Exploring grid and nudging strategies for wind energy assessment in the Model for Prediction Across Scales

Guilherme Torres Mendonça*†[1] and Pedro Peixoto[2]

[1]Institute of Mathematics and Statistics - University of São Paulo – Brazil
[2]Institute of Mathematics and Statistics - University of São Paulo – Brazil

Abstract

Compared to traditional rectangular-grid models such as WRF (Weather Research and Forecasting model) where grid refinement is possible but in an abrupt way by means of nesting, modern models with unstructured grids like MPAS (Model for Prediction Across Scales) allow for smoothly refining the grid, which may considerably improve predictions by eliminating numerical errors otherwise present at nest boundaries. But despite the potential of such smooth refinement strategy, how to best design it to obtain both accurate and efficient predictions is not well understood. Essential for predictions is also the selected data assimilation scheme. State-of-the-art schemes employed in numerical weather prediction centers around the world involve typically complex implementations and high computational cost. Assimilating data may in some cases be achieved much more easily and cheaply by means of nudging, a simple method based on the idea of adding a feedback term to the prognostic equations. Here we explore grid refinement and nudging strategies to achieve accurate but computationally efficient solutions with the Model for Prediction Across Scales, focusing on applications in wind energy assessment where the goal is to downscale coarse data to obtain high-resolution wind information in regions of interest for the wind energy industry.

Keywords: Data assimilation, nudging, grid refinement, wind energy

*Speaker
†Corresponding author: guilherme.torresmendonca@gmail.com