

Wind turbine flow modeling

Laboratory

- CORIA, CNRS UMR6614, Normandie Université et INSA de Rouen, www.coria.fr

Advisors

- Dr Pierre Bénard, <https://www.coria-cfd.fr/index.php/User:Benard>
- Dr Vincent Moureau, <http://www.coria-cfd.fr/index.php/User:Moureauv>

Context

These two postdoctoral positions are part of the WAKE-OP project funded by the Région Normandie and Siemens Gamesa Renewable Energy, in collaboration with the CORIA and LMI laboratories. It aims to bring significant new insights into wind turbine wake flow modeling. Such flow is intrinsically multi-scale, which makes it difficult to model accurately. The main goals of the project are to improve the understanding and modeling of small-scale (blade) and large-scale (wind farm) turbulence with realistic conditions (wind, weather), reducing uncertainties in load and performance predictions by combining multi-fidelity approaches and develop the use of supercomputing to reduce the return times of advanced simulations.

Objectives

The objectives of these two postdocs is to contribute to the state-of-the art wind turbine flow simulations based on Large-Eddy Simulations, to model the flow, and the Actuator Line Method to model the rotor [1]. The objectives are split into two parts:

- Wind modeling: development of new wind models and validation, impact of wind on small- and large-scale flow
- Multiphysics coupling: aero-servo-elastic simulations by combining the flow solver to a servo-elastic code, validation on real offshore wind farms data, uncertainty quantification

The work will be performed into the YALES2 flow solver [2,3].

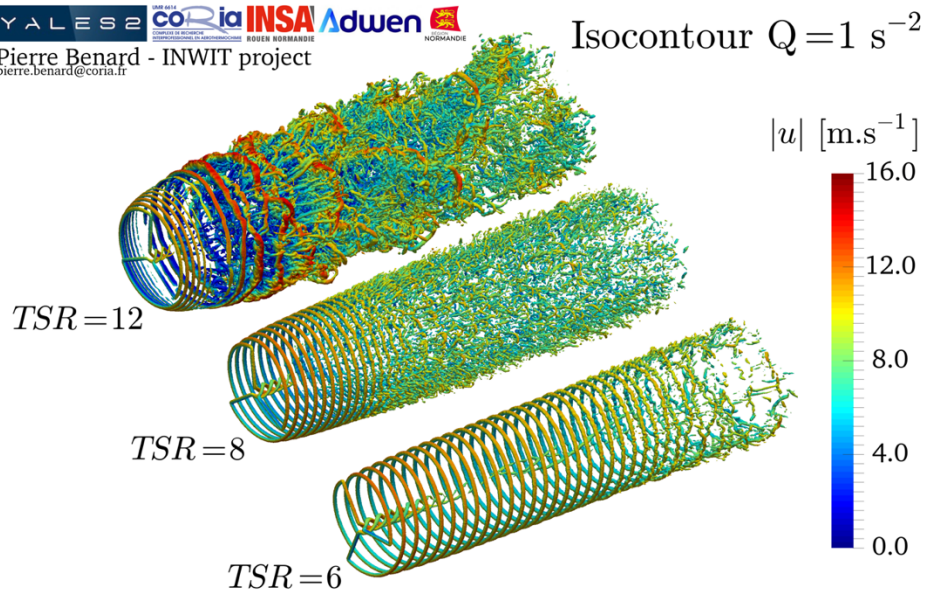


Figure 1 – Wind turbine wake visualization via Q-criterion isocontour colored by velocity at different TSR.

Requirements

The candidates are expected to hold (or about to have) a PhD in the area of computational physics or applied mathematics. Programming experience is mandatory. Experience in using high-performance computing facilities (HPC) would be an advantage.

Informations

- Number of positions: 2
- Duration: 2 years
- Start: as soon as possible
- Location: CORIA lab., Saint-Etienne du Rouvray (close to Rouen), Normandy, FRANCE
- Salary: around 2000 € net/month
- Contacts: Pierre BENARD (pierre.benard@coria.fr)
Vincent MOUREAU (vincent.moureau@coria.fr)

Bibliography

- [1] BENARD, P., VIRÉ, A., MOUREAU, V., LARTIGUE, G., BEAUDET, L., DEGLAIRE, P. & BRICTEUX, L. (2018) Large-Eddy Simulation of wind turbines wakes including geometrical effects. *Computers and Fluids* 0, 1–7.
- [2] MOUREAU, V., DOMINGO, P. & VERVISCH, L. (2011) Design of a massively parallel cfd code for complex geometries. *Comptes Rendus Mécanique* 339 (2), 141 – 148
- [3] YALES2 web site: <https://www.coria-cfd.fr/index.php/YALES2>