JOHNS HOPKINS
Center for Environmental & Applied Fluid Mechanics

Weekly CEAFM Seminar: Spring 2014

Date: **Friday, April 4, 2014**

Time: 11:00 AM

Location: Gilman # 50 (Marjorie M. Fisher Hall)

Speaker: **Dr. Yulia Peet** (Arizona State University)

Title: *"Large Eddy Simulations of Wind Turbine Flow and Wakes with Spectral Element Methods"*

Abstract

In this talk, we discuss our recent developments within the high-order spectral-element (SEM) fluid dynamics code that make it possible to adapt it to high-fidelity simulations of wind turbine flow and wakes. We start by introducing the basic concepts of a spectral-element method and what makes it especially attractive for turbulent flow simulations. We then proceed to describe our new developments within the SEM code that contribute towards efficient simulations of flows around wind turbines. The first development includes a novel overlapping grid approach that retains an exponential convergence in space and high-order accuracy in time on overlapping and moving domains. This approach can be used effectively for simulations of the flow over a rotating wind turbine under the influence of incoming atmospheric turbulence. The second development is the implementation of an actuator line aerodynamics model within the spectral element code that is an alternative approach to wind turbine wakes simulations, especially attractive in a situation of multiple wind turbines. We present our preliminary results of the Large Eddy Simulations of wind turbine wakes with the actuator line approach. We conclude by discussing our future research interests and plans.