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Hakjin Lee, Duck-Joo Lee

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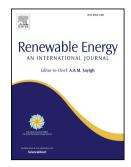
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Numerical investigation of the aerodynamics and wake structures of

2	horizontal axis wind turbines by using nonlinear vortex lattice method
3	Hakjin Lee and Duck-Joo Lee*
4	Korea Advanced Institute of Science and Technology (KAIST), Daejeon 34141, Republic of Korea
5	
6	Abstract
7	Wind turbines are emerging as one of the most promising and cost-effective renewable energy sources, due to
8	their economical merits and technical maturity. It is important to accurately predict the aerodynamic performance of
9	rotor blades for efficient design of wind turbine. Among the various numerical approaches, the vortex lattice method
10	(VLM) is one of the most suitable models for wind turbine aerodynamics because the wind turbine mostly operates
11	in the subsonic flow. However, it inherently cannot predict the nonlinear aerodynamic characteristics at a high angle
12	of attack. In the current paper, a nonlinear vortex lattice method (NVLM) has been suggested to extend the existing
13	VLM for handling the nonlinear stall and post-stall behaviors. This can be possible by finding a control point in the
14	airfoil where the effective angle of attack is applied. This paper mainly discusses the development and validation of
15	the NVLM for predicting the aerodynamic performances and the wake geometry against the measurements on the
16	MEXICO rotor model. The comparison results show that the aerodynamic loads and tip vortex trajectories computed
17	by NVLM are in significantly good agreement with the measured data. In addition, the complicated and unsteady
18	wake structures are also analyzed using vortex particle method.

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21 Vortex lattice method; Nonlinear vortex lattice method

²⁰ Keywords: Horizontal axis wind turbines; Wind turbine aerodynamics; Wind turbine wake; Vortex particle method;

^{*} Corresponding author. KAIST, 291 Daehak-ro, Yuseng-gu, Daejeon 34141, Republic of Korea. Tel.: +82-42-350-3716; fax: +82-42-350-3710; E-mail: <u>djlee@kaist.ac.kr</u> (Duck-Joo Lee)

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