Merged and Gridded GPM and Atmospheric River Dataset Documentation

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This merged GPM + AR dataset contains gridded GPROF precipitation rates (Kummerow et al. 2015; Randel 2020), Remote Sensing Systems atmospheric water vapor (Meissner et al. 2012), and Mattingly et al. (2018) atmospheric rivers in the North Atlantic and Pacific oceans. Dataset created by Marian Mateling, (mateling@wisc.edu) Claire Pettersen (pettersc@umich.edu), Kyle Mattingly, and Sarah Ringerud. A detailed explanation of these products and methodology can be found in the associated scientific article, published in the Earth and Space Science journal (an American Geophysical Union publication). **_doi_**

Kummerow, C. D., Randel, D. L., Kulie, M., Wang, N. Y., Ferraro, R., Joseph Munchak, S., & Petkovic, V. (2015). The evolution of the Goddard profiling algorithm to a fully parametric scheme. *Journal of atmospheric and oceanic technology*, *32*(12), 2265-2280. https://doi.org/10.1175/JTECH-D-15-0039.1

Meissner, T., F. J. Wentz, and D. Draper, 2012: GMI Calibration Algorithm and Analysis Theoretical Basis Document, Remote Sensing Systems, Santa Rosa, CA, report number 041912, 124 pp.

Randel, D. L., Kummerow, C. D., & Ringerud, S. (2020). The Goddard Profiling (GPROF) precipitation retrieval algorithm. *Satellite Precipitation Measurement: Volume 1*, 141-152. https://doi.org/10.1007/978-3-030-24568-9_8

File Inventory

Monthly files for each ocean basin ('atlantic' versus 'pacific') contain GPM-derived precipitation rates and atmospheric water vapor content spatiotemporally matched to a database of atmospheric rivers. All data is gridded to 0.25° × 0.25° (latitude × longitude)

spatial resolution. Each timestep represents a GPM overpass through the basin matched to the nearest-time atmospheric river flag.

The monthly files are compressed into a full year and a basin (e.g., NA_2014) and zipped.

The files produced are in NetCDF format (https://www.unidata.ucar.edu/software/netcdf/) and conform to all standard NetCDF metadata conventions (http://cfconventions.org/cf-conventions/cf-conventions.html)

Descriptions of all file variables and metadata are provided in the below table.

gridded_atlantic_*yyyymm*.nc gridded_pacific_*yyyymm*.nc

Variable Name	Description	Dimensions	Units
time	Timestep	(timestep)	YYYY-mm-dd HH:MM:SS
latitude	-	(lat)	Degrees
longitude	-	(lon)	Degrees
surface_precip	GPROF Surface Precipitation	(timestep, lat, lon)	mm h^{-1} LWE
surface_frozen	GPROF Frozen Precipitation	(timestep, lat, lon)	mm h^{-1} LWE
rain	GPROF Surface Precipitation (minus) GPROF Frozen Precipitation	(timestep, lat, lon)	mm h^{-1} LWE
temp_2m	GPROF 2-meter temperature	(timestep, lat, lon)	K
sfc_type_flag	Surface Type Flag	(timestep, lat, lon)	0 = ocean 1 = land 2 = mixed
precip_flag	Precipitation Flag	(timestep, lat, lon)	0 = No Precip 1 = Surface Precip 2 = Frozen Precip

AR_flag	Atmospheric River Flag	(timestep, lat, lon)	0 = No AR 1 = AR
RSS_wv	Remote Sensing Systems atmospheric vapor	(timestep, lat, lon)	mm
opass_counts	Overpass Counts	(lat, lon)	-
counts_pr_gr0	Counts of Precip > 0 mm h^{-1}	(lat, lon)	-
counts_pr_gr0p1	Counts of Precip ≥ 0.1 mm h^{-1}	(lat, lon)	-
counts_pr_gr0p5	Counts of Precip ≥ 0.5 mm h^{-1}	(lat, lon)	-
counts_pr_gr1	Counts of Precip ≥ 1.0 mm h^{-1}	(lat, lon)	-
counts_fzn_gr0	Counts of Frozen Precip > 0 mm h^{-1}	(lat, lon)	-
counts_fzn_gr0p1	Counts of Frozen Precip ≥ 0.1 mm h^{-1}	(lat, lon)	-
counts_fzn_gr0p5	Counts of Frozen Precip ≥ 0.5 mm h^{-1}	(lat, lon)	-
counts_fzn_gr1	Counts of Frozen Precip ≥ 1.0 mm h^{-1}	(lat, lon)	-
counts_rn_gr0	Counts of (Surface minus Frozen) Precip > 0 mm h^{-1}	(lat, lon)	-
counts_rn_gr0p1	Counts of (Surface minus Frozen) Precip ≥ 0.1 mm h^{-1}	(lat, lon)	-
counts_rn_gr0p5	Counts of (Surface minus Frozen) Precip	(lat, lon)	-

	≥ 0.5 mm h^{-1}		
counts_rn_gr1	Counts of (Surface minus Frozen) Precip ≥ 1.0 mm h^{-1}	(lat, lon)	-
AR_counts_pr_gr0	Counts of Precip > 0 mm h^{-1} during AR	(lat, lon)	-
AR_counts_pr_gr0p1	Counts of Precip ≥ 0.1 mm h^{-1} during AR	(lat, lon)	-
AR_counts_pr_gr0p5	Counts of Precip ≥ 0.5 mm h^{-1} during AR	(lat, lon)	-
AR_counts_pr_gr1	Counts of Precip ≥ 1.0 mm h^{-1} during AR	(lat, lon)	-
AR_counts_fzn_gr0	Counts of Frozen Precip > 0 mm h^{-1} during AR	(lat, lon)	-
AR_counts_fzn_gr0p1	Counts of Frozen Precip ≥ 0.1 mm h^{-1} during AR	(lat, lon)	-
AR_counts_fzn_gr0p5	Counts of Frozen Precip ≥ 0.5 mm h^{-1} during AR	(lat, lon)	-
AR_counts_fzn_gr1	Counts of Frozen Precip ≥ 1.0 mm h^{-1} during AR	(lat, lon)	-
AR_counts_rn_gr0	Counts of (Surface minus Frozen) Precip > 0 mm h^{-1} during AR	(lat, lon)	-
AR_counts_rn_gr0p1	Counts of (Surface minus Frozen) Precip ≥ 0.1 mm h^{-1} during AR	(lat, lon)	-
AR_counts_rn_gr0p5	Counts of (Surface minus Frozen) Precip	(lat, lon)	-

	≥ 0.5 mm h^{-1} during AR		
AR_counts_rn_gr1	Counts of (Surface minus Frozen) Precip ≥ 1.0 mm h^{-1} during AR	(lat, lon)	-
noAR_counts_pr_gr0	Counts of Precip > 0 mm h^{-1} during No AR	(lat, lon)	-
noAR_counts_pr_gr0p1	Counts of Precip ≥ 0.1 mm h^{-1} during No AR	(lat, lon)	-
noAR_counts_pr_gr0p5	Counts of Precip ≥ 0.5 mm h^{-1} during No AR	(lat, lon)	-
noAR_counts_pr_gr1	Counts of Precip ≥ 1.0 mm h^{-1} during No AR	(lat, lon)	-
noAR_counts_fzn_gr0	Counts of Frozen Precip > 0 mm h^{-1} during No AR	(lat, lon)	-
noAR_counts_fzn_gr0p1	Counts of Frozen Precip ≥ 0.1 mm h^{-1} during No AR	(lat, lon)	-
noAR_counts_fzn_gr0p5	Counts of Frozen Precip ≥ 0.5 mm h^{-1} during No AR	(lat, lon)	-
noAR_counts_fzn_gr1	Counts of Frozen Precip ≥ 1.0 mm h^{-1} during No AR	(lat, lon)	-
noAR_counts_rn_gr0	Counts of (Surface minus Frozen) Precip > 0 mm h^{-1} during No AR	(lat, lon)	-
noAR_counts_rn_gr0p1	Counts of (Surface minus Frozen) Precip ≥ 0.1 mm h^{-1} during No AR	(lat, lon)	-
noAR_counts_rn_gr0p5	Counts of (Surface minus Frozen) Precip	(lat, lon)	-

	≥ 0.5 mm h^{-1} during No AR		
noAR_counts_rn_gr1	Counts of (Surface minus Frozen) Precip ≥ 1.0 mm h^{-1} during No AR	(lat, lon)	-