High Mountain Asia Daily Reach-Scale River Discharge using Data Assimilation, 2004-2019, Version 1

USER GUIDE

How to Cite These Data

As a condition of using these data, you must include a citation:

Flores, J. A., Gleason, C. J., Andrews, L. C., Girotto, M., Kumar, S. V., Lammers, R. B., Maina, F. Z., McLarty, A. R., Proussevitch, A., & Vergopolan, N. 2025. *High Mountain Asia Daily Reach-Scale River Discharge using Data Assimilation, 2004-2019, Version 1*. [Indicate subset used]. Boulder, Colorado USA. NASA National Snow and Ice Data Center Distributed Active Archive Center. https://doi.org/10.5067/YV5A43E2Y1I2. [Date Accessed].

FOR QUESTIONS ABOUT THESE DATA, CONTACT NSIDC@NSIDC.ORG

FOR CURRENT INFORMATION, VISIT https://nsidc.org/data/HMA2_RSRD

National Snow and Ice Data Center

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1 DATA DESCRIPTION

1.1 Summary

This data set reports daily, reach-scale river discharge for 114,147 river reaches in the High Mountain Asia region from 1 January 2004 through 31 December 2019. The data were generated by combining ensemble hydrologic modeling with data assimilation of remotely sensed discharge from Landsat and PlanetScope satellite imagery.

1.2 Parameters

River discharge (m^3/s)
River discharge standard deviation (m^3/s)

1.3 File Information

1.3.1 Format

NetCDF-4

1.3.2 File Contents

Data are provided as a single NetCDF file. Daily discharge and daily discharge standard deviation are stored in 32-bit floating point, 5844 × 114147 arrays, where the first dimension corresponds to time (days since 0001-01-01) and the second to the 114,147 individual river reaches.

The following table describes the variables in the NetCDF file:

Table 1. Variable Names and Descriptions

Variable Name	Description	Dimensions
discharge	Mean daily river discharge (m3/s). Fill value = -9999.0	5,844 × 114,147
discharge_sd	Standard deviation of mean daily river discharge (m3/s), computed using 4 independent model estimates. Provided for each time step as a measure of uncertainty/disagreement among the models. Fill value = -9999.0	5,844 × 114,147

Variable Name	Description	Dimensions
geometry_container	Geometry container variable with the following attributes: grid_mapping = "mapping" geometry_type = "line" node_count = "node_count" node_coordinates = "lon lat"	Scalar variable = 0
lat	Latitude (°N)	9,518,209 × 1
lon	Longitude (°E)	9,518,209 × 1
mapping	Grid mapping variable with a complete description of the coordinate reference system	Scalar variable = 0
node	Dimension scale	—
node_count	Number of coordinate points per river geometry	114,147 × 1
reach_id	Reach ID (MERIT-Basin river network).	114,147 × 1
time	Days since 0001-01-01	5,844 × 1

1.3.3 Naming Convention

This data set consists of a single file:

HMA2_RSRD_2004-2019_daily_discharge_V01.0.nc

1.4 Spatial Information

1.4.1 Coverage

N: 45.975° N

S: 20.0249° N

E: 110.9751° E

W: 60.0249° E

Daily discharge is provided for 114,147 separate river reaches within nine HMA basins: the Syr Darya, Amu Darya, Indus, Ganges-Brahmaputra-Meghna (GBM), Salween, Irrawaddy, Mekong, Yangtze, and Yellow River.

1.4.2 Resolution

Data are provided at reach-scale resolution, where a river "reach" represents a continuous river segment between two points with relatively uniform hydraulic and geomorphic conditions. Each reach is represented as a vector derived from the corresponding river network topology, and as such the spatial resolution depends on river morphology.

River reach length in this data set in general ranges from approximately 1 km to 10 km, with a median length of 6.3 km and a channelization threshold[1] of 25 km^2.

1.4.3 Geolocation

WGS 84 (EPSG:4326)

The "mapping" variable in the NetCDF file (see Table 1) contains a complete description of the coordinate reference system.

1.5 Temporal Information

1.5.1 Coverage

1 January 2004 – 31 December 2019

[1] The channelization threshold is set to constrain the minimum contributing area required to initiate and maintain a stream. Watersheds smaller than this threshold were not included.

1.5.2 Resolution

Daily

1.6 Processing

The approach used for this data set comprises three major components: remotely sensed discharge, runoff modeling, and data assimilation of the remotely sensed discharge within a daily river routing scheme.

Landsat optical imagery was utilized for downstream rivers >30 meters wide; PlanetScope imagery was only utilized for narrow (<10 m wide), upstream proglacial rivers based on its documented performance in this range. Rivers between 10 m and 30 m were not observed. Data assimilation was performed on the Landsat and PlanetScope imagery using a Local Ensemble Transform Kalman Filter.

Gridded runoff was modeled using the Noah-Multiparameterization Land Surface Model (Noah-MP LSM); the Water Balance Model (WBM), the NOAA Geophysical Fluid Dynamics Laboratory Earth System Model (NOAA GFDL-ESM), and Global Reach-level Flood Reanalysis (GRFR; Y. Yang et al., 2021).

Hydrography was obtained from MERIT-Basins (Lin et al. 2019; Yamazaki et al., 2019), a global vector hydrography database which includes 114,147 river reaches with the nine HMA basins listed in "Section 1.4.1 | Spatial Information | Coverage." In addition, 1,676 planned and existing dams were identified for the river reaches within the study domain. The Randolph Glacier Inventory, Version 7 was used to locate 62,632 glaciers that deliver meltwater to downstream HMA river systems and to define the parameters used for glacier melt.

For a complete description of the approach, see Flores et al., 2025.

1.7 Quality, Errors, and Limitations

See "Section 4.4 | Uncertainties and Limitations" in Flores et al, 2025.

2 VERSION HISTORY

Version 1 (initial release)

3 REFERENCES

Flores, J. A., Gleason, C. J., Brown, C., Vergopolan, N., Lummus, M. M., Stearns, L. A., Li, D., Andrews, L. C., Basnyat, D., Brinkerhoff, C. B., Ducusin, R., Feng, D., Friedmann, E., He, X., Girotto, M., Kumar, S. V., Lammers, R. B., Lamsal, G., Maina, F. Z., … Wang, J. (2025). Accelerating River Discharge in High Mountain Asia. AGU Advances, 6(4). https://doi.org/10.1029/2024av001586

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4 DOCUMENT INFORMATION

4.1 Publication Date

December 2025

4.2 Date Last Updated

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