

Accepted Manuscript

DDES with adaptive coefficient for stalled flows past a wind turbine airfoil

Jian Liu, Wenqing Zhu, Zhixiang Xiao, Haisheng Sun, Yong Huang, Zhitao Liu

PII: S0360-5442(18)31473-7

DOI: [10.1016/j.energy.2018.07.176](https://doi.org/10.1016/j.energy.2018.07.176)

Reference: EGY 13441

To appear in: *Energy*

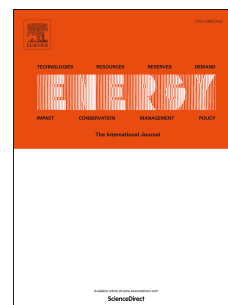
Received Date: 29 May 2018

Revised Date: 20 July 2018

Accepted Date: 26 July 2018

Please cite this article as: Liu J, Zhu W, Xiao Z, Sun H, Huang Y, Liu Z, DDES with adaptive coefficient for stalled flows past a wind turbine airfoil, *Energy* (2018), doi: 10.1016/j.energy.2018.07.176.

This is a PDF file of an unedited manuscript that has been accepted for publication. As a service to our customers we are providing this early version of the manuscript. The manuscript will undergo copyediting, typesetting, and review of the resulting proof before it is published in its final form. Please note that during the production process errors may be discovered which could affect the content, and all legal disclaimers that apply to the journal pertain.



DDES with Adaptive Coefficient for Stalled Flows past a Wind Turbine Airfoil

Jian Liu^{a,b}, Wenqing Zhu^a, Zhixiang Xiao^{a,*}, Haisheng Sun^b, Yong Huang^b, Zhitao Liu^b

^a School of Aerospace Engineering, Tsinghua University, Beijing 100084, China

^b China Aerodynamics Research and Development Center, Mianyang 621000, China

Abstract A new delayed detached eddy simulation method with adaptive coefficient (DDES-AC) is proposed to overcome the transition delay from Reynolds-averaged Navier–Stokes (RANS) to large eddy simulation (LES) in the simulation of the mild, moderate separation, and dynamic stall flows past a wind turbine airfoil (NACA0015). The coefficient C_{DES} is designed to be adaptive with the flow patterns, quasi-2D or 3D vortex structures, which aids in reducing the modelled eddy viscosity in the initial region of the separated shear layer. The DDES-AC is proved to be effective in the simulation of a fully attached plate flow without additional skin friction loss and a NACA0015 airfoil with a mild trailing edge separation. It also outperforms the DDES in moderate separation at an angle of attack beyond the static stall. The DDES presents “delay behaviour” in the dynamic stall simulation, resulting in an underestimation of the drag and pitching moment peaks and a deferred recovery of those in the downstroke. However, the DDES-AC improves the prediction accuracy and agrees excellently with the available experiment data.

Keywords: Delayed detached eddy simulation, Adaptive coefficient, Wind turbine airfoil, Separation, Dynamic stall

Nomenclature

AoA = Angle of attack

C = Chord length

* Corresponding author.

E-mail address: xiaotigerzhx@tsinghua.edu.cn (Z–X. Xiao)

Download English Version:

<https://daneshyari.com/en/article/8070891>

Download Persian Version:

<https://daneshyari.com/article/8070891>

[Daneshyari.com](https://daneshyari.com)