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T&C

Tethys-Chloris

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Tethys- Chloris (T&C) is a mechanistic model designed to simulate essential components of the hydrological and carbon cycles, resolving exchanges of energy, water, and CO_2 between the land surface and the planetary boundary layer with an hourly time step. Mass and energy fluxes control the temporal dynamics of vegetation (carbon pools) that in turn affect land-atmosphere exchange through its biophysical structure and physiological properties. Plant life-cycle processes, including photosynthesis, phenology, carbon allocation and tissues turnover are explicitly modeled. For instance, Leaf Area Index (LAI) is a prognostic variable, which varies in response to environmental conditions and vegetation leaf phenology. Changes in LAI can affect water and carbon fluxes that in turn can modify vegetation growth in a fully interactive framework.

This repository contains the *Tethys- Chloris (T&C)* **source code** for plot scale applications with the latest updates up to 15-09-2020. **Three case studies**: Athens, Zurich, and Singapore are also provided as examples.

Meteorological inputs in the format required by T&C are prepared in advance and stored in a file: "**Data_##_Run.mat**" and they must be continuous time series without gaps.

The "**prova_##**" file specifies a few general setting as number of time-steps, load the inputs, and call the models

The "**MOD_PARAM_##**" file contains all the free parameters of T&C and information about initial conditions (e.g., soil moisture and carbon pools). Such a file fully describes the cell topography and land cover, vegetation, and soil properties of the ecosystem and allows distinguishing among multiple vegetation types.

At the end of the model run, you will find a summary of the computational time in hours and in ms per time step as well as the residual of the water and energy budgets. These should be ~ 0 otherwise it is very likely that something went wrong.

At the end of the simulation you can save the entire workspace with **save** "**Results_##**" in the Matlab prompt. Results are not saved automatically.

There are two plotting functions for the standard T&C (GRAPH_MOD) and for the T&C with biogeochemistry (GRAPH_BIOGEO) to plot standard outputs, in GRAPH_MOD there are switchers, which allows deciding what to plot.