

User's Guide for thirteen years daily and annual mean land surface temperature dataset over the Third pole

Youhua Ran, Xin Li

Cold and Arid Regions Environmental and Engineering Research Institute, Chinese Academy of Sciences, Lanzhou 730000, China

1. Introduction

The Tibetan plateau (TP), called as “the third pole of the earth” is the water tower of Asia not only feed tens of millions of people, but also maintain fragile ecosystems in arid region of northwestern China. Temporal-spatially complete representations of land surface temperature are required for many purposes in environmental science, especially in third pole where the traditional ground measurement is difficult and therefore the data is sparse.

The cloud-free datasets of daily mean land surface temperature (LST) and mean annual land surface temperature (MAST) during 2004 to 2016 were released and derived from the quartic daily MODIS (the Moderate Resolution Imaging Spectroradiometer) Terra/Aqua LST products with a resolution of 1 km using a pragmatic data processing algorithm (Ran et al., 2015; 2017a). The comparison between radiance-based LST measurement and the estimated LST shows good agreement in the daily and inter-annual variability, with a correlation of 0.95 and 0.99 and bias of -1.73°C ($\pm 3.38^{\circ}\text{C}$) and -2.07°C ($\pm 1.05^{\circ}\text{C}$) for daily-mean-LST and MAST, respectively (Ran et al., 2017c). The systematic error is mainly source from the defined of daily mean LST, which is represented by the arithmetic average of the daytime and nighttime LSTs. The random error is mainly source from the uncertainty of the original MODIS LST values, especially for the daytime LST products. Trend validation using air temperatures from 94 weather stations indicate that the warming trends derived from time series MAST data is comparable with that derived from CMA data. The dataset is potential useful for various studies, including climatology, hydrology, meteorology, ecology, agriculture, public health, and environmental monitoring in the third pole and around regions.

2. Data file contents

The datasets include daily mean LST and mean annual land surface temperature (MAST) during 2004 to 2016. The format is GeoTIFF, a public domain metadata standard which allows georeferencing information to be embedded within a TIFF file.

The character types is numerical integer types, it should be converted to float point type and then subtract 273.15.

True value = data*scale_factor. Here, the scale_factor is 100.

3. Header information

Variables	Value	Note
-----------	-------	------

Ncols	4321	Number of cols
Nrows	1921	Number of rows
Xllcorner	71	Longitude of west of data field
Yllcorner	25	Latitude of southern of data field
Cellsize	0.0083333	Spatial resolution is 0.0083333 degree
NODATA_value	-9999	

4. Contact information

Xin Li, Professor (lixin@lzb.ac.cn)

Youhua Ran, Associate professor (ranyh@lzb.ac.cn)

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

320 West Donggang Road, Lanzhou 730000, Gansu Province, China

Phone: +86-931-4967964 (Youhua Ran)

5. References

- a) Ran, Y., Li, X., Jin, R., and Guo, J.: Remote sensing of the mean annual surface temperature and surface frost number for mapping permafrost in China. *Arctic, Antarctic, and Alpine Research*, 47(2), 255-265, 2015.
- b) Ran, Y.H., Li, X., and Cheng, G.D.: A permafrost thermal stability map over third pole by integrated remotely sensed land surface temperature, leaf area index, soil properties, and ground boreholes measurement. Submitted to *Remote Sensing of Environment*, 2017a.
- c) Ran, Y.H., Li, X., and Cheng, G.D.: Climate warming led to the degradation of permafrost stability in the past half century over Qinghai-Tibet Plateau. *The Cryosphere Discuss.*, <https://doi.org/10.5194/tc-2017-120>, 2017b.
- d) Ran, Y.H., Li, X., Yang, K., Meng, X.H., and Wang, S.Y. Thirteen years daily and annual mean land surface temperature dataset over the Third Pole. Submitted to *Earth System Science Data*, 2017c.