JOHNS HOPKINS
Center for Environmental
& Applied Fluid Mechanics

SPRING 2022 CEAFM VIRTUAL SEMINAR

"Fluid Mechanics and Wind Energy: Applications of Aerodynamics Beyond Turbine Blades"

Presented by Prof. Charles Meneveau

ME-ROSEI-CEAFM-IDIES

Johns Hopkins University

Hosted by Dennice Gayme (MechE)

In this presentation we discuss various applications of basic fluid dynamics and aerodynamics concepts to new problems arising in wind energy. We sumamrize basic wind farm flow modeling via coupled wake and boundary layer concepts, then go on

to show how simple lifting line theory can be applied to geatly improve on models for yawed wind turbine wakes. Effects of vortex decay due to turbulent diffusion are discussed and we show how to include such effects in simple analytical models for the velocity distribution in wakes. Effects of wind veer are also described. Finally, we summarize efforts to couple local and global boundary layer effects in new-generation wind farm models. The work to be presented arose from the contributions of C. Shapiro (now DOE), G. Starke, D. Gayme, G. Narasimhan, M. Bastankhah (Durham, UK), S. Shamsoddin (Zürich, CH), M. Howland (now MIT), also based on earlier work with R. Stevens (Twente U, NL), M. Calaf (Utah), and J. Meyers (Leuven, B). We are grateful to the US National Science Foundation for financial support.

Friday, February 4, 2022 at 3:00 PM

In-Person Gilman Hall 132

https://wse.zoom.us/j/93762992307