Geophysical Research Abstracts
Vol. 17, EGU2015-14926-1, 2015
EGU General Assembly 2015
© Author(s) 2015. CC Attribution 3.0 License.

A new analytical model for wind farm power prediction

Amin Niayifar and Fernando Porte-Agel

École Polytechnique Fédérale de Lausanne (EPFL), Wind Engineering and Renewable Energy Laboratory (WIRE), EPFL-ENAC-IIE-WIRE, 1015 Lausanne, Switzerland (amin.niayifar@epfl.ch)

In this study, a new analytical approach is presented and validated to predict wind farm power production. The new model assumes a Gaussian distribution for the velocity deficit in the wake which has been recently proposed by Bastankhah and Porté-Agel (2014). To estimate the velocity deficit in the wake, this model needs the local wake growth rate parameter which is calculated based on the local turbulence intensity in the wind farm. The interaction of the wakes is modeled by use of the velocity deficit superposition principle. Finally, the power curve is used to estimate the power production from the wind turbines. The wind farm model is compared to large-eddy simulation (LES) data of Horns Rev wind farm for a wide range of wind directions. Reasonable agreement between the proposed analytical model and LES data is obtained. This prediction is substantially better than the one obtained with common wind farm softwares such as WAsP.