



## **On the impact of wind farms on a convective atmospheric boundary layer: A large-eddy simulation study**

Hao Lu and Fernando Porté-Agel

École Polytechnique Fédérale de Lausanne, Laboratory of Wind Engineering and Renewable Energy, Lausanne, Switzerland  
(hao.lu@live.com)

With the fast growth of the installation of wind turbines worldwide, an urgent demand exists for a clear understanding of how wind farms modify land-atmosphere exchanges. Here, we conduct three-dimensional large-eddy simulations to investigate the impact of wind farms on a convective atmospheric boundary layer. The farms consist of Siemens SWT-2.3-93 wind turbines. The numerical framework is applied to study several cases of aligned and staggered wind farms with different streamwise and spanwise spacings. In line with wind-farm simulations in a stable boundary layer (Lu and Porté-Agel, 2011), results reveal that in the presence of wind turbines, the stability of the atmospheric boundary layer is modified, the boundary layer depth is increased, and the magnitude of the surface heat flux is reduced. Results also show a slight cooling near the land surface, and a highly heterogeneous spatial distribution of the surface heat flux. These findings highlight the importance of the wind-farm impacts on local meteorology.