Extended Datasets of Machine learning and FLUXNET-based Carbon and Water Fluxes (MF-CW-v2)

Description:
The extended datasets of the Machine learning and FLUXNET-based Carbon and Water Fluxes (MF-CW-v2) include exponential GPR-based optimal estimates and the corresponding standard deviations (SDs) for monthly GPP and ET at 0.1° resolution over global vegetated lands. They further include the mean and median GPP estimates derived from 24 machine learning methods, as well as ET estimates generated using nine long-term monthly gridded precipitation products. The machine learning models were trained using FLUXNET in situ observations of CO2 and water vapor fluxes from a global dataset of 292 eddy covariance (EC) sites spanning diverse climate zones and plant functional types (PFTs) across vegetated lands during 1997–2022. Detailed descriptions of the methodology, validation, and spatial and temporal patterns of these datasets are provided in the paper.

Fair Data Use Policy:
We make the datasets available to the research community as we believe that the dissemination of the datasets can be helpful to advancement in science. If you plan to use our datasets in a manuscript or project, we request that you inform us early in your work. In addition, if the datasets are essential to your results or findings, co-authorship is appreciated.

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Metadata:
Spatial resolution: 0.1-degree
Spatial extent: globe
Temporal resolution: monthly
Temporal extent: 1982-2022
File format: GeoTIFF
Map projection: Geographic
Scale factor: no
Units: GPP (gC m^{-2} mo^{-1}) and ET (mm mo^{-1})

Citation:
Li, F., Xiao, J., Chen, J., Ballantyne, A., Peñuelas, J., Green, J. K., Tian, S., Zhang, Y., Poulter, B., Sitch, S., Jin, J., Hu, X., Bao, G. (2026) Dryland dominance in the slowdown of global vegetation carbon uptake. *Nature Geoscience*, https://doi.org/10.1038/s41561-026-01957-8.

Download:
Global Ecology Group Data Repository: https://globalecology.unh.edu/data/MF-CW_v2.html. Please visit our webpage for any updates to this product.

Relevant publications:

Xiao, J., Baldocchi, D., Ichii, K., Li, F., Papale, D. (2026) Insights into terrestrial carbon and water cycling from the global eddy covariance network. *Nature Reviews Earth & Environment*, 7, 60–79. https://doi.org/10.1038/s43017-025-00743-1.

Li, F., Xiao, J., Chen, J., Ballantyne, A., Jin, K., Li, B., Abraha, M., John, R. (2023) Global water use efficiency saturation due to increased vapor pressure deficit. *Science*, 381, 672-677. DOI: 10.1126/science.adf5041.