**Document**

**Introduction**

Thanks for using this code. If you use this code for data processing and research, please refer to the following literature.

Liu, X., Guo, J., Hu, J., & Liu, L. (2019). Atmospheric Correction for Tower-Based Solar-Induced Chlorophyll Fluorescence Observations at O2-A Band. Remote Sensing, 11, 355.

Liu, X., & Liu, L. (2015). Improving chlorophyll fluorescence retrieval using reflectance reconstruction based on principal components analysis. IEEE Geoscience and Remote Sensing Letters, 12, 1645-1649.

Liu, X., Liu, L., Zhang, S., & Zhou, X. (2015). New Spectral Fitting Method for Full-Spectrum Solar-Induced Chlorophyll Fluorescence Retrieval Based on Principal Components Analysis. Remote Sensing, 7, 10626-10645.

Chang, C.Y., Guanter, L., Frankenberg, C., Köhler, P., Gu, L., Magney, T.S., Grossmann, K., & Sun, Y. (2020). Systematic assessment of retrieval methods for canopy far‐red solar‐induced chlorophyll fluorescence (SIF) using high‐frequency automated field spectroscopy. Journal of Geophysical Research: Biogeosciences, e2019JG005533.

Du, S., Liu, L., Liu, X., Guo, J., Hu, J., Wang, S., & Zhang, Y. (2019). SIFSpec: Measuring solar-induced chlorophyll fluorescence observations for remote sensing of photosynthesis. Sensors, 19, 3009.

**Test**

The original data of XTS can be used for test under the folder of .Datasets / XTS/raw data/ 2018;

**Reminder**

At present, the program lacks quality control!

1. Data file:

(1) Data

Establish the corresponding site folder, and establish three sub folders of [raw data], [problem data], [results]. The site data is stored in the raw data.

【Setup\_ The veg. M] function configures the vegetation growth period of the station, which is mainly used to calculate the equivalent length for accurate atmospheric correction.

**Note:** you can customize the modification path.

(2) Settings

The folder includes: Simulated atmospheric transmittance folder-[Atmospheric\_transmittance]、Fluorescent shapes folder-[Prescribed\_shape] and the Scope simulation dataset folder -[Simulated\_Datasets].

The files includes: [pressure\_Temperature\_ Data.txt] used for atmospheric correction; the standard wavelength file [wl\_ pro.txt].

1. Data processing program:

(1) The original observation data were read and processed, and the txt data were sorted and saved as xlsx and mat

QE65\_ 1. m was used for reading the original spectral data;

(2) Atmosphere correction

QE65\_ 2. m was used for atmosphere correction;

* 1. Load\_ Meteo function obtains the data of air pressure and temperature, which is then used to calculate the equivalent length, which is located in the [Settings] folder;
  2. Load\_ LUT function is a look-up table of atmospheric transmittance by MORtrans 5.2 with the corresponding [Atmospheric\_Transmittance] folder;
  3. LUT\_ Tra function is used to find the up and down transmittance.

(3) SIF retrievals:

QE65\_3.m is the main program

SIFretrieval.m function was used for retrieved SIF.

Cal\_ PCA. M function was use for pFLD algorithm,F-SFM algorithm based on the principal component analysis;

The hf.mat located in the [Prescribed\_shape] folder was used for SVD and DOAS algorithms.

The test\_ 2015-07-18-1311\_ train\_ 2880 located in the [Simulated\_Datasets] folder was used for pFLD algorithm and F-SFM algorithm.

(4) Save as mat and nc for half an hour average

QE65\_4.m is the main program

(5) Supplementary:

There are two function settings:

Setup\_ Window. m is the absorption band window for setting inversion algorithm.

Setup\_ Veg. m is to set the initial vegetation growth cycle and vegetation height.

1. Others:

Other simulation data training, such as SCOPE and MORtrans simulation, are omitted.