Comparison between experiments and Large-Eddy Simulations of tip spiral structure and geometry - DTU Orbit (29/12/2018)

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Results from Large-Eddy Simulations using the actuator line technique have been validated against experimental results. The experimental rotor wake, which forms the basis for the comparison, was studied in a recirculating free-surface water channel, where a helical vortex was generated by a single-bladed rotor mounted on a shaft. An investigation of how the experimental blade geometry and aerofoil characteristics affect the results was performed. Based on this, an adjustment of the pitch setting was introduced, which is still well within the limits of the experimental uncertainty. Excellent agreement between the experimental and the numerical results was achieved concerning the circulation, wake expansion and pitch of the helical tip vortex. A disagreement was found regarding the root vortex position and the axial velocity along the centre line of the tip vortex. This work establishes a good base for further studies of more fundamental stability parameters of helical rotor wakes.

General information
State: Published
Organisations: Department of Wind Energy, Fluid Mechanics, Uppsala University, Aix-Marseille University, Aix Marseille Université
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Number of pages: 10
Publication date: 2015
Peer-reviewed: Yes

Publication information
Journal: Journal of Physics: Conference Series (Online)
Volume: 625
Article number: 012018
ISSN (Print): 1742-6596
Ratings:
BFI (2018): BFI-level 1
BFI (2017): BFI-level 1
Scopus rating (2017): CiteScore 0.48 SJR 0.241 SNIP 0.447
Web of Science (2017): Indexed yes
BFI (2016): BFI-level 1
Scopus rating (2016): CiteScore 0.45 SJR 0.24 SNIP 0.401
Web of Science (2016): Indexed yes
BFI (2015): BFI-level 1
Scopus rating (2015): CiteScore 0.35 SJR 0.252 SNIP 0.374
Web of Science (2015): Indexed yes
BFI (2014): BFI-level 1
Scopus rating (2014): CiteScore 0.32 SJR 0.264 SNIP 0.352
Web of Science (2014): Indexed yes
BFI (2013): BFI-level 1
Scopus rating (2013): CiteScore 0.25 SJR 0.245 SNIP 0.293
ISI indexed (2013): ISI indexed no
Web of Science (2013): Indexed yes
BFI (2012): BFI-level 1
Scopus rating (2012): CiteScore 0.33 SJR 0.293 SNIP 0.387
ISI indexed (2012): ISI indexed no
BFI (2011): BFI-level 1
Scopus rating (2011): CiteScore 0.43 SJR 0.293 SNIP 0.356
ISI indexed (2011): ISI indexed no
BFI (2010): BFI-level 1
Scopus rating (2010): SJR 0.288 SNIP 0.351
Web of Science (2010): Indexed yes
BFI (2009): BFI-level 1
Scopus rating (2009): SJR 0.259 SNIP 0.346
BFI (2008): BFI-level 1
Scopus rating (2008): SJR 0.264 SNIP 0.301
Web of Science (2008): Indexed yes
Scopus rating (2007): SJR 0.258 SNIP 0.399
Web of Science (2007): Indexed yes
Scopus rating (2006): SJR 0.272 SNIP 0.311
Web of Science (2006): Indexed yes
Original language: English
Electronic versions:
Comparison_between_experiments.pdf
DOIs:
10.1088/1742-6596/625/1/012018
Research output: Research - peer-review › Conference article – Annual report year: 2015