

# Soil Moisture Experiment in the Luan River



## Synchronous observations data set of soil surface roughness in the upstream of Luan River

User Guider, Version 1

Shandong Agricultural University (SDAU)

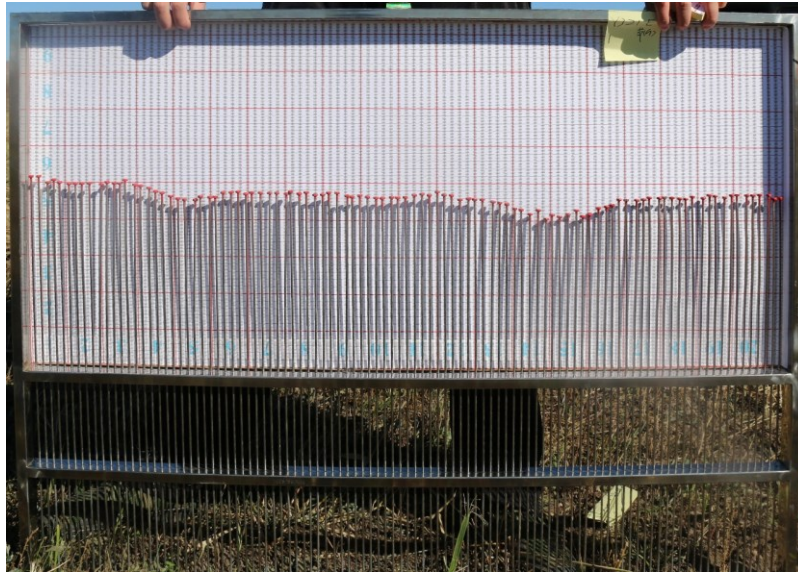
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## 1. Abstract

The soil surface roughness data set measured simultaneously during the Soil Moisture Experiment in the Luan River (SMELR) in 2018, which covers (1) 30 quadrats in the north-south flight region of 70 km  $\times$  12 km typical experimental area, and (2) 8 quadrats in the northeast-southwest flight region of 165 km $\times$ 5 km complex experimental area. The data were measured on September 17, September 18 and September 20, 2018 respectively. The soil surface roughness along the row (East-West) direction and cross the row (North-South) direction of typical features in each sample area were measured. The surface roughness of the dataset is described using three parameters; root mean square height (RMSH) and correlation length (CL). The root mean square height describes the random surface characteristics, while the correlation length and correlation function describe the periodicity of the surface. The surface roughness was calculated through the steps of soil surface height digitization, slope correction, periodic correction, and roughness calculation.

## 2. Instruments

The surface roughness is measured by roughness measuring plate. The roughness plate is composed of three parts: main frame, measuring needle and scale (as shown in Figure 1). The main frame is composed of a frame, a scale plate and two upper and lower parallel pinhole rods, which are used to fix the measuring needle and mark the scale. The length of the scale plate is 100 cm, including 101 measuring needles, which are evenly distributed on the pinhole rod with an interval of 1 cm. The scale is set from bottom to top with an interval of 5cm, which is used for measuring the fluctuation height of the measuring needle. There is a leveling pipe in the center of the top of the frame to ensure the levelness of the roughness measuring plate. When measuring, place the roughness plate horizontally, setting the level bubble centered, and the measuring needles will automatically fall on the surface. The height deviation of the surface and the correlation length in this direction was calculated by measuring the falling amplitude of the measuring needle.



**Figure 1. roughness measuring plate**

### **3. Data**

#### **3.1 Location of sampling**

The experimental area is located in the upstream of the Luan River, where the North-South flight region is located at the junction of Zhenglanqi County ( $115.990^{\circ}\text{E}$ ,  $42.241^{\circ}\text{N}$ ), Xilingol League, Inner Mongolia Autonomous Region, and Guyuan County ( $115.688^{\circ}\text{E}$ ,  $41.669^{\circ}\text{N}$ ), Zhangjiakou, Hebei Province, the Northeast-Southwest flight region is located in Guyuan County and Weichang Manchu and Mongolian Autonomous County, Chengde City ( $117.761^{\circ}\text{E}$ ,  $41.938^{\circ}\text{N}$ ), as shown in Figure 2. The terrain in the North-South flight region is complex with many kinds of typical features, including grassland, agricultural land, wasteland, bare land and forest. The land cover types in a same quarter varies greatly. The land cover in the northeast-southwest are simple and mostly grassland.

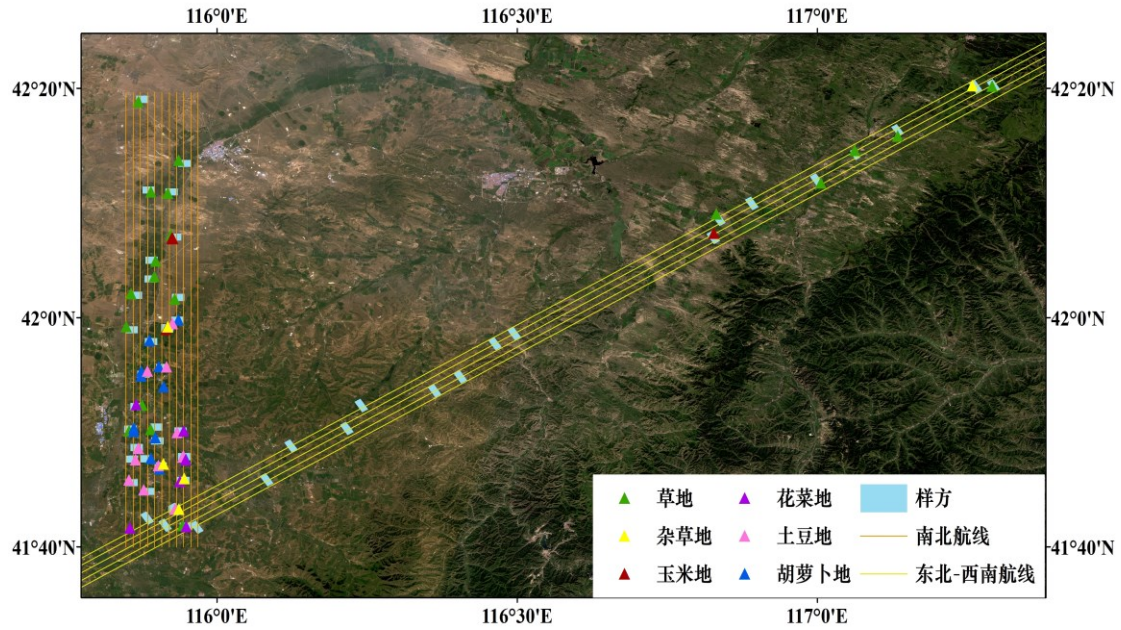


图 2. The synchronous sampling quarter of soil surface roughness in the upstream of Luan River

### 3.2 Soil surface roughness sampling strategy

When measuring, one person places the roughness measuring plate on the surface and ensure that the level bubble is centered, the other people take pictures along the horizontal direction at an angle of 90 degree with the roughness measuring plate. The four corners of the roughness measuring plate should not have any shielding, and try not to tilt left, right and up and down when taking pictures. At the same time, record the land cover of the sampling location, write it on the sticky note, paste it to the left and right metal frames of the roughness plate, and take pictures together. At each sampling location, along the row (east-west) direction and in the cross-row (south-north direction) was measured. In order to obtain more stable measurement results, each quadrat is measured three times along the row (east-west) direction, and then three times the cross-row (south-north) direction, so as to obtain the soil surface height of 3 m long. Finally, the average value of the two direction is calculated as the roughness results of the sampling quadrat.

### 3.3 data specification

The surface roughness data file is LuanRiver\_Surface\_Roughness.xls. This file contains two sheets with name of corresponding flight region. There are two roughness parameters including RMSH and CL at two directions for each quarter, for which 01

indicates along row(east-west) direction and 02 indicates cross row (south-north) direction.

The location and land cover of sampling site file is Sampling\_Location.xls, which contains name of the quadrat, the land cover and the longitude and latitude of the sampling location.

## 4. Data keywords

**Theme keywords:** soil surface roughness; root mean square height ; correlation length

**Location keywords:** the Luan River watershed; the Shandian River watershed; the Xiaoluan River watershed

**Temporal keyword:** 2018

**Discipline keywords:** Remote Sensing; Hydrology; Soil science

## 5. Data Citation

Guo, P., Yang, G., Meng C., Wang, B. (2021). Synchronous observations data set of soil surface roughness in the upstream of Luan River in 2018. National Tibetan Plateau Data Center.

## 6. Reference

- [1]. Zhao, T.J., Shi, J.C., Lv, L.Q., Xu, H.X., Chen, D.Q., Cui, Q., Jackson, T.J., Yan, G.J., Jia, L., Chen, L.F., Zhao, K., Zheng, X.M., Zhao, L.M., Zheng, C.L., Ji, D.B., Xiong, C., Wang, T.X., Li, R., Pan, J.M., Wen, J.G., Yu, C., Zheng, Y.M., Jiang, L.M., Chai, L.N., Lu, H., Yao, P.P., Ma, J.W., Lv, H.S., Wu, J.J., Zhao, W., Yang, N., Guo, P., Li, Y.X., Hu, L., Geng, D.Y., & Zhang, Z.Q. (2020). Soil moisture experiment in the Luan River supporting new satellite mission opportunities. Remote Sensing of Environment, 240,111680. <https://doi.org/10.1016/j.rse.2020.111680>.
- [2]. Zhao T J, Shi J C, Xu H X, Sun Y L, Chen D Q, Cui Q, Jia L, Huang S, Niu S D, Li X W, Yan G J, Chen L F, Liu Q H, Zhao K, Zheng X M, Zhao L M, Zheng C L, Ji D B, Xiong C, Wang T X, Li R, Pan J M, Wen J G, Mu X H, Yu C, Zheng Y M, Jiang L M, Chai L N, Lu H, Yao P P, Ma J W, Lyu H S, Wu J J, Zhao W, Yang N, Guo P, Li Y X, Hu L, Geng D Y, Zhang Z Q, Hu J F and Du A P. 2021. Comprehensive remote sensing experiment of water cycle and energy balance in the Shandian river basin. National Remote Sensing Bulletin, 25 (4) :871-887.
- [3]. Meng C H, Guo P, Zhao T J, Yang G, Li X C,Wang B, Wan H. Measurement and Calculation Method of SurfaceRoughness and Its Impact on Microwave Radiation Scattering (in Chinese) .Remote Sensing Technology and Application, 2021, 36 (3):



692-704.

[4]. Yan G J, Zhao T J, Mu X H, Wen J G, Pang Y, Jia L, Zhang Y G, Chen D Q, Yao C B, Cao Z Y, Lei Y H, Ji D B, Chen L F, Liu Q H, Lyu L Q, Chen J M and Shi J C. 2021. Comprehensive remote sensing experiment of carbon cycle, water cycle and energy balance in Luan River Basin. National Remote Sensing Bulletin, 25 (4): 856-870.

## 7. Disclaimer

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