Advanced flow and noise simulation method for wind farm assessment in complex terrain - DTU Orbit (28/08/2019)

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A new wind farm during its development phase requires a technical evaluation of its annual power prediction and noise issue in the area in and around the wind farm. In this paper, for the first time, an advanced numerical method for wind farm assessment is developed, which consists of a Reynolds averaged Navier-Stokes - Actuator Disc model for the flow modelling, a semi-engineering model for the noise source modelling, and a parabolic wave equation model for the sound propagation modelling. The developed method can evaluate both annual energy production of wind farm and noise emission at receivers nearby. The wind farm considered in this study is located in a typical mountainous area. The energy production of the wind turbines is simulated and compared with measured data. The flow simulations over the complex terrain are performed using the in-house developed Navier-Stokes solver. A wind farm noise map is created by solving the parabolic wave equation. The obtained flow results are the inputs to the parabolic wave equation solver for sound propagation. The numerical computations are performed on a standard high-performance computer cluster. The developed numerical method provides a reliable assessment method for wind farm about its energy efficiency and noise features.