# PyDisALEXI

## Synopsis

## Installation

1. Make sure you install anaconda python from <https://www.continuum.io/downloads>
2. Register for the following web services
   1. Anaconda cloud, <https://anaconda.org>
   2. NWP SAF, https://nwpsaf.eu/site/login/
   3. USGS, <https://espa.cr.usgs.gov/login>
   4. NASA Earthdata Login, <https://urs.earthdata.nasa.gov>

* You will have to give access to services by going the “my application” tab and give access to
  + LP DAAC OPeNDAP
  + LP DAAC Data Pool
  + GES DISC

1. Type ‘conda install projectmaspreprocess’

## Code Example

### usage

‘preparepydisalexi lat (dd.dd) lon (dd.dd) startdate (yyyy-mm-dd) enddate (yyyy-mm-dd)’

### example

## Basic Contents

### High-level modules

- \*.src/pyTSEB.py\*, class object for TSEB scripting

- \*ProcessPointTimeSeries.ipynb\* and \*ProcessLocalImage.ipynb\* notebooks for using TSEB and configuring

TSEB through a Graphical User Interface, GUI

- \*MAIN\_TSEB\_LocalImage.py\* and \*MAIN\_TSEB\_PointTimeSeries.py\*, high level scripts for running TSEB

through a configuration file (\*Config\_LocalImage.txt\* or \*Config\_PointTimeSeries.txt\*)

- \*TSEB\_ProcessPointTimeSeries.ipynb\* notebook with more details about the high-level TSEB programming

- \*pyTSEB\_in\_Detail.ipynb\* notebook with a closer look at the low-level and high-level TSEB code

- \*TSEB\_and\_Resistances.ipynb\* notebook for undertanding the TSEB model and the estimation of resistances

### Low-level modules

The low-level modules in this project are aimed at providing customisation and more flexibility in running TSEB.

The following modules are included

- \*.src/TSEB.py\*

> core functions for running different TSEB models (`TSEB\_PT (\*args,\*\*kwargs)`, `TSEB\_2T(\*args,\*\*kwargs)`,

`DTD (\*args,\*\*kwargs)`), or a One Source Energy Balance model (`OSEB(\*args,\*\*kwargs)`).

- \*.src/netRadiation.py\*

> functions for estimating net radiation and its partitioning between soil and canopy

- \*.src/resistances.py\*

> functions for estimating the different resistances for momemtum and heat transport and surface roughness

- \*.src/MOsimilarity.py\*

> functions for computing adiabatic corrections for heat and momentum transport,

Monin-Obukhov length, friction velocity and wind profiles

- \*.src/ClumpingIndex.py\*

> functions for estimating the canopy clumping index and get effective values of Leaf Area Index

- \*.src/meteoUtils.py\*

> functions for estimating meteorolgical-related variables such as density of air,

heat capacity of air or latent heat of vaporization.

## API Reference

http://pytseb.readthedocs.org/en/latest/index.html

## Main Scientific References

- Norman, J. M., Kustas, W. P., Prueger, J. H., and Diak, G. R.: Surface flux estimation using radiometric temperature: a dual-temperature-difference method to minimize measurement errors, Water Resour. Res., 36, 2263, doi: 10.1029/2000WR900033, 2000

- Norman, J., Kustas, W., and Humes, K.: A two-source approach for estimating soil and vegetation fluxes from observations of directional radiometric surface temperature, Agr. Forest Meteorol., 77, 263–293, doi: 10.1016/0168-1923(95)02265-Y, 1995

- Kustas, W. P. and Norman, J. M.: A two-source approach for estimating turbulent fluxes using multiple angle thermal infrared observations, Water Resour. Res., 33, 1495–1508, 199

- Kustas, W. P. and Norman, J. M.: Evaluation of soil and vegetation heat flux prediction using a simple two-source model with radiometric temperatures for partial canopy cover, Agr. Forest Meteorol., 94, 13–29, 199

## Tests

The folder \*./Input\* contains examples for running TSEB in a tabulated time series (\*ExampleTableInput.txt\*)

and in an image (\*ExampleImage\_\< variable >.tif\*). Just run the high-level scripts with the configuration files

provided by default and compare the resulting outputs with the files stored in \*./Output/\*

## Contributors

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- \*\*William P. Kustas\*\* TSEB modeling, tester

- \*\*Radoslaw Guzinski\*\* DTD code developer, tester

- \*\*Ana Andreu\*\* tester

## License

pyTSEB: a Python Two Source Energy Balance Model

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