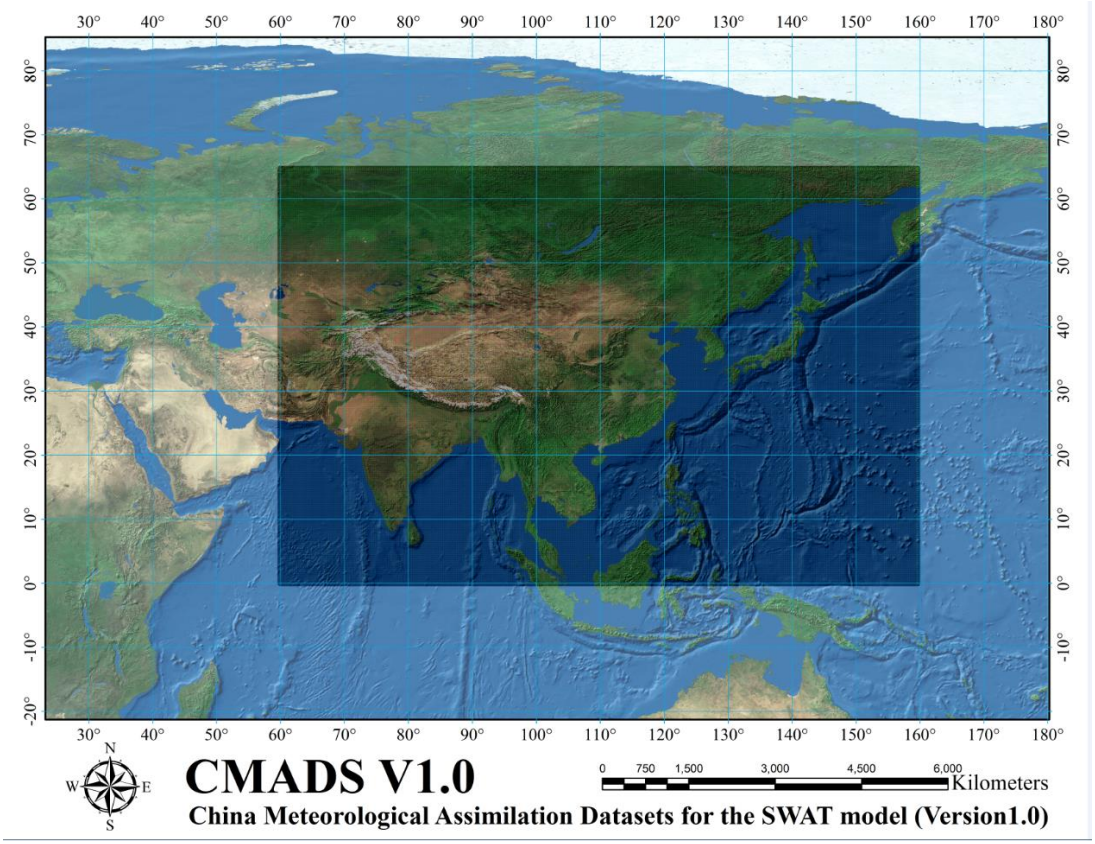
How to use the China Meteorological Assimilation Driving Datasets for the SWAT model (CMADS)



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The China Meteorological Assimilation Driving Datasets for the SWAT model (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°, 1/4°, 1/8°, and 1/16°, respectively.

The China Meteorological Assimilation Driving Datasets (CMADS) was completed over the 9-year period of 2008.01.01 through 2016.12.31. The current CMADS will be extended as real time product in the future.

Download CMADS data

This website allows you to download CMADS data in SWAT file format for a given location and time period. In CMADS V1.0 (at a spatial resolution of 1/3°), East Asia was spatially divided into 195 × 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 × 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. You can download it on http://swat.tamu.edu/software/links/.

How to extract the station you need in CMADS

1. Download CMADS.7z and Find out the CMADSV1.0-station.zip in CMADS folder, open CMADSV1.0.mxd using Arcmap. (The initial geographic coordinates of the map are: GCS_WGS_1984 Datum: D_WGS_1984)

   We selected Ebinur lake as research area and add map (See Figure. 1).

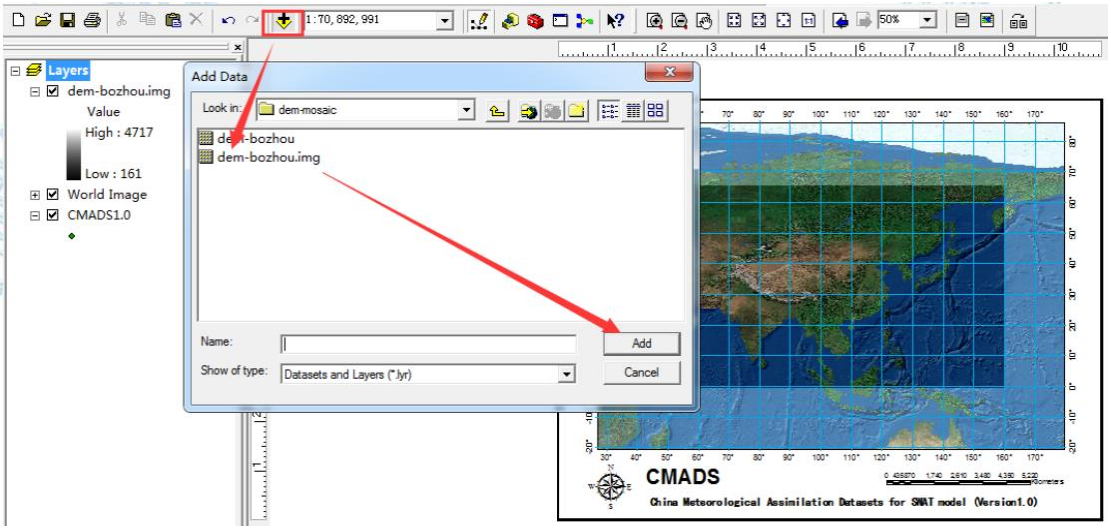

Figure. 1 Add map

2.Click the zoom button to enlarge the target area (Because the site is too much, you'd better click the zoom button, so that the machine can read the station more smoother, Of course, Before zoom operation, don't forget to remove the check mark of theCMADS1.0 check box)(See Figure. 2).

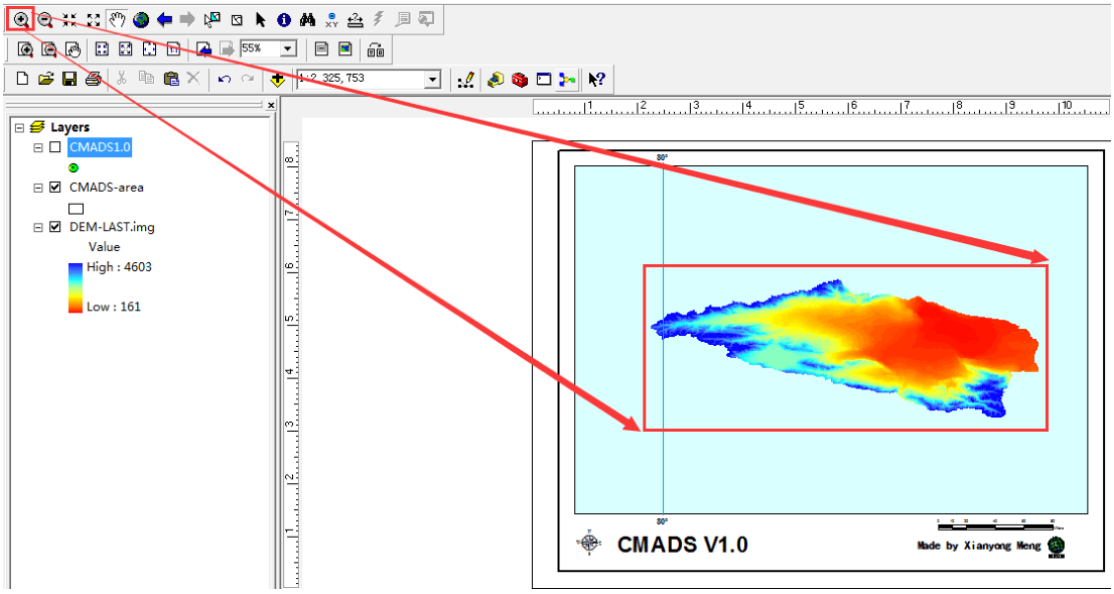

Figure. 2 Zoom map

3.After you zoom in the research area, select the check box (CMADS 1.0) again and. Select attributes of CMADS1.0 layer and lable the CMADS-station name (See Figure. 3).

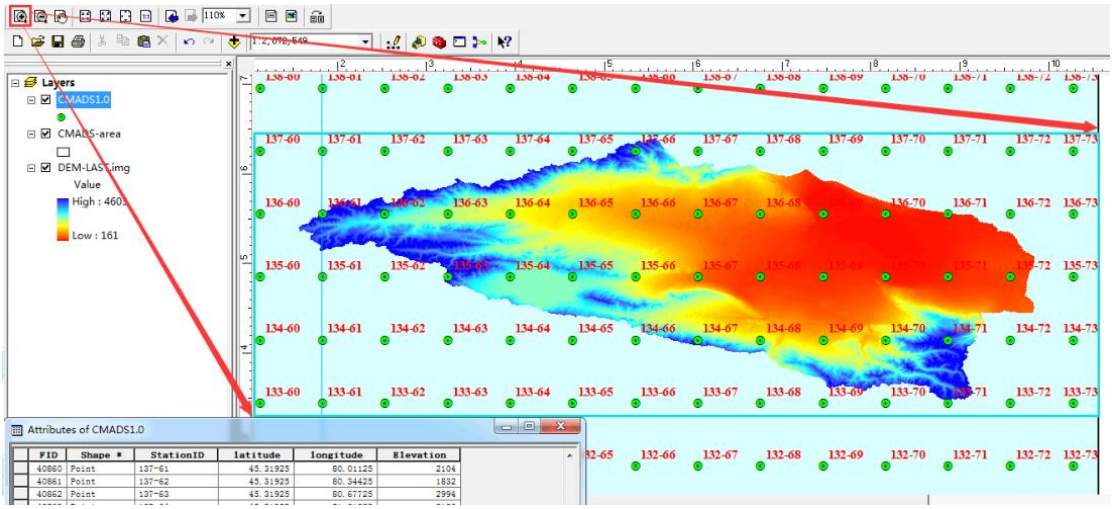

Figure. 3 Lable CMADS station name

4.We can now select the CMADS station which included in the study area (you can find the station in Catalog \For-swat-2009\ and \For-swat-2012\). In this case, we considered the selected Station contain from 137-60 to 137-73, from 136-60 to

136-73, from 135-60 to 135-73, from 134-60 to 134-73 and from 133-60 to 133-73.

5.We now select these stations from the Fork index table and create the user's own index table. We will find the index table for all weather elements in the \FORK\ directory (Don't forget to paste the header in this step 'ID, NAME, LAT, LONG, ELEVATION') (See Figure. 4).

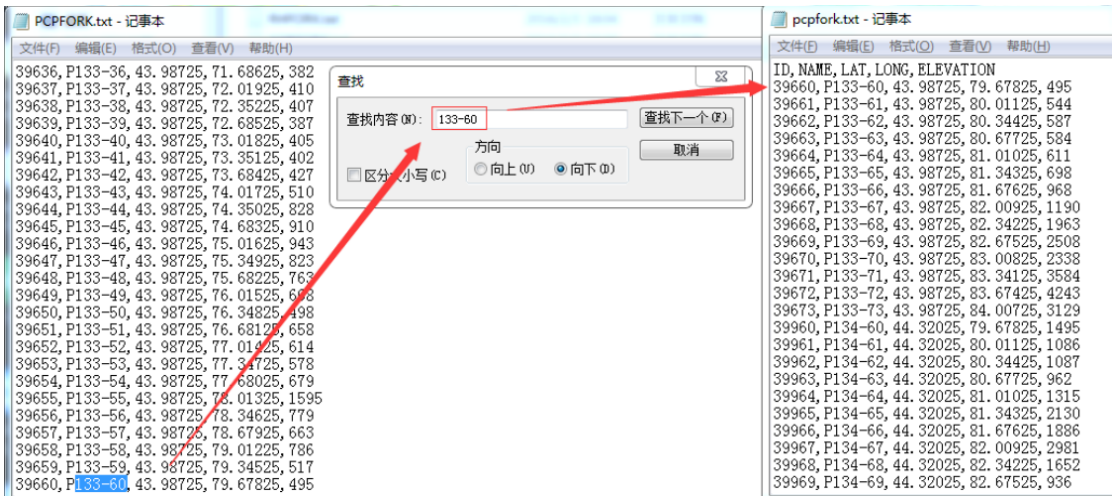

Figure. 4 Make user index table

The result in this case is：

ID,NAME,LAT,LONG,ELEVATION

39660,P133-60,43.98725,79.67825,495

39661,P133-61,43.98725,80.01125,544

39662,P133-62,43.98725,80.34425,587

39663,P133-63,43.98725,80.67725,584

39664,P133-64,43.98725,81.01025,611

39665,P133-65,43.98725,81.34325,698

....

6.Place all of the above meteorological stations and index tables (*fork.txt) in the same folder(See See Figure 5)

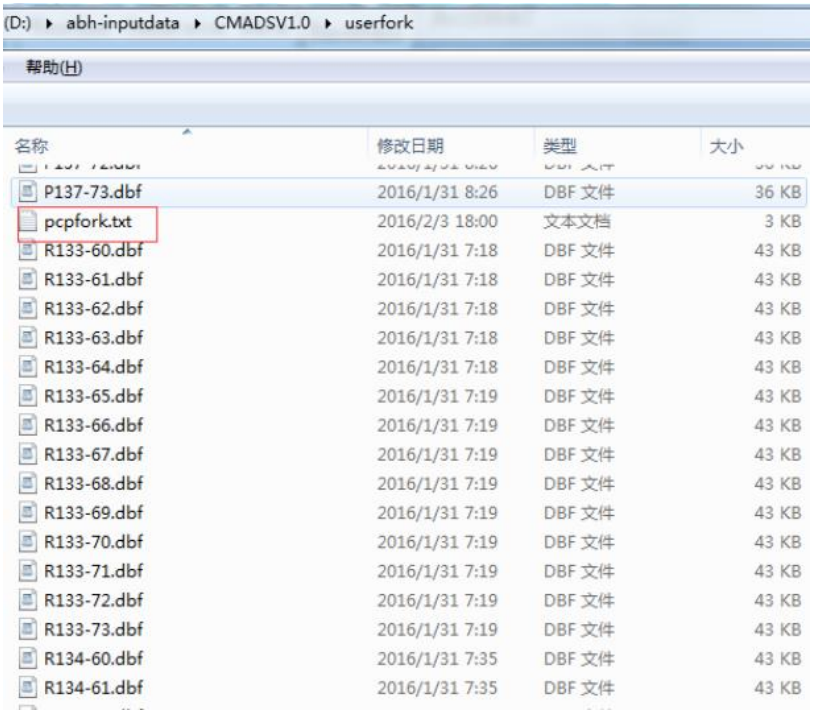

Figure. 5 Prepare the file

7. Create site location file‘ wgnstation.txt ’(See below).(Select any point in the study area is okey and this case we selected the station 135-67)

ID,NAME,LAT,LONG,ELEVATION

38,CMADS13567,43.98,86.67,950

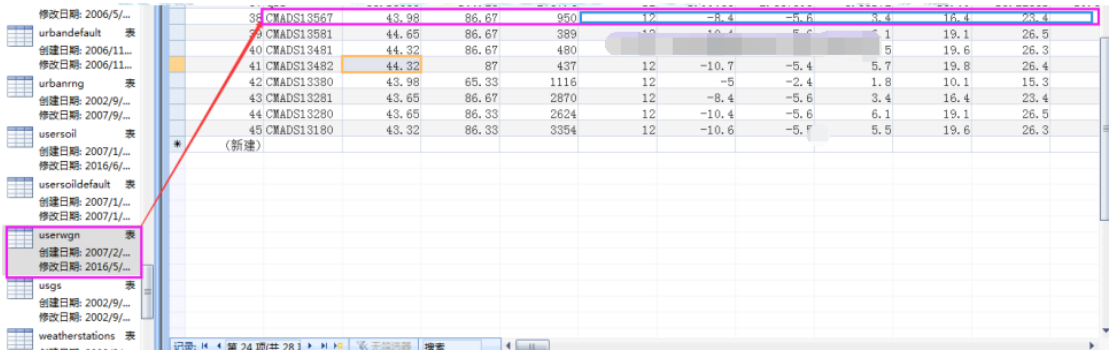

Figure.6 Fill the userwgn according to wgnstation.txt

8.Then, we add the 135-67 site location information to userwgn (See figure.6)(In addition to the site location information, other data can be filled arbitrary).

9.Finally, load the station table and index table.

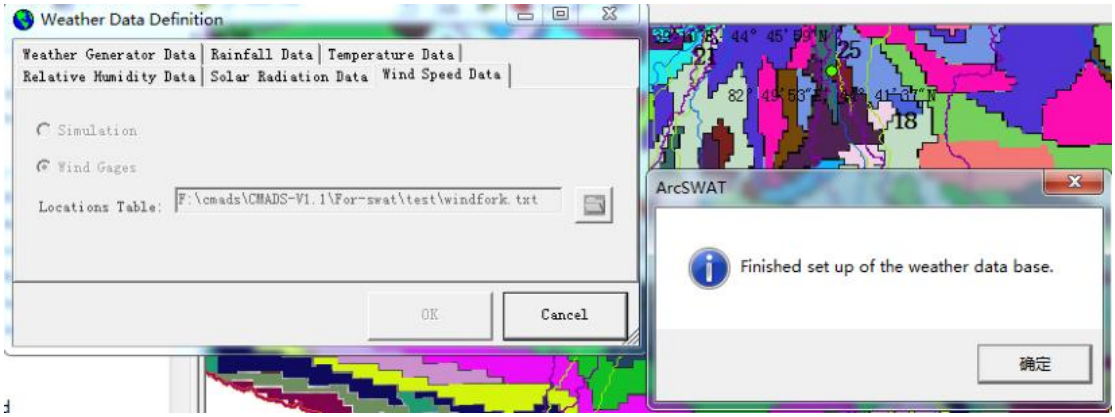

Figure.7 Load data

（Note: The loading process of the SWAT2012 model is similar to SWAT2009）