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Aerodynamics assessment and O&M technologies for Wind Turbine blades

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► **To cite this version:**

Caroline Braud. Aerodynamics assessment and O&M technologies for Wind Turbine blades. SEAN-ERGY 2021 - International leading event on offshore wind and marine renewable energy, Sep 2021, Nantes - St Nazaire, France. hal-03437742

HAL Id: hal-03437742

<https://hal.science/hal-03437742>

Submitted on 3 Dec 2021

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OFFSHORE WIND RESEARCH ACTIONS in Labs

Aerodynamics assessment and O&M technologies for Wind Turbine blades

Caroline Braud (CR CNRS)



Research issues:

Wind Turbine Blade aerodynamics under realistic inflows (Gust, turbulence ...) and operations (misalignment, FOWT motions ...) and/or with Add-Ons/Controllers (VGs, spoilers, flaps/slats, micro-jets etc ...) is highly unsteady, and leads to modeling issues → On going research on improvement of knowledge in unsteady blade aerodynamics.

Research outcomes:

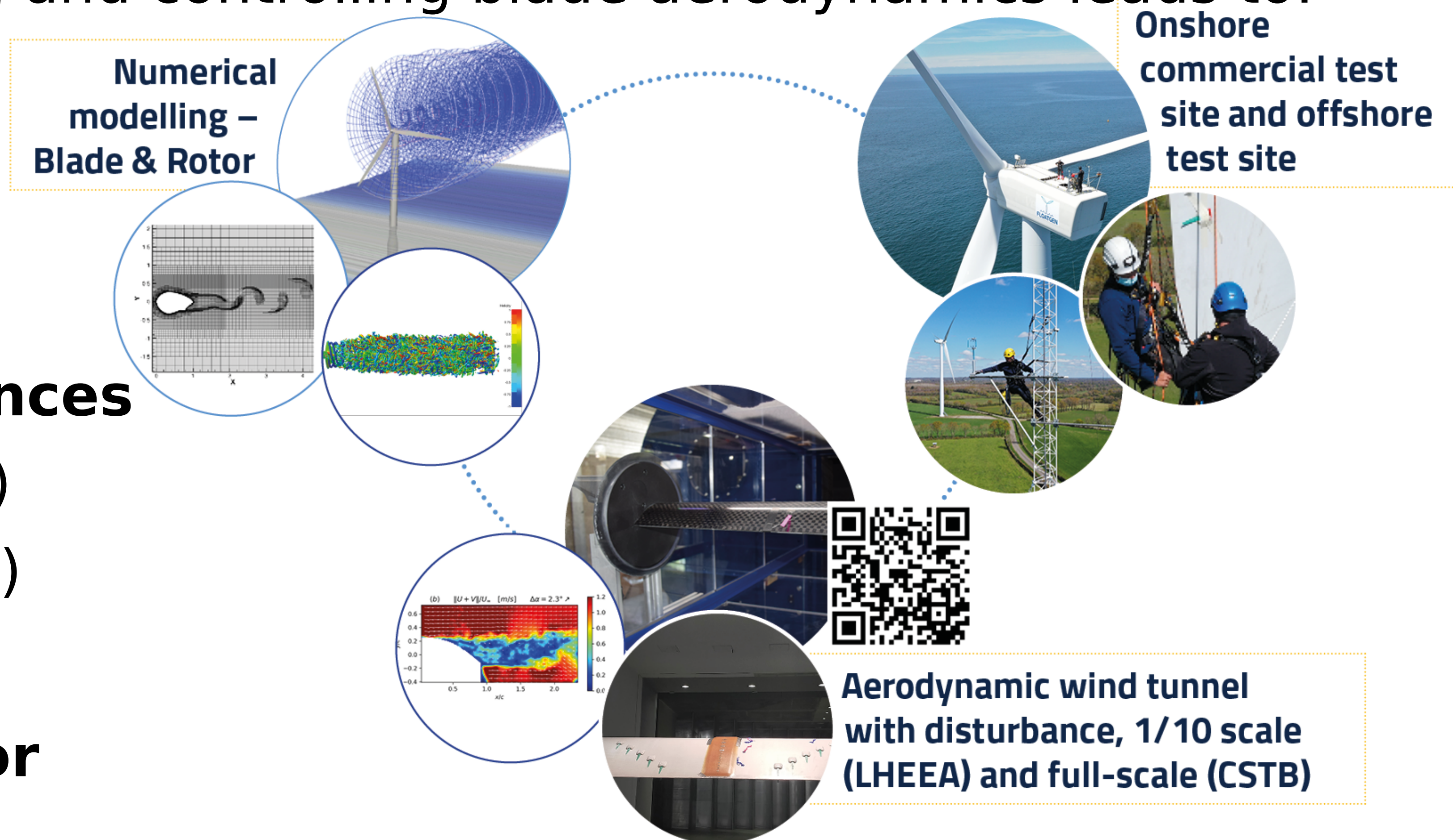
Results of this research are used to develop/help in the development of O&M strategies / technologies. Monitoring and controlling blade aerodynamics leads to:

- Noise reduction
- Increase wind turbine life time
- Improve energy extraction

Approach:

- Wind tunnel with **inflow disturbances** (full and reduced scales of 2D blade)
- On-site measurements (sonic/Lidar)
- Simulations (full scale blade/rotor)

Example of use : E-TellTale sensor



**Scale 1/10
2D blade section**

**Full Scale
2D blade section**

**On-site
measurements**

E-TellTale sensor aerodynamics was assessed first at the 1/10 scale (LHEEA facility), then at the full scale (CSTB facility) and finally on site measurements. At reduced scale, the dynamics of the tail was found to react sufficiently fast to detect the flow separation dynamics. At full scale, it was possible to demonstrate the ability of the sensor to follow the separation point location with only one sensor located at the blade trailing edge. From these outputs, sensors were placed on a rotor blade.

E-PARADISE project:



The LHEEA is a member of:

