A Big Earth Data Platform for Three Poles

**Hourly solar radiation dataset over the Heihe River Basin (2002)**

1、Description

一. Data overview
 In the heihe river basin simulation model development and environment construction of cross integration research, project support, ren-sheng Chen (RReDC) in the center of the renewable energy data provided by the model, on the basis of considering the data of heihe river and other radiation model parameterization scheme, by 1 km resolution DEM, heihe surface weather observation data and NECP reanalysis data, the preparation of total radiation, direct radiation and scattering radiation three data sets.
二, data processing process
1) data source
Watershed basic data mainly include DEM data, as well as slope and slope direction data generated thereby.The model adopts Alberts equal area conic projection), the grid size is 1km\*1km, a total of 411×562 grids, that is, the actual calculated area is about 23\*10^4 km^2.The calculated year is 2002, and the temporal resolution is 1h.
Two sets of NCEP/NCAR reanalysis data were used, one set was instantaneous data of 1°\*1° per 6h, mainly ozone and precipitable data.The other set is based on the assimilation data of 4 times a day of 192\*94 grid (which is the average value per 6h), mainly the data of total cloud cover and precipitation rate.The main reason for applying the two sets of data is that the total cloud cover changes dramatically with time, and the instantaneous data cannot control the overall change of the weather.However, it is impossible to control the weather change within 6 hours by using the average data of 6 hours.
2) method
A. Short-wave solar incident radiation model in clear sky horizontal plane.Rayleigh scattering, aerosol absorption, water vapor absorption, ozone absorption and heterogeneous mixed gases (O2, CO2, etc.) are mainly considered in the calculation of direct radiation from clear sky.
B. Short-wave radiation model of clear-sky solar incidence under arbitrary topographic conditions.According to the principle of solid geometry and the algorithm of the short-wave radiation of horizontal plane, a simple algorithm of the short-wave radiation considering the self-masking effect of mountain slopes is designed.
C. Calculation of solar incident short-wave radiation under arbitrary terrain conditions in actual weather.Based on the Ver4Fortran source code provided by Dr. Harry d. K of the Greek institute of meteorology and atmospheric physics.
D. Spatial interpolation adopts the three-dimensional interpolation method based on triangular grid. The time interpolation of the first set of data adopts linear interpolation.
For specific algorithm description, please refer to: Chen rensheng, kang ersi, et al. (2006). "model of hourly incident short-wave radiation under arbitrary terrain and actual weather conditions -- a case study of heihe river basin." Chinese desert (05).
3) data verification
The simulation results were verified by using the total radiation observation data of three automatic meteorological stations located in the mountainous area, xishui, linze in the middle reaches and ejinaqi in the lower reaches. The calculated results of the total radiation of xishui were relatively poor, with R2 = 0.71.The measured and calculated results of total radiation of linze and ejin flags are better, with R2 of 0.90 and 0.91, respectively.
4) conclusion
It is a feasible method to calculate the solar incident short-wave radiation with large range, long time and high spatial and temporal resolution under any terrain and actual weather conditions by combining the radiation transmission parameterization scheme and remote sensing information, especially in the northwest arid region.The established model only USES DEM data of the basin and the slope and slope direction data generated thereby, while other data are reanalysis data, so it is easy to be popularized and applied.The weather changes at any time in high mountain areas. The main reason for the poor calculation effect of the model in high mountain areas is still the low spatial and temporal resolution of the total cloud cover data. Meanwhile, the inconsistency between the calculated value and the measured value partly leads to the poor comparison results.

2、Keywords

Theme：Radiation,Solar radiation,Shortwave radiation
Discipline：Atmosphere
Places：Heihe River Basin
Time：2002

3、Data details

1.Scale：None

2.Projection：4326

3.Filesize：97358.1MB

4.Data format：shp

4、Space scope

|  |  |  |
| --- | --- | --- |
| - | north：43.3 | - |
| west：96.1 | - | east：104.2 |
| - | south：37.7 | - |

5、Time frame:2002-01-08 22:00:00+00:00--2003-01-07 22:00:00+00:00

6、Reference method

References to data:

CHEN Rensheng. Hourly solar radiation dataset over the Heihe River Basin (2002). A Big Earth Data Platform for Three Poles, doi:10.3972/heihe.016.2013.db2013

References to articles:

陈仁升, 康尔泗, 李新, 杨建平, 吉喜斌, 张智慧. 任意地形实际天气条件下小时入射短波辐射模型—以黑河流域为例. 中国沙漠, 2006, 26(5)：773-779.

Han, C.T., Chen, R.S., Liu, Z.W., Yang, Y., Liu, J.F., Song, Y.X., Wang, L., Liu, G.H., Guo, S.H.,, & Wang, X.Q. (2018). Cryospheric Hydrometeorology Observation in the Hulu Catchment (CHOICE), Qilian Mountains, China. Vadose Zone Journal, 17(1), 1-18.

7、Supporting project information

8、Data resource provider

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