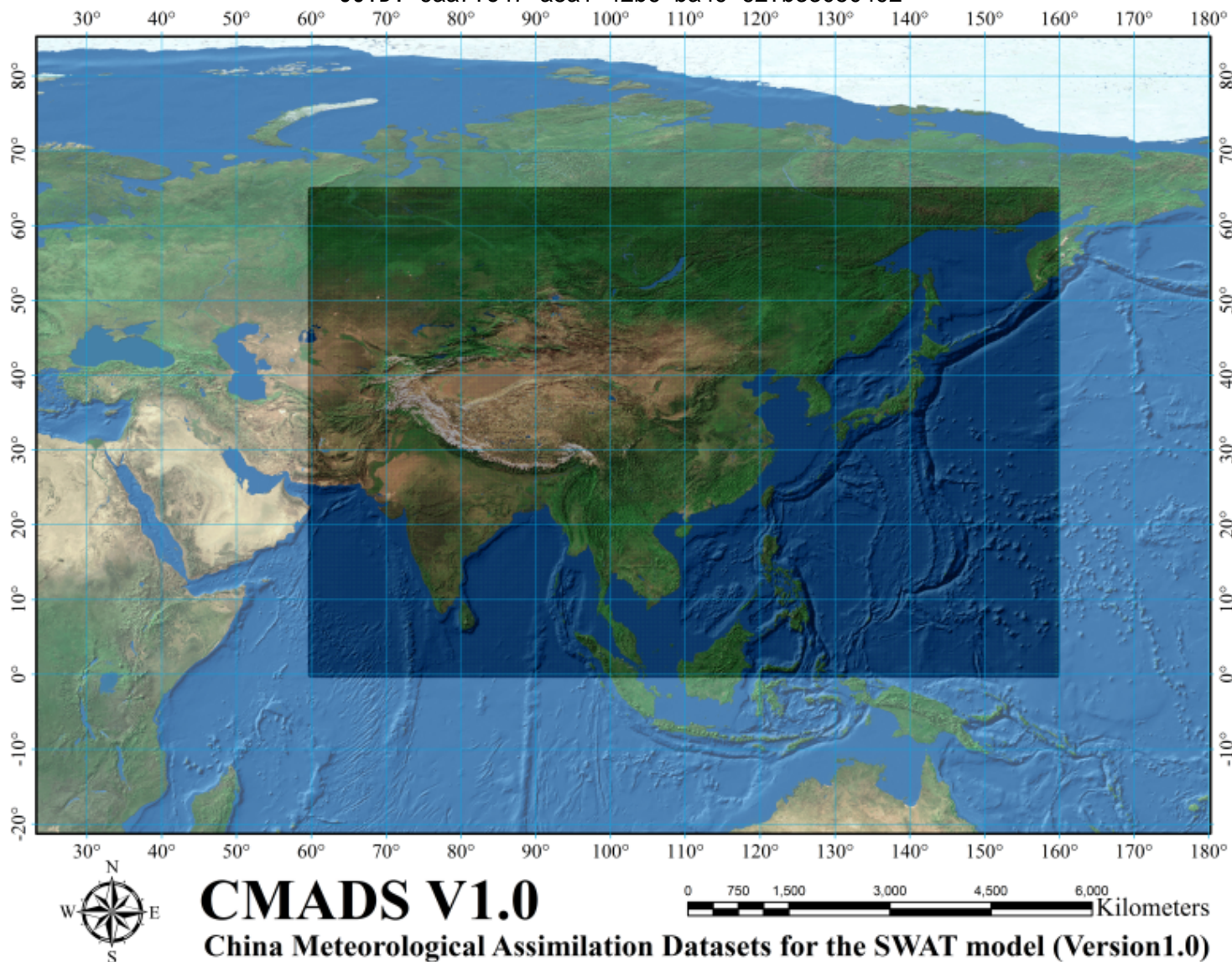




Cold and Arid Regions Science Data Center

# China Meteorological Assimilation Driving Datasets for the SWAT model Version 1.0

UUID: 6aa7fe47-a8a1-42b6-ba49-62fb33050492



## Abstract

The China Meteorological Assimilation Driving Datasets (CMADS) incorporates technologies of the China Land Data Assimilation System (CLDAS) developed by the China Meteorological Administration. It was constructed using multiple technologies and scientific methods, including loop nesting of data, projection of resampling models, and bilinear interpolation. The CMADS series of datasets can be used to drive various hydrological models, such as SWAT, the Variable Infiltration Capacity (VIC) model, and the Storm Water Management model (SWMM). It also allows users to conveniently extract a wide range of meteorological elements for detailed climatic analyses. Data sources for the CMADS series include nearly 40,000 regional automatic stations under China's 2,421 national automatic and business assessment centres. This ensures that the CMADS datasets have wide applicability within the country, and that data accuracy was vastly improved.

The CMADS series of datasets has undergone finishing and correction to match the specific format of input and driving data of SWAT models. This reduces the volume of complex work that model builders have to deal with. An index table of the various elements encompassing all of East Asia was also established for SWAT models. This allows the models to utilize the datasets directly, thus eliminating the need for any format conversion or calculations using weather generators. Consequently, significant improvements to the modelling speed and output accuracy of SWAT models were achieved.

Most of the source data in the CMADS datasets are derived from CLDAS in China and other reanalysis data in the world. The integration of air temperature, air pressure, humidity, and wind velocity data was mainly achieved through the LAPS/STMAS system. Precipitation data were stitched using CMORPH's global precipitation products and the National Meteorological Information Center's data of China (which is based on CMORPH's integrated precipitation products). The latter contains daily precipitation records observed at 2,400 national meteorological stations and the CMORPH satellite's inversion precipitation products. The inversion algorithm for incoming solar radiation at the ground surface makes use of the discrete longitudinal method by Stamnes et al.(1988) to calculate radiation transmission. The resolutions for CMADS V1.0, V1.1, V1.2, and V1.3 were  $1/3^\circ$ ,  $1/4^\circ$ ,  $1/8^\circ$ , and  $1/16^\circ$ , respectively.

In CMADS V1.0 (at a spatial resolution of  $1/3^\circ$ ), East Asia was spatially divided into  $195 \times 300$  grid points containing 58,500 stations. Despite being at the same spatial resolution as CMADS V1.0, CMADS V1.1 contains more data, with  $260 \times 400$  grid points containing 104,000 stations. For both versions, the stations' daily data include average solar radiation, average temperature, average pressure, maximum and minimum temperature, specific humidity, cumulative precipitation, and average wind velocity.

The CMADS comprises other variables for any hydrological model (under 'For-other-model' folder): Daily Average Temperature, Daily Maximum Temperature, Daily Minimum Temperature, Daily cumulative precipitation (20-20h), Daily average Relative Humidity, Daily average Specific Humidity, Daily average Solar Radiation, Daily average Wind, and Daily average Atmospheric Pressure.

## Introduction to metadata of CMADS

CMADS storage path description:(CMADS was divided into two datasets)

- 1.CMADS-V1.0\For-swat\ --specifically driving the SWAT model
- 2.CMADS-V1.0\For-other-model\ --specifically driving the other hydrological model(VIC,SWMM,etc.)

CMADS--\For-swat-2009\ folder contain:(Station\ and Fork\)

1).Station\

Relative-Humidity-58500\ Daily average relative humidity(fraction)

Precipitation-58500\ Daily accumulated 24-hour precipitation(mm)

Solar radiation-58500\ Daily average solar radiation(MJ/m2)

Temperature-58500\ Daily maximum and minimum temperature( )

Wind-58500\ Daily average wind speed(m/s)

Where R, P, S, T, W+ dimensional grid number - the number of longitude grid is the station in the above five

folders respectively.(Where R,P,S,T,W respective Daily average relative humidity,Daily cumulative

precipitation(24h),Daily mean solar radiation(MJ/m2),Daily maximum and minimum temperature( ) and Daily mean

wind speed (m/s)) respectively.Data format is (.dbf)

2).Fork\ (Station index table over East Asia)

PCPFORK.txt (Precipitation index table)

RHFORK.txt (Relative humidity index table)

SORFORK.txt (Solar radiation index table)

TMPFORK.txt (Temperature index table)

WINDFORK.txt (Wind speed index)

CMADS--\For-swat-2012\ folder contain:(Station\ and Fork\ ) Storage structure is consistency with \For-swat-

2009\ .However, all the data in this directory are only available in TXT format and can be readed by SWAT2012.

3)\For-other-model\ (Includes all weather input data required by the any hydrologic model (daily).)

Atmospheric-Pressure-txt\ Daily average atmospheric pressure(hPa)

Average-Temperature-txt\ Daily average temperature( )

Maximum-Temperature-txt\ Daily maximum temperature( )

Minimum-Temperature-txt\ Daily minimum temperature( )

Precipitation-txt\ Daily accumulated 24-hour precipitation (mm)

Relative-Humidity-txt\ Daily average relative humidity(fraction)

Solar-Radiation-txt\ Daily average solar radiation(MJ/m2)

Specific-Humidity-txt\ Daily average Specific Humidity(g/kg)

Wind-txt\ Daily average wind speed(m/s)

Data storage information: data set storage format is .dbf and .txt

Other data information:

Total data: 33.6GB

Occupied space: 35.2GB

Time: From year 2008 to year 2016

Time resolution: Daily

Geographical scope description: East Asia

Longitude: 60 ° E

The most east longitude: 160 ° E

North latitude: 65 ° N

Most southern latitude: 0 ° N

Number of stations: 58500 stations

Spatial resolution:  $1/3 * 1/3$  \* grid points

Vertical range: None

The main production and other contributions: Meng Xianyong, Wang Hao, Lei Xiaohui, Liu Shiyin, Liu Zhihui, Shi Chunxiang, Cai Yu, Hu Jiajun, Zhang Xuesong, Long Aihua, Chen Xi, Yin Gang, Bai Lei, Zhang Tao, Liao Weihong, Yang Mingxiang, Zhao Honggang, Zhao Qiudong, well, Ji Xiaonan, Wu Hongjing, Zheng Bin, Cao Kaijun

China Institute of Water Resources and Hydropower Research

National Meteorological Information Center, China Meteorological Administration

Cold and Arid Regions Environmental and Engineering Research Institute, Chinese Academy of Sciences

Xinjiang University

Pacific Northwest National Laboratory

University of Maryland

Jiangxi Meteorological Information Center

Xinjiang Institute of ecology and geography, Chinese Academy of Sciences

memorial university of newfoundland

Pearl River water conservancy comprehensive technology center

#### Keywords

Theme: Atmospheric data assimilation, SWAT, Meteorological and hydrology,  
Place: East & South East Asia,  
Temporal: 2008-01-01 to 2016-12-31,  
Discipline: Geographic science, hydrology, meteorology,  
Statrum:

#### ISO 19115 Category

Category: climatologyMeteorologyAtmosphere

#### Detail

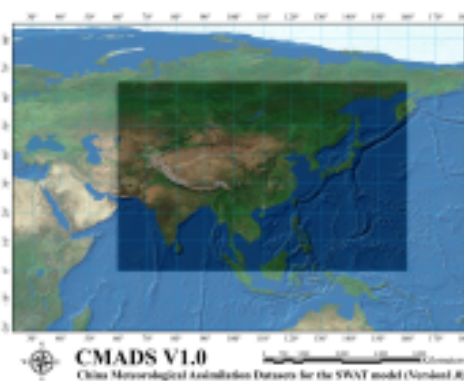
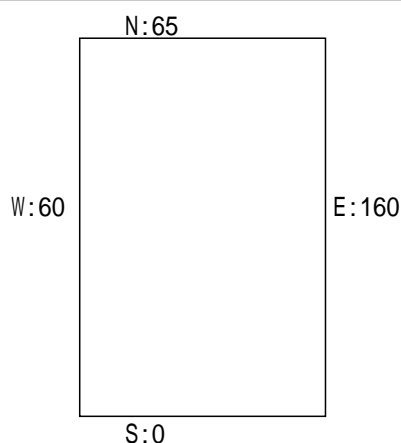
Scale: 10000

Project:

Data Volume(MB): 35200

Data Format: text and dbf

#### Position and Thumbnail



#### Temporal Range

Start: 2008-01-01

End: 2016-12-31

#### Citation

1. Meng, X.; Wang, H.; Cai, S.; Zhang, X.; Leng, G.; Lei, X.; Shi, C.; Liu, S.; Shang, Y. The China Meteorological Assimilation Driving Datasets for the SWAT Model (CMADS) Application in China: A Case Study in Heihe River Basin. Preprints 2016, 2016120091 (doi: 10.20944/preprints201612.0091.v2).
2. Meng, X.Y., Wang, H., Lei, X.H., Cai, S.Y., Wu, H.J. (2017). Hydrological Modeling in the Manas River Basin Using Soil and Water Assessment Tool Driven by CMADS. Tehnicki Vjesnik - Technical Gazette, 24, (2), 525-534. DOI: 10.17559/TV-20170108133334
3. 孟现勇, 师春香, 刘时银, 王浩, 雷晓辉, 刘志辉, 吉晓楠, 蔡思宇, 赵求东. CMADS数据集及其在流域水文模型中的驱动作用——以黑河流域为例[J]. 人民珠江, 2016, 37(7): 1-19.
4. Shi C X, Xie Z H, Qian H, et al. China land soil moisture EnKF data assimilation based on satellite remote sensing data. Sci China Earth Sci, 2011, doi: 10.1007/s11430-010-4160-3.

#### Recommended Publications

1. 孟现勇, 吉晓楠, 刘志辉等. SWAT模型融雪模块的改进与应用研究[J]. 自然资源学报. 2014. 29(3): 528-539.
2. 孟现勇, 王浩, 等. 基于CMDAS驱动SWAT模式的精博河流域水文相关分量模拟、验证及分析[J]. 生态学报, 2017. 39(3) DOI: 10.5846/stxb201608231719.
3. 孟现勇, 王浩等. 基于CLDAS强迫CLM3.5模式的新疆区域土壤温度陆面过程模拟及验证[J]. 生态学报. 2017, 37(3), 979-995. DOI: 10.5846/stxb201508171717.
4. 孟现勇, 王浩等. XJLDAS同化驱动场及其强迫CLM3.5模式的新疆区域土壤湿度陆面过程模拟及验证[J]. 生态学报. 2017, 40(5). DOI: 10.5846/stxb201608241728.
5. 张涛, 2013. 基于LAPS/STMAS的多源资料融合及应用研究[M]. 硕士学位论文, 南京: 南京信息工程大学.
6. 师春香, 谢正辉. 2008, 基于静止气象卫星观测的降水时间尺度研究[J]. 地理科学进展, 27(4): 15-22.
7. 任芝花, 熊安元. 地面自动站观测资料三级质量控制业务系统的研制[J]. 气象, 2007, (01): 19-24.
8. 游然, 卢乃锰: FY-2C 卫星降水估计产品 <http://satellite.cma.gov.cn>.
9. Meng, X.Y., Yu, D.L., LIU, Z.H. (2015). Energy Balance-Based SWAT Model to Simulate the Mountain Snowmelt and Runoff - Taking the Application in Juntanghu Watershed (China) as an Example. Journal of Mountain Sciences, 12(2), 368-381. DOI: 10.1007/s11629-014-3081-6.
10. Meng, X.Y\*. (2016). Snowmelt Runoff Analysis Under Generated Climate Change Scenarios for the Juntanghu River Basin in Xinjiang, China. Tecnología y Ciencias del Agua, (4), 41-54.

#### DOI

10.3972/westdc.001.2016.db

#### Funding

This work was supported by the Ministry of science and technology infrastructure projects (2013FY111400), National Natural Science Fund Project (4113064141190084), 12th Five-Year science and technology support program -- the East Route Project of South to North Water Diversion Project in the operation and management of key technology research and demonstration (2015BAB07B03), national and international scientific and technological cooperation project "multi-source data fusion precipitation and soil water research" (2011DFG23150) as well as public welfare industry (meteorological) study on Fusion Technology Research Projects - Multi-source soil moisture data (GYHY201306045).

#### Limitation

1. Respect for the protection of intellectual property rights and the interests of the author, the extended data data center service, evaluation of potential data, please data users in the research results generated using the data (including published papers, data products and unpublished research reports, data products and achievements), indicate the source of data author and data. For reprint (two or more times) data, the author must indicate the original data source.

#### Online Resources

1. <http://card.westgis.ac.cn> <ftp://ftp2.westgis.ac.cn/>

## Contacts

### 1. Author

Meng Xianyong Organization: State Key Laboratory of Simulation and Regulation of Water Cycle in River Basin & China Institute of Water Resources and Hydropower Research  
Address: China Beijing No.1 Yuyuantan South Road, Haidian District  
Zip code: 100044 Phone: 010-68785706 Email: mxy@iwhr.com

### 2. Distributor

Cold and Arid Regions Science Data Center at Lanzhou (CARD) Organization: Cold and Arid Regions Environmental and Engineering Research Institute, Chinese Academy of Sciences  
Address: China Lanzhou No. 320 Donggang West Road  
Zip code: 730000 Phone: 0931-4967287 Email: westdc@lzb.ac.cn

### 3. Process

Meng Xianyong Organization: State Key Laboratory of Simulation and Regulation of Water Cycle in River Basin & China Institute of Water Resources and Hydropower Research  
Address: China Beijing No.1 Yuyuantan South Road, Haidian District  
Zip code: 100044 Phone: 010-68785706 Email: mxy@iwhr.com

### 4. Process

Wang Hao Organization: State Key Laboratory of Simulation and Regulation of Water Cycle in River Basin & China Institute of Water Resources and Hydropower Research  
Address: China Beijing No.1 Yuyuantan South Road, Haidian District  
Zip code: 100044 Phone: Email: wanghao@iwhr.com

### 5. Process

Lei Xiaohui Organization: State Key Laboratory of Simulation and Regulation of Water Cycle in River Basin & China Institute of Water Resources and Hydropower Research  
Address: China Beijing No.1 Yuyuantan South Road, Haidian District  
Zip code: 100044 Phone: Email:

### 6. Process

Shi Chunxiang Organization: China Meteorological Administration  
Address: China Beijing No.46, Zhongguancun South Street, Haidian District  
Zip code: 100000 Phone: Email:

### 7. Resource Provider

Meng Xianyong Organization: State Key Laboratory of Simulation and Regulation of Water Cycle in River Basin & China Institute of Water Resources and Hydropower Research  
Address: China Beijing No.1 Yuyuantan South Road, Haidian District  
Zip code: 100044 Phone: 010-68785706 Email: mxy@iwhr.com