Séminaire vendredi le 3 août 2018 11:00 / Seminar Friday August 3rd 2018 11:00h

Sujet/Subject: Regime occupation and transition information obtained from observable meteorological state variables in the stably stratified nocturnal boundary layer

Langue/language : Anglais/English

Conférenciers/Lecturers: **Carsten Abraham** (University of Victoria)

Résumé/Abstract:

The stably stratified nocturnal boundary layer (SBL) can be classified into two distinct regimes: one with moderate to strong winds, weak stratification and mechanically sustained turbulence (wSBL) and the other one with moderate to weak wind conditions, strong stratification and collapsed turbulence (vSBL). With the help of a hidden Markov model (HMM) analysis of the three dimensional state variable space of stratification, mean wind speeds, and wind shear the SBL can be accurately classified in these two regimes in both the Reynolds-averaged as well as turbulence state variables. The two-regime SBL is a generic structure at different tower sites around the world independent of their underlying surface types, the meteorological setting, or the complexity of the surrounding. Sensitivity analysis indicate that essential information about transitions between the states are present in both the shear and the stratification as these properties describe turbulent kinetic energy production and consumption, respectively.

Besides clustering the data the HMM analysis calculates the most likely regime occupation sequence. Having this state path time series allows for detailed analysis of the changes across regime transitions of the state variables observed at tower sites. We present how transitions in the SBL are captured by the HMM analysis and how different meteorological state variables behave in times of turbulence collapse (wSBL to vSBL transition) and turbulence recovery (vSBL to wSBL transitions). The HMM analysis also reveals some results of possible precursors and external forces which might be responsible for transitions in the SBL. The implication of these results for weather prediction and climate modelling will be discussed.