-Sta **US-Sta: Saratoga** DOI Data Use Log MODIS Publications BADM Overview Windroses Image Gallery Tower_team: PI: Brent Ewers BEEwers@uwyo.edu - University of Wyoming PI: Elise Pendall e.pendall@westernsydney.edu.au - University of Wyoming DataManager: David Reed david.edwin.reed@gmail.com - University of Wyoming 41.3966. -106.8024 Lat, Long: Elevation(m): 2069 US-Sta Network Affiliations: AmeriFlux Vegetation IGBP: OSH (Open Shrublands) Climate Koeppen: Bsh (Steppe: very cold winter) +Mean Annual Temp (°C): 5.1 _ Mean Annual Precip. (mm): -Map data ©2018 Terms of Use Flux Species Measured: CO2, H2O Site Photo Years Data Collected: AmeriFlux: 2006 - 2009 More Site Images Description: Sagebrush steppe ecosystem AMERIFLUX URL: **Research Topics:** Sagebrush water relations Acknowledgment: _ Site Tasks Site Publication More Site Publications Add to Site Set Add Image Add Publication Download Data Data Processing Status

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4	2.01E+11	2.01E+11	-99999	-9999	-9999	-9999	-9999	-9999	-9999	-9999	-99999	-9999	-9999	-9999	-9999	-9999	-9999	-9999	-9999	-99999	-9999	-9999	-9999	-99999	-9999	-99999	-9999	-9999	-9999
6	2.01E+11	2.01E+11	-9999	-9999	-9999	-9999	-9999	-9999	-9999	-9999	-99999	-9999	-9999	-9999	-9999	-9999	-9999	-9999	-9999	-9999	-9999	-9999	-9999	-9999	-9999	-9999	-9999	-9999	-9999
7	2.01E+11	2.01E+11	-9999	-9999	-9999	-9999	-9999	-9999	-9999	-9999	-9999	-9999	-9999	-9999	-9999	-9999	-9999	-9999	-9999	-9999	-9999	-9999	-9999	-9999	-9999	-9999	-9999	-9999	-9999
8	2.01E+11	2.01E+11	-9999	-9999	-9999	-9999	-9999	-9999	-9999	-9999	-9999	-9999	-9999	-9999	-9999	-9999	-9999	-9999	-9999	-9999	-9999	-9999	-9999	-9999	-9999	-9999	-9999	-9999	-9999
9	2.01E+11	2.01E+11	-9999	-9999	-9999	-9999	-9999	-9999	-9999	-9999	-9999	-9999	-9999	-9999	-9999	-9999	-9999	-9999	-9999	-9999	-9999	-9999	-9999	-9999	-9999	-9999	-9999	-9999	-9999
10	2.01E+11	2.01E+11	-9999	-9999	-9999	-9999	-9999	-9999	-9999	-9999	-9999	-9999	-9999	-9999	-9999	-9999	-9999	-9999	-9999	-9999	-9999	-9999	-9999	-9999	-9999	-9999	-9999	-9999	-9999 👻
9788	2.01E+11	2.01E+11	0.206	6.964	15.687	2.386	0.431	0.431	0	-9.559	-9999	4.623	-9999	1.241	-9999	7.296	-9999	46.307	76.737	379.466	379.466	0.537	-9999	-9999	-9999	-0.265	-9999	-9999	-9999 🔺
9789	2.01E+11	2.01E+11	0.331	6.575	0.318	4.064	0.695	0.695	0	-11.25	-9999	4.819	-9999	-0.995	-9999	7.274	-9999	51.462	76.727	378.588	378.588	0.473	-9999	-9999	-9999	-0.258	-9999	-9999	-9999
9790	2.01E+11	2.01E+11	0.403	5.067	351.388	5.794	1.881	1.881	0	8.235	-9999	-18.18	-9999	-2.669	-9999	7.255	-9999	64.956	76.729	386.663	386.663	0.308	-9999	-9999	-9999	-0.29	-9999	-9999	-9999
9791	2.01E+11	2.01E+11	0.245	3.175	343.942	3.486	1.272	1.272	0	9.355	-9999	-13.902	-9999	-4.792	-9999	7.201	-9999	79.452	76.649	382.067	382.067	0.158	-9999	-9999	-9999	-0.367	-9999	-9999	-9999
9792	2.01E+11	2.01E+11	0.09	1.699	262.083	1.737	0.924	0.924	0	-5.435	-9999	-5.954	-9999	-8.957	-9999	7.132	-9999	84.818	76.571	377.119	377.119	0.105	-9999	-9999	-9999	-0.348	-9999	-9999	-9999
9793	2.01E+11	2.01E+11	0.206	2.418	227.424	0.981	0.553	0.553	0	-3.162	-9999	1.261	-9999	-12.578	-9999	7.061	-9999	82.915	76.537	377.372	377.372	0.125	-9999	-9999	-9999	-0.35	-9999	-9999	-9999
9794	2.01E+11	2.01E+11	4.592	0.642	67.725	7.98	1.725	1.725	0	396.659	-9999	-9999	-9999	-13.237	-9999	6.971	-9999	93.522	76.628	380.738	380.738	0.042	-9999	-9999	-9999	-0.327	-9999	-9999	-9999
9795	2.01E+11	2.01E+11	2.613	-0.294	61.862	9.438	-9999	-9999	0	-9999	-9999	-9999	-9999	-16.481	-9999	6.867	-9999	98.95	76.684	370.849	370.849	0.007	-9999	-9999	-9999	-0.286	-9999	-9999	-9999
9790	2.01E+11	2.01E+11	0.235	-0.755	49.210	4.430	-9999	-9999	0	195.710	-9999	-9999	-9999	-19.629	-9999	0.708	-9999	99.483	76.69	-9999	-9999	0.003	-9999	-9999	-9999	-0.289	-9999	-9999	-9999
9797	2.01E+11	2.01E+11	0.201	-0.912	32.094	2.988	-99999	-9999	0	-9999	-99999	-9999	-99999	-20.914	-9999	6.52	-99999	99.000	76 726	-99999	-9999	0.003	-9999	-99999	-9999	-0.204	-9999	-9999	-9999
9799	2.01E+11	2.01E+11	0.133	-1.2.54	24 756	2 151	-9999	-9999	0	170 015	-9999	-9999	-9999	-21.245	-9999	6 402	-9999	98 734	76 723	-9999	-9999	0.004	-9999	-9999	-9999	-0.235	-9999	-9999	-9999
9800	2.01E+11	2.01E+11	0.114	-1.743	25.412	1.88	-9999	-9999	0	-9999	-9999	-9999	-9999	-20.976	-9999	6.273	-9999	98,178	76.7	-9999	-9999	0.01	-9999	-9999	-9999	-0.249	-9999	-9999	-9999
9801	2.01E+11	2.01E+11	0.191	-2.372	44.849	3.046	-9999	-9999	0	-9999	-9999	-9999	-9999	-20.762	-9999	6.138	-9999	97.188	76.646	-9999	-9999	0.015	-9999	-9999	-9999	-0.252	-9999	-9999	-9999
9802	2.01E+11	2.01E+11	0.124	-2.432	356.07	1.837	-9999	-9999	0	-9999	-9999	-9999	-9999	-20.471	-9999	6.014	-9999	96.823	76.614	-9999	-9999	0.017	-9999	-9999	-9999	-0.225	-9999	-9999	-9999
9803	2.01E+11	2.01E+11	0.285	-2.146	11.985	4.598	-9999	-9999	0	391.334	-9999	-9999	-9999	-20.118	-9999	5.893	-9999	95.204	76.616	335.03	335.03	0.026	-9999	-9999	-9999	-0.251	-9999	-9999	-9999
9804	2.01E+11	2.01E+11	0.539	-2.502	30.11	7.83	-5.526	-5.526	0	-66.153	-9999	87.878	-9999	-19.82	-9999	5.773	-9999	92.462	76.581	401.671	401.671	0.039	-9999	-9999	-9999	-0.267	-9999	-9999	-9999
9805	2.01E+11	2.01E+11	0.558	-3.608	24.415	7.735	-3.281	-3.281	0	-112.302	-9999	183.906	-9999	-19.584	-9999	5.656	-9999	88.103	76.602	386.669	386.669	0.056	-9999	-9999	-9999	-0.281	-9999	-9999	-9999
9806	2.01E+11	2.01E+11	0.532	-4.586	16.878	7.814	-2.859	-2.859	0	-50.354	-9999	17.407	-9999	-19.334	-9999	5.547	-9999	84.751	76.593	382.738	382.738	0.067	-9999	-9999	-9999	-0.263	-9999	-9999	-9999
9807	2.01E+11	2.01E+11	0.61	-4.853	16.187	9.168	-0.342	-0.342	0	-50.622	-9999	25.221	-9999	-19.467	-9999	5.441	-9999	83.572	76.579	383.291	383.291	0.071	-9999	-9999	-9999	0.105	-9999	-9999	-9999
9808	2.01E+11	2.01E+11	0.695	-4.914	11.176	9.454	-0.905	-0.905	0	-63.885	-9999	35.295	-9999	-20.216	-9999	5.335	-9999	83.58	76.545	381.062	381.062	0.07	-9999	-9999	-9999	15.926	-9999	-9999	-9999
9809	2.01E+11	2.01E+11	0.556	-5.309	25.835	1./73	-0.04	-0.04	0	-33.0/2	-99999	21./11	-9999	-20.933	-9999	5.234	-9999	83.921	76.642	380.011	380.011	0.067	-9999	-9999	-9999	87.461	-9999	-9999	-9999
0011	2.01E+11	2.01E+11	0.679	-5.007	16 202	9.075	-0.379	-0.379	0	-32.895	-99999	35.89	-99999	-21.235	-9999	5.020	-99999	82.005	76.671	380.352	380.352	0.076	-9999	-99999	-9999	270 11	-9999	-9999	-9999
9812	2.016+11	2.016+11	0.03	-4.045	16 013	10 312	-1.334	-1.334	0	-20.947	-9999	53 122	-9999	-20.811	-9999	4 944	-9999	83 225	76.649	380.582	380.582	0.072	-0000	-9999	-9999	302 017	-0000	-9999	-9999
9813	2.01E+11	2.01E+11	0.757	-4.305	20.527	10.493	-1.652	-1.652	0	-22.294	-9999	66.241	-9999	-20.383	-9999	4.852	-9999	79.43	76.659	380.99	380.99	0.092	-9999	-9999	-9999	625.866	-9999	-9999	-9999
9814	2.01E+11	2.01E+11	0.751	-3.365	20.605	10.277	-2.605	-2.605	0	-4.145	-9999	99.35	-9999	-19.904	-9999	4.76	-9999	77.215	76.69	381.028	381.028	0.109	-9999	-9999	-9999	1146.687	-9999	-9999	-9999
9815	2.01E+11	2.01E+11	0.791	-2.986	21.377	11.114	-3.441	-3.441	0	16.876	-9999	121.99	-9999	-18.968	-9999	4.673	-9999	77.346	76.703	381.01	381.01	0.112	-9999	-9999	-9999	1395.92	-9999	-9999	-9999
9816	2.01E+11	2.01E+11	0.771	-2.597	22.548	10.518	-4.237	-4.237	0	27.614	-9999	153.519	-9999	-17.659	-9999	4.59	-9999	75.108	76.743	381.012	381.012	0.126	-9999	-9999	-9999	1510.068	-9999	-9999	-9999
9817	2.01E+11	2.01E+11	0.714	-2.325	24.706	9.845	-4.675	-4.675	0	29.689	-9999	162.862	-9999	-15.972	-9999	4.516	-9999	73.15	76.768	381.225	381.225	0.139	-9999	-9999	-9999	1395.353	-9999	-9999	-9999
9818	2.01E+11	2.01E+11	0.773	-2.172	24.275	10.496	-4.894	-4.894	0	32.5	-9999	177.145	-9999	-14.503	-9999	4.444	-9999	71.899	76.749	381.114	381.114	0.147	-9999	-9999	-9999	1386.196	-9999	-9999	-9999
9819	2.01E+11	2.01E+11	0.753	-1.63	20.684	10.633	-5.73	-5.73	0	35.211	-9999	215.719	-9999	-13.757	-9999	4.378	-9999	67.179	76.728	381.002	381.002	0.179	-9999	-9999	-9999	1723.068	-9999	-9999	-9999
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