M2 SOAC-DC : Fiche de stage

Titre du stage :
Atmospheric Surface Flux Modeling using Artificial Neural Networks (ANN)

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Sujet du stage :
Fluxes in the atmospheric surface layer are extremely important as they quantify the strength of sources and sinks of carbon dioxide, water vapor, heat and pollutants. Understanding the behavior of these sources and sinks is critical to a diverse range of problems including : climate change, air quality, and impacts of wind turbines local on vegetation and crops. Unfortunately, making these measurements can be extremely expensive as the state-of-the-art techniques employing « Eddy Covariance » stations cost upwards of 30 000 € and provide only single-point measurement. Further, each type of land cover yields varying fluxes depending on characteristics such vegetation cover, soil type, soil moisture, etc. To meet these needs, it is necessary to deploy many stations at an extremely high cost. Hence, the primary goal of this stage is to use low-cost sensor technology to accurately estimate surface fluxes of sensible heat and moisture over a diverse range of surfaces. The primary questions to be answered is: can an Artificial Neural Network (ANN) estimate of surface fluxes be better than other physics-based methods.

For this stage, an MS student will work to understand the behavior of artificial neural-network (ANN)-based atmospheric surface-layer flux models as well as widely used physics-based flux models (e.g. Monin-Obukhov similarity and Pennman-Montieth models). The hypothesis to be tested is that low-cost sensors can provide flux measurements commensurate with high-cost flux stations. In particular, the student will better understand ANN model performance subject to a range of conditions such heterogeneous terrain types and crop growth using the Boundary Layer Late Afternoon and Sunset Transition (BLLAST) experiment dataset (see http://bllast.sedoo.fr). The BLLAST dataset was acquired as part of a French led international field experiment conducted in Lannemezan. This work will be conducted with Drs. Fabienne Lohou, Marie Lothon, and Eric Pardyjak (Visiting professor from the University of Utah).

Mots clé : Interaction surface/atmosphère, Station de mesures des flux d'énergie, Réseau de neurones, Campagne BLLAST

Lieu du stage : Lannemezan