# A brief introduction to the SCSG-based interpolation method

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## 1 Data preparation

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| Product code | Spatial/temporal resolutions | Variable(s) provided |
| MYD11A1 | 1 km/daily | Daytime LST  View time |
| MYD03 | 1 km/daily | View zenith/azimuth angle  Solar zenith/azimuth angle |
| MYD06\_L2 | 1 km/5 min | Cloud-top height |
| MYD13A2 | 1 km/16 d | NDVI |
| MCD18A1 | 1 km/3 h | Downward shortwave radiation |
| GLASS Albedo | 1 km/8 d | Albedo |
| SRTM | 90 m | Elevation |

## 2. Data preprocessing

### 2.1. Mean filter applied to cloud top height data (data->Cloud\_top\_height)

1) R codes

1\_1\_Preprocess\_Filter\_CloudTopHeight.R

2) Note: the extent after filtering will shrink. It is advised to prepare data covering a larger area than the study area.

### 2.2. Filling up missing view time data (data——>view\_time)

In the case of missing LST, view time information is also lost. We need to fill up the missing view time according to lat/lon information, and make them ready prior to further processing.

### 2.3. Downward shortwave radiation data (data——>DSR)

Two temporal resolutions (instantaneous and 3-hr) are provided in DSR data. Severe data losses are present in Instantaneous DSR data due to cloud cover whereas not in the 3hr data. We use the 3hr data and locate two time points closest to the MODIS overpassing time. A linear interpolation is then applied to find DSR at the acquisition time.

R codes

1\_2\_Preprocess\_DSR\_UTC2MODISPasstime.R

## 3. Generating SCSG images（result—>SCSG）

1) R codes

2\_1\_Generate\_SCSG\_image.R

2\_2\_SCSG\_PostProcessing.R

## 4. Interpolating clear-sky equivalent LST（result—>LSTClearSky—> fusionResults）

1) R codes

3\_1\_LST\_interpolation\_clearSky.R

3\_2\_Fuse\_ClearSkyInterpolations.R

## 5. Estimating LST values under clouds（result—>LSTcloudy）

R codes

4\_LST\_interpolation\_cloudySky\_KMeans.R

## 6. References

[1] Explanation to SCSG:

Wang, T., Shi, J., Ma, Y., Husi, L., Comyn Platt, E., Ji, D., Zhao, T., Xiong, C., 2019. Recovering land surface temperature under cloudy skies considering the solar-cloud-satellite geometry: Application to MODIS and Landsat‐8 data. Journal of Geophysical Research: Atmospheres 124, 3401-3416.

[2] Interpolation of clear-sky equivalent LST:

Chen, Y., Nan, Z., Zhao, S., Xu, Y., 2021. A Bayesian approach for interpolating clear-sky MODIS land surface temperatures on areas with extensive missing data. IEEE J. Sel. Top. Appl. Earth Observ. Remote Sens. 14, 515-528.

[3] SCSG-based interpolation for LST under cloudy sky conditions：

Chen, Y., Nan, Z., Cao, Z., Min, Y., Feng, K., 2023. A stepwise framework for interpolating land surface temperature under cloudy conditions based on the solar-cloud-satellite geometry. ISPRS Journal of Photogrammetry and Remote Sensing.