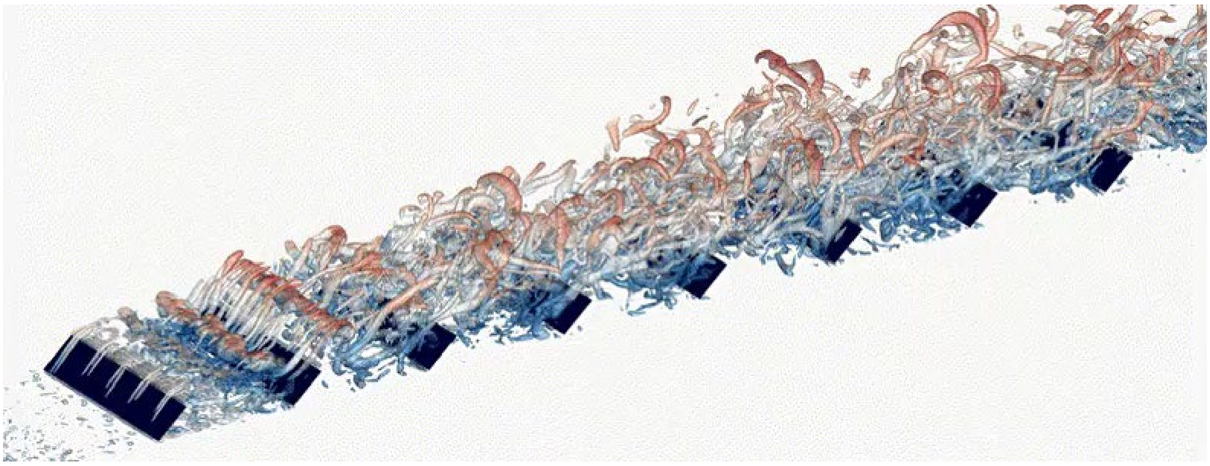
**Research stay at the University of Oviedo - Aerodynamics of solar photovoltaic farms – Dr Ouro**

During this 3.5-month research stay at the University of Oviedo, I worked with Dr Suarez-Sierra to develop new skills and knowledge in the field of solar photovoltaic (PV) farms. This institution has developed a portfolio of experimental campaigns related to solar panel aerodynamic instabilities and through this collaboration we extended this current knowledge by applying high-fidelity simulations to solar PV farms. The aim of this stay was to validate the in-house code DOFAS in application to large solar PV farms, to develop analytical models that can predict the load variation for various deployment scenarios, and to familiarise with how the Eurocode standard enables the design of such renewable energy facilities.

Over the first weeks, we worked on expanding the capabilities of our in-house solver to account for the geometry of the solar panels. As these can be assembled to single-axis solar tracking systems, this was also considered in the fluid-structure interaction model. After performing a literature review, we realised that very little work has been published on the aerodynamics of solar PV farms and loading on these devices despite their rapid deployment worldwide. Our colleagues at the University of Oviedo have a very close collaboration with a large solar PV manufacturer, Gonvarri Solar Steel, to whom we invited on a monthly basis to present the results obtained.

For two months, we carried our multiple simulations by just changing the angle of attach of an array comprising 20 solar panels, ranging from ±60 degrees. The mean velocity field and turbulence flow field was obtained using 200 CPUs running for over 6 days, with the following figure showing the turbulence structures being shed by the panels at a -40 tilt angle, which lose coherence after five rows approximately. The first row generates a well-defined roller structure that is shed with a given frequency, and generates a low-velocity wake that decreases the wind load on the following row.



The large-eddy simulations done for a wide range of cases has enabled a new understanding of how the wind load varies with row number and for different tilt angles. We have improved the current knowledge of solar PV farm aerodynamics by studying the mean kinetic energy budget and informing a new analytical solar panel loading model to be used by manufacturers and project developers. Future research collaboration will focus on the further development of the model for floating solar arrays to be deployed in offshore locations.

As outcomes, we are currently writing a paper to be submitted to Physics of Fluids in May and have been invited to give a talk at an industry-oriented webinar on 15th March to which more than 500 people attended.