

## SPATIO TEMPORAL FLOW STRUCTURES IN THE WAKE OF AN OFF-SHORE WIND TURBINE

Soledad Le Clainche<sup>1</sup>, Xuerui Mao<sup>2</sup> and José M. Vega<sup>1</sup>

<sup>1</sup> School of Aeronautics (ETSIAE), Universidad Politécnica de Madrid, Madrid, Spain

<sup>2</sup> University of Nottingham, Nottingham, UK

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The main goal of this work is to study in detail the flow physics of the wake of an off-shore wind turbine. For such purpose, a new technique called Spatio-Temporal Koopman Decomposition (STKD) [1] is used to analyse the main flow instabilities and the large flow structures in the wake of the turbine. STKD presents the main flow structures as an expansion in traveling waves that exhibit the main frequencies and wavenumbers characterizing the flow.

The main results of this work show that the complex behaviour of the wake of the wind turbine is mainly driven by a single dominant traveling wave moving downstream and a combination of small amplitude traveling waves, related to velocity fluctuations, representing the flow rotation [2]. Figure 1 shows the spatio-temporal diagram in the wake of the wind turbine, where it is possible to distinguish the character of the traveling wave. More results will be presented at the time of the conference.

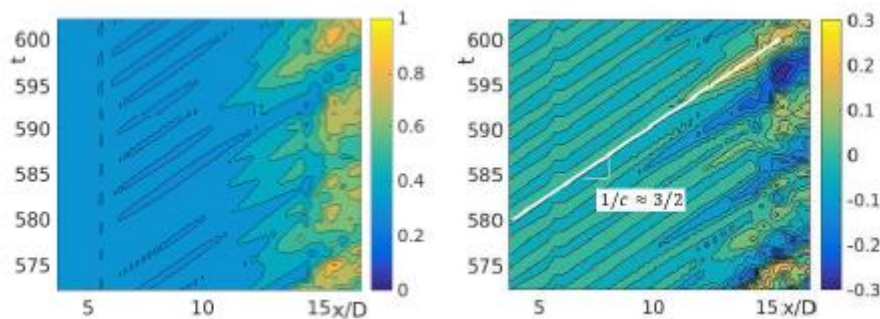


Figure 1: Spatio-temporal diagram in the streamwise component in the wake of the wind turbine. Left: unsteady flow field. Right: velocity fluctuations.

### REFERENCES

- [1] Le Clainche, S. & Vega, J.M., Spatio-Temporal Koopman Decomposition, *J. Nonlin. Sci (to appear)*, 2018.
- [2] Le Clainche, S., Mao, X. & Vega, J.M., Spatio-Temporal Koopman Decomposition in off-shore wind turbines. Proceedings of International Symposium on Transport Phenomena and Dynamics of Rotations Machinery (ISROMAC 17), Maui, Hawaii, December 2017.