High Mountain Asia COAWST Monthly 4km Regional Climate Model Simulations, Version 1

USER GUIDE

How to Cite These Data

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

Osmanoglu, B. and S. D. Nicholls. 2020. *High Mountain Asia COAWST Monthly 4km Regional Climate Model Simulations, Version 1.* [Indicate subset used]. Boulder, Colorado USA. NASA National Snow and Ice Data Center Distributed Active Archive Center. https://doi.org/10.5067/W2O7VL8G25BS. [Date Accessed].

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

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

National Snow and Ice Data Center

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1 DATA DESCRIPTION

This data product is closely related to the *High Mountain Asia COAWST Daily 4km Regional Climate Model Simulations*, *High Mountain Asia COAWST 6-Hourly 4km Regional Climate Model Simulations*, and *High Mountain Asia COAWST Hourly 4km Regional Climate Model Simulations* data products, which provide the same model output at different temporal resolutions.

NOTE: The model output in this data product should not be used to validate specific weather events or the exact weather conditions within a particular year, as the simulation only spans 15 years and its lateral boundary conditions were only updated after initialization. Instead, these modeled data are best used to study diurnal variability, seasonality, water resource use, or interannual variability.

1.1 Parameters

The data files include modeled variables such as precipitation, moisture, snow cover, temperature, wind speed, surface radiation fluxes, and ocean states from the Weather Research and Forecasting (WRF) – Advanced Research WRF (WRF-ARW) atmospheric model and the Regional Ocean Modeling System (ROMS). A complete list of variables and associated metadata can be obtained via the ncks or ncdump utilities.

1.2 File Information

1.2.1 Format

The data files are provided in netCDF-4 (.nc) format.

1.2.2 Naming Convention

The file names within this monthly data product communicate the source model, the associated model domain, and the time frame associated with the data. Example file names include:

HMA_RCMO_M_wrfout_d01_Monthly_1999100100-1999103123.nc
HMA_RCMO_M_wrfout_d01_Monthly3D_1999100100-1999103118.nc
HMA_RCMO_M_wrfout_d021_Monthly_1999100100-1999103123.nc
HMA_RCMO_M_wrfout_d02_Monthly_1999100100-1999103123.nc
HMA_RCMO_M_romsout_d01_Monthly_1999100100-1999103118.nc

The data files are named according to the following convention, which is described in Table 1:

HMA_RCMO_M_model_dmn_res_YYYYMMDDHH-yyyymmddhh.ext

Table 1. File Naming Convention

File Designator	Description
HMA_RCMO_M	Data set ID
model	Indicates output from the WRF atmospheric model (wrfout) or ROMS ocean model (romsout), respectively.
dmn	Indicates the model domain: • d01: 20-km parent model grid • d02: 4-km nested ("child") model grid • d021: 20-km model grid interpolated from the 4-km nested grid. **Note:** There are no d02 or d021 files from ROMS because it was operated only at a 20-km grid spacing.
res	Temporal resolution indicating monthly averaged data. **Note:** The 2D and 3D ROMS data are provided in the same file. The WRF data are separated into 2D and 3D files. The 3D WRF files are indicated by "3D" in the file names.
YYYYMMDDHH-yyyymmddhh	Range of dates (in UTC) used to generate the data. **Note:** Each file will only contain one time period because it represents the monthly average or monthly accumulation of the variables contained within.
.ext	File extension: netCDF-4 data file (.nc) or XML metadata file (.nc.xml)

1.3 Spatial Information

1.3.1 Coverage

The four corner coordinates of the outer model grid are as follows:

Upper left: 46.34996˚ N, 54.743225˚ E

Upper right: 46.34996˚ N, 120.831604˚ E

Lower left: 20.96392˚ N, 54.743225˚ E

Lower right: 20.96392˚ N, 115.256775˚ E

1.3.2 Resolution

WRF atmospheric model:

1) 20-km grid spacing ("d01")

2) 4-km grid spacing ("d02")

3) 20-km grid spacing interpolated from 4-km grid spacing model domain ("d021")

ROMS oceanic model:

1) 20-km grid spacing ("d01")

1.3.3 Geolocation

The WRF model assumes a spherical rather than an oblate spheroidal Earth, which can create some discrepancies when projected to a specific datum. The exact parameters needed to make the natural WRF spherical coordinate system compatible with the Geospatial Data Abstraction Library (GDAL) are listed in Table 2.

Table 2. Geolocation Details

Coordinate Reference System	WGS 84
Datum	unknown
Spheroid	Unspecified spheroid with Earth radius of 6,370,000 m
Prime Meridian	Greenwich
Central/Standard Meridian	85° E
Standard Parallel 1	0° N
Standard Parallel 2	15° N
Latitude of Origin	15° N
False Easting	3540000.00000 meters
False Northing	3990000.00000 meters
Lambert Conformal Conic GeoTransform	"0.00000 20000 0 0.00000 0 20000"
PROJ.4 String	+proj=lcc +a=6370000 +b=6370000 +lon_0=85 +lat_1=0 +lat_2=15 +lat_ts=15 +x_0=3540000 +y_0=3990000 +ellps=sphere

1.4 Temporal Information

1.4.1 Coverage

The model simulations start on 01 October 1999 and run through 30 September 2014.

1.4.2 Resolution

Monthly

2 INSTRUMENTATION

The COAWST modeling system facilitates a two-way coupling between the Weather Research and Forecasting (WRF) – Advanced Research WRF (WRF-ARW) atmospheric model and the Regional Ocean Modeling System (ROMS) and is operated in a free-running state (i.e., lateral boundary

conditions are only updated after initialization). Unlike with previous High Mountain Asia studies, COAWST was run at a sufficiently high spatiotemporal data resolution (4-km grid spacing and 12-second time steps) to simulate convective systems explicitly.

The COAWST modeling system was run on NASA high-end computing resources and its output was written directly to main file storage system in netCDF-4 format. No special data collection methods, instrument data, or sensors data were applied or utilized to create the data in this repository.

3 DATA ACQUISITION AND PROCESSING

3.1 Input Data

The initial state and lateral boundary conditions for WRF and ROMS utilized global model analysis and reanalysis products. WRF atmosphere data were derived from the Modern-Era Retrospect Analysis for Research and Applications, Version 2 (MERRA-2) data products, which are produced on a regular 0.625° by 0.5° latitude-longitude grid. ROMS utilized the Hybrid Coordinate Ocean Model (HyCOM) Global Reanalysis at 1/12˚ (before 2013) and Hybrid Coordinate Ocean Model (HyCOM) Global Analysis at 1/12˚ (after 2013). MERRA-2 was selected due to its favorable comparison to similar reanalysis products, whereas HyCOM offers high-resolution data and has been commonly leveraged in COAWST research studies.

3.2 Processing Steps

Both the MERRA-2 and HyCOM input data required some initial preprocessing so that they could be used as input data for WRF and ROMS. MERRA-2 was processed through an internally developed Python script, which first extracted the required state variables (e.g., temperature, water vapor, geopotential heights) and then converted them from a netCDF-4 to a Grib1 format, as required by the WRF preprocessing system. HyCOM data were interpolated from the native model grid to the 20-km grid spacing used by COAWST for each daily file, temporally averaged or accumulated to create a single input, and saved in a ROMS-legible netCDF-4 file.

3.3 Quality, Errors, and Limitations

Not applicable for this modeled data product.

4 SOFTWARE AND TOOLS

The data files can be opened using software for netCDF visualization, such as Panoply or HDFView.

5 RELATED DATA SETS

High Mountain Asia at NSIDC | Data Sets
High Mountain Asia COAWST Daily 4km Regional Climate Model Simulations
High Mountain Asia COAWST 6-Hourly 4km Regional Climate Model Simulations
High Mountain Asia COAWST Hourly 4km Regional Climate Model Simulations

6 RELATED WEBSITES

High Mountain Asia at NSIDC | Overview
NASA High Mountain Asia Project
HiMAT COAWST project page on GitHub
COAWST model information
WRF model information
ROMS model information

7 CONTACTS

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8 ACKNOWLEDGMENTS

The data producers acknowledge the following entities: Understanding Changes in High Mountain Asia Program, which funded the project proposal and the data producers' work effort; NASA High-End Computing, the system that provided technical support and upon which the COAWST model was run; and NASA Advanced Data Analytics PlaTform (ADAPT), which allowed the data producers to share the COAWST data with their team. The data producers also thank the High Mountain Asia project managers, Tom Wagner and Jared Entin (NASA Headquarters), as well as the head architect of the COAWST project, John Warner (USGS). Finally, the data producers acknowledge Bruce Raup and the HMA team at the NSIDC DAAC for hosting the COAWST data and making them publicly available.

9 DOCUMENT INFORMATION

9.1 Publication Date

15 October 2020

9.2 Date Last Updated

07 December 2020