

# User information for dataset: A 10-year (2009-2019) surface soil moisture dataset produced based on *in situ* measurements collected from the Tibet-Obs

## 1. Introduction

The Tibet-Obs consists of three regional-scale soil moisture (SM) monitoring networks, i.e. the Maqu, Naqu, and Ngari (including Ali and Shiquanhe) networks. This surface SM dataset includes the original 15-min *in situ* measurements collected at a depth of 5 cm by multiple SM monitoring sites of the three networks, and the spatially upscaled SM records produced for the Maqu and Shiquanhe networks.

This document describes the content of the dataset. A publication based on the dataset is submitted to the journal Earth Systems Science Data in July 2020:

Pei Zhang, Donghai Zheng, Rogier van der Velde, Jun Wen, Yijian Zeng, Xin Wang, Zuoliang Wang, Jiali Chen, Zhongbo Su, “*Status of the Tibetan Plateau observatory (Tibet-Obs) and a 10-year (2009-2019) surface soil moisture dataset*”<sup>[1]</sup>

This document also introduces the existing dataset utilized in the publication and the scripts for the data processing. Please refer to [1] for details on the production of the upscaled soil moisture dataset.

## 2. Folder and file structure

Folder	File/subfolder	Sheet/script
\In situ soil moisture\	\Maqu.xlsx	- Information: This sheet contains the information of all the monitoring sites including location, elevation, topography, land cover, soil texture and soil organic matter content. - 2009-2019: These 11 sheets contain the available original 15-min/30-min <i>in situ</i> measurements at 5 cm depth for each year.
	\Shiquanhe. xlsx	- Information: This sheet contains the information of all the monitoring sites including location, elevation, topography, land cover, soil texture and soil organic matter content. - 2010-2019: These 10 sheets contain the available original 15-min <i>in situ</i> measurements at 5 cm depth for each year.
	\Ali. xlsx	- Information: This sheet contains the information of monitoring sites including location, elevation, topography, land cover, soil texture and soil organic matter content. - 2010-2018: These 9 sheets contain the available original 15-min <i>in situ</i> measurements at 5 cm depth for each year.
	\Naqu. xlsx	- Information: This sheet contains the information of monitoring sites including location, elevation, topography, land cover, soil texture and soil organic matter content.

		- 2010-2019: These 10 sheets contain the available original 15-min <i>in situ</i> measurements at 5/2.5 cm depth for each year.
\Upscaled soil moisture\	\Maqu upscaled. xlsx	- 2009-2019: These 11 sheets contain spatial upscaled soil moisture with the input of original <i>in situ</i> measurement between 5/15/2009 and 5/15/2019.
	\Maqu upscaled-daily average. xlsx	- 2009-2019: These 11 sheets contain spatial upscaled soil moisture with the input of daily average measurement between 5/15/2009 and 5/15/2019.
	\Shiquanhe upscaled. xlsx	- 2010-2019: These 10 sheets contain spatial upscaled soil moisture with the input of original <i>in situ</i> measurement between 8/1/2010 and 8/1/2019
	\Shiquanhe upscaled-daily average. xlsx	- 2010-2019: These 10 sheets contain spatial upscaled soil moisture with the input of daily average measurement between 8/1/2010 and 8/1/2019
\Data processing script\	\MODIS data\	MODIS_LST_pointdata.java: Downloading the point LST data from MODIS by Google Earth Engine
		MODIS_Albedo_pointdata.java: Downloading the point albedo data from MODIS by Google Earth Engine
		MODIS_LST_griddata.m: Processing the MODIS LST data by Matlab
		MODIS_Albedo_griddata.m: Processing the MODIS albedo data by Matlab
		dailyati.m: Calculating apparent thermal index with input of albedo and LST data
	\Model-based soil moisture data\	ERA5_land.m: Processing the ERA5-land soil moisture dataset
		GLDAS_Noah.m: Processing the GLDAS Noah soil moisture dataset
		MERRA2.m: Processing the MERRA2 soil moisture dataset

### 3. Data records

The tables shown below (Tables 1-3) demonstrate data records of all the SMST monitoring sites performed for the Tibet-Obs. Green shaded cells represent that there is not data missing, blue and pink shaded cells represent that the lengths of data missing are less than and more than one month for each year, respectively. Pure cells represent that there is not measurement performed. The number represents the month(s) when the data is missing.

Table 1 Maqu network

	2009	2010	2011	2012	2013	2014	2015	2016	2017	2018	2019	Data length (months)
CST01			10~12	1~6 10~12								36
CST02			5~12	1~10	6	7~12						46
CST03					6~12	1~10	7~12			1~9	5~12	68
CST04	1~5		12	1~3 11~12	1~2 6	8~10	7~12		1~6	7~12		73
CST05					6			5~7		1~2	6~12	119

NST01	1~5				6			5~7			6~12	116
NST02	1~3			7~8 10~12								40
NST03			5~10		6			5~7			6~12	115
NST04			10~12									33
NST05	3~5				6~12	1~7		5~7	7~12	1~7	6~12	92
NST06		1~3 12	1~3		6			6~7	8~12	1~7	6~12	104
NST07			3		6, 12	1	12	1~2 7, 12	1~2 12	1~3 9~12		101
NST08		2, 4 9~12	1~5		6~10	1~10		6~7			6~12	95
NST09	1, 12	1~4 12	1~3		1~2 6	7~10	12	1~3 7, 12	1~2 7		6~12	99
NST10		11~12	1~5 7~12	1~6	6~12					1~7	6~12	44
NST11				7~8	6	7~12						63
NST12	10~12	1~9			6~12	1~10	7~12					49
NST13					6		7~12					77
NST14	6~9				6	10~12						64
NST15		10~12	1~5	6~12								33
NST21						1~7	7~12					11
NST22						1~7	7~12					11
NST24						1~7	2~12	1~7			6~12	40
NST25						1~7		2~12	1~8		6~12	39
NST31									1~8	7~12		10
NST32										1~5	6~12	12

Table 2 Ngari network

	2010	2011	2012	2013	2014	2015	2016	2017	2018	2019	Data length (months)
Shiquanhe network											
SQ01	1~7				9~12	1~9					52
SQ02	1~7				5~9					9~12	104
SQ03	1~7				8~9					9~12	107
SQ04	1~7		9~12								25
SQ05	1~7				5~12						45
SQ06	1~7		9~12	1	2~9					9~12	96
SQ07	1~7			9~12	1~8		7~8	7~8		9~12	93
SQ08	1~7	8~12		1~8	8~9					9~12	82
SQ09	1~7		9~12	1~8	9~12						37

SQ10		1~8			7~12	1~9	7~12	1~8		9~12	67
SQ11	1~7			9~12					1~8	9~12	49
SQ12	1~7		9~12								25
SQ13	1~7	8~12									12
SQ14	1~7				6 8~9					9~12	106
SQ16	1~7	7~8			3~8	9~12					53
SQ17							1~8			9~12	36
SQ18							1~8	1	9~12		23
SQ19							1~8			9~12	36
SQ20							1~8			9~12	36
SQ21							1~8			9~12	36
Ali network											
Ail	1~7		9~12	1~8				1~8	8~12		40
Ali01	1~7	8~12	1~8		8				8~12		82
Ali02	1~7 11~12	1~8			8				8~12		85
Ali03	1~7			3~12	1~8				8~12		78

Table 3 Naqu network

	2010	2011	2012	2013	2014	2015	2016	2017	2018	2019	Data length (months)
Naqu	1~7			8~9	6~8	6~9		9~12	1~8	9~12	88
East		1~8		9~12							24
West	1~7	1~8		1~9	7~12	1~7	8~12				42
North		1~8 11~12	1~3 9	9~12			1~8	9~12	1~8	9~12	42
South		1~8	9~12								12
Kema				1~9	3~9		8~12				26
MS	1~7		10~12	1~9	8~9 11~12	1~5		9~12	1~8	9~12	76
NQ01									1~8	9~12	12
NQ02									1~8	9~12	12
NQ03							1~8	9~12	1~8	9~12	24
NQ04									1~8	9~12	12

- The measurement interval of NST24 and NST25 is 30 min since 7/13/2018, and for other sites is 15 min.

## 4. Existing dataset/script linkage

1. MODIS datasets
  - MODIS/Terra+Aqua BRDF/Albedo Albedo Daily L3 Global - 500m V006 (MCD43A3)  
[https://search.earthdata.nasa.gov/search?q=C1000000426-LPDAAC\\_ECS](https://search.earthdata.nasa.gov/search?q=C1000000426-LPDAAC_ECS)
  - MODIS/Aqua Land Surface Temperature/Emissivity Daily L3 Global 1km SIN Grid V006 (MYD11A1)  
[https://search.earthdata.nasa.gov/search?q=C203669661-LPDAAC\\_ECS](https://search.earthdata.nasa.gov/search?q=C203669661-LPDAAC_ECS)
  - MODIS/Terra Land Surface Temperature/Emissivity Daily L3 Global 1km SIN Grid V006 (MOD11A1)  
[https://search.earthdata.nasa.gov/search?q=C203669662-LPDAAC\\_ECS](https://search.earthdata.nasa.gov/search?q=C203669662-LPDAAC_ECS)
2. ERA5-land dataset
  - ERA5-land hourly data: Volumetric soil water layer 1 (swvl1)  
<https://cds.climate.copernicus.eu/cdsapp#!/dataset/reanalysis-era5-land?tab=form>
3. MERRA2 dataset
  - MERRA-2 tavg1\_2d\_int\_Nx: Soil Water surface layer (SFMC)  
<https://search.earthdata.nasa.gov/search?q=M2T1NXINT>
4. GLDAS Noah dataset
  - GLDAS\_NOAH025\_3H: SoilMoi0\_10cm\_inst  
[https://search.earthdata.nasa.gov/search?q=GLDAS\\_NOAH025\\_3H\\_2.0](https://search.earthdata.nasa.gov/search?q=GLDAS_NOAH025_3H_2.0)
5. ATI-based upscaling method
  - The demo of the ATI-based upscaling method in Matlab language is available online (Qin et al., 2013)  
<http://dam.itpcas.ac.cn/rs/>

## 5. Reference

- Qin, J., Yang, K., Lu, N., Chen, Y., Zhao, L., & Han, M. (2013). Spatial upscaling of in-situ soil moisture measurements based on MODIS-derived apparent thermal inertia. *Remote Sensing of Environment*, 138, 1–9. <https://doi.org/10.1016/j.rse.2013.07.003>