DCAMM SEMINAR

APPLIED MATHEMATICS AND MECHANICS

19 February 2018

A DCAMM seminar No. 717 will be presented by

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The title of the lecture is

Interaction of thermally stratified atmospheric boundary layers with wind turbines and wind farms

Abstract:

With the thriving wind energy market all around the world, there is an increasing demand for larger, more efficient and more reliable wind farms. Wind farms extract energy from the ambient flow in the turbulent atmospheric boundary layer (ABL). Hence, optimizing the design and operations of wind farms requires a profound understanding of the mutual interaction between the ABL and wind turbines. Also, with the fast-growing number of wind farms being installed worldwide, it becomes of scientific and practical interest to quantify how the large-scale extraction of energy from the wind will affect the structure of the atmosphere and vice versa. The complexity of such flows makes it difficult to obtain all the needed information through field experiments alone and often necessitates high-resolution eddy-resolving numerical tools such as large-eddy simulation (LES). This talk primarily focuses on:

1) LES as the leading numerical technique to study the interaction between thermally stratified ABLs and wind turbines/farms
2) Improved theoretical models for prediction of heterogeneous ABL and wake flows under different atmospheric regimes (e.g.; new sub-grid-scale models for LES, new wind farm parameterizations in large-scale atmospheric models, new analytical wake modes, etc.).
3) Modeling the velocity and scalar-concentration fluctuations using the hierarchical random additive process (HRAP) formalism, which is a recently proposed interpretation of the Townsend attached eddy hypothesis.

Worth mentioning here is that power extraction from the wind can be achieved using two general types of rotary machines: horizontal-axis and vertical-axis wind turbines. In this talk, both categories are considered and discussed.

DATE:	**Thursday, 1 March 2018**
TIME:	**13:00 – 13:45 + questions**
PLACE:	**Room 025, Building 414,** DTU, Technical University of Denmark

Danish pastry, coffee and tea will be served 15 minutes before the seminar starts.

All interested persons are invited.

Niels Leergaard Pedersen