



# High Mountain Asia GFDL FLOR Modeled Extreme Precipitation Indices, Version 1

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## USER GUIDE

### How to Cite These Data

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

Kirschbaum, D. B., T. A. Stanley, S. Kapnick, and S. Pascale. 2018. *High Mountain Asia GFDL FLOR Modeled Extreme Precipitation Indices, Version 1*. [Indicate subset used]. Boulder, Colorado USA.

NASA National Snow and Ice Data Center Distributed Active Archive Center.

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FOR QUESTIONS ABOUT THESE DATA, CONTACT [NSIDC@NSIDC.ORG](mailto:NSIDC@NSIDC.ORG)

FOR CURRENT INFORMATION, VISIT [https://nsidc.org/data/HMA\\_Precip\\_FLOR](https://nsidc.org/data/HMA_Precip_FLOR)



National Snow and Ice Data Center

# TABLE OF CONTENTS

1	DATA DESCRIPTION.....	2
1.1	Parameters .....	2
1.2	File Information .....	2
1.2.1	Format .....	2
1.2.2	Naming Convention .....	3
1.3	Spatial Information .....	3
1.3.1	Coverage .....	3
1.3.2	Resolution.....	4
1.3.3	Geolocation .....	4
1.4	Temporal Information.....	4
1.4.1	Coverage .....	4
1.4.2	Resolution.....	4
2	DATA ACQUISITION AND PROCESSING .....	4
2.1	Background.....	4
2.2	Acquisition .....	5
2.3	Processing .....	5
2.4	Quality, Errors, and Limitations .....	5
2.5	Instrumentation .....	5
3	SOFTWARE AND TOOLS.....	5
4	RELATED DATA SETS .....	5
5	RELATED WEBSITES.....	6
6	CONTACTS .....	6
7	ACKNOWLEDGMENTS .....	6
8	REFERENCES .....	6
9	DOCUMENT INFORMATION.....	7
9.1	Publication Date.....	7
9.2	Date Last Updated .....	7

# 1 DATA DESCRIPTION

The data presented in this data set are modeled precipitation estimates and cover the Himalayan region at a spatial resolution of  $0.625^{\circ} \times 0.5^{\circ}$ .

This data set is closely related to the *High Mountain Asia TRMM-derived 3B42 Extreme Precipitation Indices, Version 1* data set, which features the same seven extreme precipitation indices. However, the TRMM-derived data were calculated from 3B42 Version 7 daily satellite precipitation estimates and cover an equatorial band from  $50^{\circ}$  N to  $50^{\circ}$  S at a spatial resolution of  $0.25^{\circ} \times 0.25^{\circ}$ .

## 1.1 Parameters

The seven annual extreme precipitation indices are described in Table 1. Parameters represent yearly precipitation maximums (Rx1day, Rx5day), precipitation frequencies (R10mm, R20mm), length of precipitation events (CWD), and precipitation totals (R95pTOT, R99pTOT).

Table 1. Parameter Descriptions

Parameter	Description	Units
Rx1day	Maximum 1-day precipitation	mm
Rx5day	Maximum precipitation to fall over a consecutive 5-day period	mm
R10mm	Number of days in which more than 10 mm of precipitation fell	Days
R20mm	Number of days in which more than 20 mm of precipitation fell	Days
CWD	Longest number of consecutive days with precipitation greater than 1 mm	Days
R95pTOT	Sum of precipitation from all days that exceed the 95th percentile of precipitation; precipitation percentiles calculated based on 3B42 observations between 1999 and 2017	mm
R99pTOT	Sum of precipitation from all days that exceed the 99th percentile of precipitation; precipitation percentiles calculated based on 3B42 observations between 1999 and 2017	m

## 1.2 File Information

### 1.2.1 Format

The data files are provided in TIFF (.tif) format, represented as 64-bit floating point values.

Each data file is paired with an associated XML file (.xml), which contains additional metadata.

## 1.2.2 Naming Convention

The data files are organized in chronological order. Each file name contains the precipitation index and the year for that file. Example file names include:

HMA\_Precip\_FLOR\_CWD\_2000.tif

HMA\_Precip\_FLOR\_CWD\_2000.tif.xml

The files are named according to the following convention, which is described in Table 2:

HMA\_Precip\_FLOR\_index\_YYYY.ext

Table 2. File Naming Convention

Variable	Description
HMA_Precip_FLOR	Short name for High Mountain Asia GFDL FLOR Modeled Extreme Precipitation Indices
index	Precipitation index: <ul style="list-style-type: none"> <li>• Rx1day</li> <li>• Rx5day</li> <li>• R10mm</li> <li>• R20mm</li> <li>• CWD</li> <li>• R95pTOT</li> <li>• R99pTOT</li> </ul>
YYYY	Four-digit survey year
.ext	Indicates file type: <ul style="list-style-type: none"> <li>• .tif = TIFF data file</li> <li>• .tif.xml = XML metadata file</li> </ul>

## 1.3 Spatial Information

### 1.3.1 Coverage

Spatial coverage includes the Himalayas, as noted by the spatial extents below.

Northernmost latitude: 50.5° N

Southernmost latitude 0.5° S

Easternmost longitude: 125.625° E

Westernmost longitude: 34.375° E

## 1.3.2 Resolution

The model's horizontal resolution is 0.625° (x-direction, longitude) by 0.5° (y-direction, latitude).

## 1.3.3 Geolocation

Table 3 provides geolocation information for this data set.

Table 3. Geolocation Details

<b>Geographic coordinate system</b>	WGS 84
<b>EPSG code</b>	4326
<b>PROJ4 string</b>	+proj=longlat +datum=WGS84 +no_defs
<b>Reference</b>	<a href="https://epsg.io/4326">https://epsg.io/4326</a>

## 1.4 Temporal Information

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### 1.4.1 Coverage

01 January 2000 to 31 December 2016

### 1.4.2 Resolution

Yearly

## 2 DATA ACQUISITION AND PROCESSING

### 2.1 Background

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This data set features 7 extreme precipitation indices (Table 1) selected from the 27 climate indices established by the joint CCI/CLIVAR/JCOMM Expert Team (ET) on Climate Change Detection and Indices (ETCDDI). These seven factors can provide insight into the future of rainfall-triggered natural hazards, such as landslides, in High Mountain Asia. Landslides are a particular concern in this region due to the frequency with which deadly events occur; the Himalayan Mountains' stark relief combined with heavy monsoon rainfalls and occasional seismicity result in a region with a high risk of landslides.

## 2.2 Acquisition

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The data were derived from a Global Climate Model (GCM), specifically the Geophysical Fluid Dynamics Laboratory (GFDL) Forecast-oriented Low Ocean Resolution of the CM2.5 (CM2.5-FLOR or FLOR) model. See the Instrumentation section for more information on GFDL FLOR.

## 2.3 Processing

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The precipitation data were summarized into annual ETCCDI indices in R using the `climdex.pcic` library.

## 2.4 Quality, Errors, and Limitations

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The precipitation indices in this data set have not been evaluated for error against an absolute reference. However, the methods used to generate the indices are well defined; thus, any errors in the values of the indices reflect errors in the underlying precipitation data.

## 2.5 Instrumentation

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GFDL FLOR is descended from CM2.5 and CM2.1; it combines the higher horizontal resolution in the atmosphere and land, higher vertical resolution in the atmosphere, and significantly improved land model of CM2.5 with the relatively low-resolution ocean and sea ice components of CM2.1. GFDL FLOR accurately simulates continental hydroclimate, including extreme precipitation trends in High Mountain Asia.

The original FLOR simulations are described in more detail in Yang et al. (2018).

## 3 SOFTWARE AND TOOLS

The climate indices were calculated in R using the `climdex.pcic` library. More details can be found on the [climdex.PCIC CRAN repository](#) or the [Pacific Climate Impacts Consortium](#) website.

## 4 RELATED DATA SETS

[High Mountain Asia TRMM-derived 3B42 Extreme Precipitation Indices](#)

[High Mountain Asia at NSIDC | Data Sets](#)

## 5 RELATED WEBSITES

[High Mountain Asia at NSIDC | Overview](#)

[GFDL Global Climate Models, CM2.5 and FLOR](#)

[NASA High Mountain Asia Project](#)

[NASA Research Announcement: Understanding Changes in High Mountain Asia](#)

[GLIMS: Global Land Ice Measurements from Space](#)

## 6 CONTACTS

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## 7 ACKNOWLEDGMENTS

The original FLOR simulations were produced by X. Yang and are described in Yang et al. (2018).

## 8 REFERENCES

Yang, X., Jia, L., Kapnick, S. B., Delworth, T. L., Vecchi, G. A., Gudgel, R., ... Zeng, F. (2018). On the seasonal prediction of the western United States El Niño precipitation pattern during the 2015/16 winter. *Climate Dynamics*, 51(9–10), 3765–3783. <https://doi.org/10.1007/s00382-018-4109-3>

## 9 DOCUMENT INFORMATION

### 9.1 Publication Date

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