Internship (M2/INGÉ)

Title: Time series of evapotranspiration fluxes simulated with the DART-EB model coupled with remote sensing measurements

Laboratory: CESBIO (Center for Space Studies of the BIOsphere)

Supervisor: Yingjie Wang

Co-Supervisor: Jean-Philippe Gastellu-Etchegorry

Beginning of the internship: January to March 2023, for a period of 5 or 6 months

Context and objective:

Evapotranspiration is a major process in the functioning of land surfaces. Monitoring and studying its temporal evolution are essential for many fields of research and applications in agriculture, forestry, urban environment, and also water, energy, and carbon cycles. Precisely quantifying the evapotranspiration flux from satellite measurements is therefore a scientific challenge. The final objective of this internship is to derive the temporal evolution of the evapotranspiration of a corn field from remote sensing observations using physical modelling. Particularly, it aims at precisely estimating the evapotranspiration through the coupling of the 3D energy budget model DART-EB (https://dart.omp.eu) and time series of remote sensing images. The study site is the Auzeville site of the CESBIO (https://www.cesbio.cnrs.fr). The work will contribute to the preparation of the Franco-Indian satellite mission TRISHNA (Thermal infraRed Imaging Satellite for High-resolution Natural resource Assessment, https://trishna.cnes.fr/fr/trishna).

Major work:

The work includes 6 major steps.

Step 1: bibliography on the research domain (remote sensing, 3D radiative transfer model, etc.)

Step 2: get to grips with DART radiative transfer model.

Step 3: improve the spectral resolution of DART atmosphere illumination by creating an atmosphere database using a reference atmospheric radiative transfer model.

Step 4: create the 3D mock-up of the CESBIO test site in Auzeville using visible and thermal infrared cameras, and a vegetation growth model.

Step 5: calibrate the energy budget model DART-EB (Thang Nguyen, 2022) that simulates the 3D temperature of the maize field, using thermal infrared images.

Step 6: simulate time series of TRISHNA images and evapotranspiration with DART-EB.

Requirements: physics of remote sensing is appropriated, as well as bases in vegetation functioning. A good knowledge of a language (Python, Matlab) for processing scientific data is essential. Knowledge the Linux environment is welcome.

Send a CV and motivation letter to Yingjie Wang (yingjie.wang@univ-tlse3.fr or yingjiewang1102@gmail.com)