M2 SOAC-DC : Fiche de stage

Titre du stage :
Dispersion in Mountainous Terrain

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Sujet du stage :

For this stage, an MS student will have the opportunity to get hands-on field experiment experience by participating in the KAtabatic winds and Stability over CAdarache for Dispersion of Effluents (KASCADE) project. KASCADE 2017 will consist of a number in Intensive Observation Periods to be conducted in the Cadarache Valley. The Cadarache Valley is a relatively small valley that is embedded in the larger Durance Valley drainage system. During the winter, winds are light and stably stratified leading to complex near-surface atmospheric layering that impacts dispersion of contaminants.

The primary goal of the project is improved prediction of dispersion in complex terrain during stable atmospheric conditions. Observations will be taken to better understand the complex flow dynamics in the Cadarache Valley, but also to improve existing meso and micro-scale weather and dispersion models. Within the framework of this project, we would like to address the following questions:
Can a large deployment of low-cost sensors (LEMS) be used to improve predictions of conditions that are unfavorable for dispersion?
Can a coupled fast response urban and mountain terrain dispersion model improve fine-scale predictions?

The observation to be taken during the experiment will include: mean near surface weather observations from 10 to 15 low-cost Local Energy-budget Measurement Stations (LEMS), sonic anemometers (for turbulence measurements), remote sensing from sodar measurements, and regular radiosoundings.

The work that the MS student will engage in will include: experimental observations, data analysis, and modeling. In particular, the student will analyze the new field data (as well as data from the KASCADE 2013 experiment - http://kascade.sedoo.fr) and evaluate several different Artificial Neural Network (ANN) techniques used to estimate dispersion conditions. Using the ANN technique and the measured data, we would like to develop a method for rapidly and accurately predicting flows and stabilities that lead to situations when mixing is weak and contaminant concentrations can become dangerously high. The student will also use and help modify a three-dimensional simulation tool for modeling air flow and pollutant concentrations in mountainous regions accounting for both building and vegetation flow dynamics.

This work will be conducted with Drs. Pierre Durand and Eric Pardyjak (Visiting professor from the University of Utah), as well as with collaborators in Cadarache.

Mots clé : Vents catabatiques, Couche limite atmosphérique stable, dispersion de polluants, Station de mesure des flux surface/atmosphère, Réseaux de neurones, campagne KASCADE

Lieu du stage : Toulouse