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Absolute Instability of Interacting Planar Mixing Layers and Wakes

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Final Technical Report

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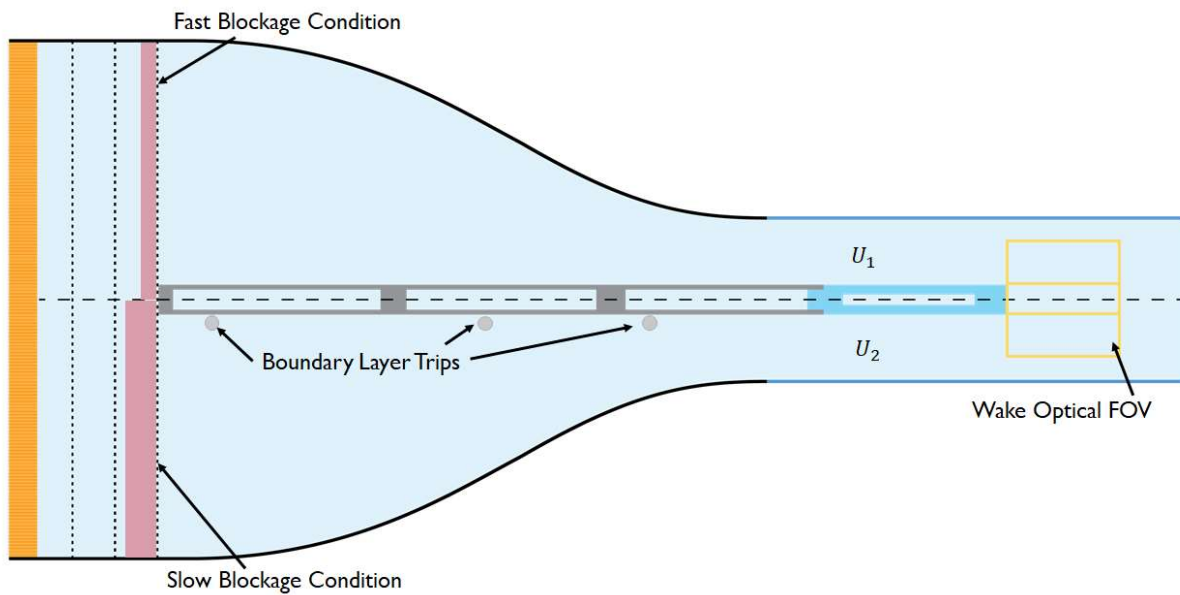


Figure 1: Experimental schematic, showing the upstream blockage on both sides of the splitter plate and boundary layer trips used to manipulate the VR and MR and the downstream PIV field of view.

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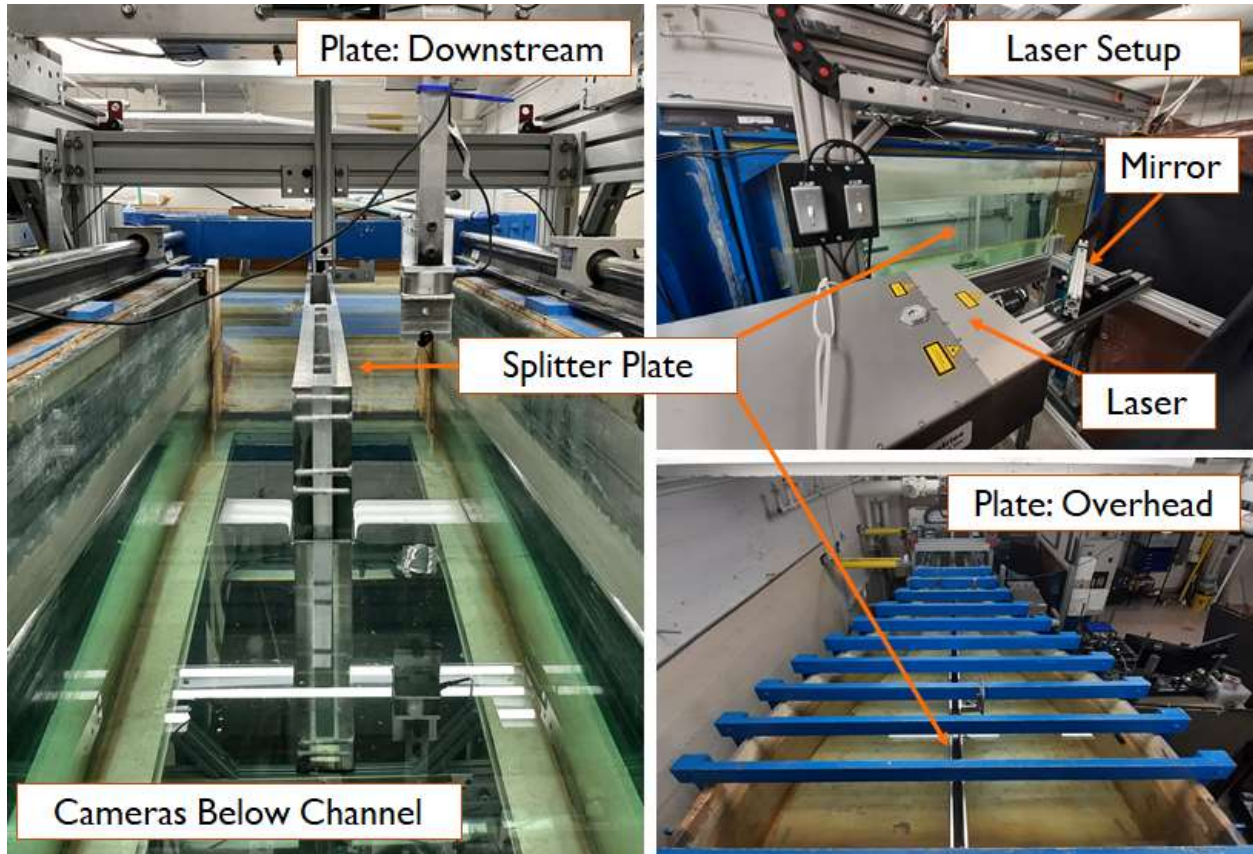


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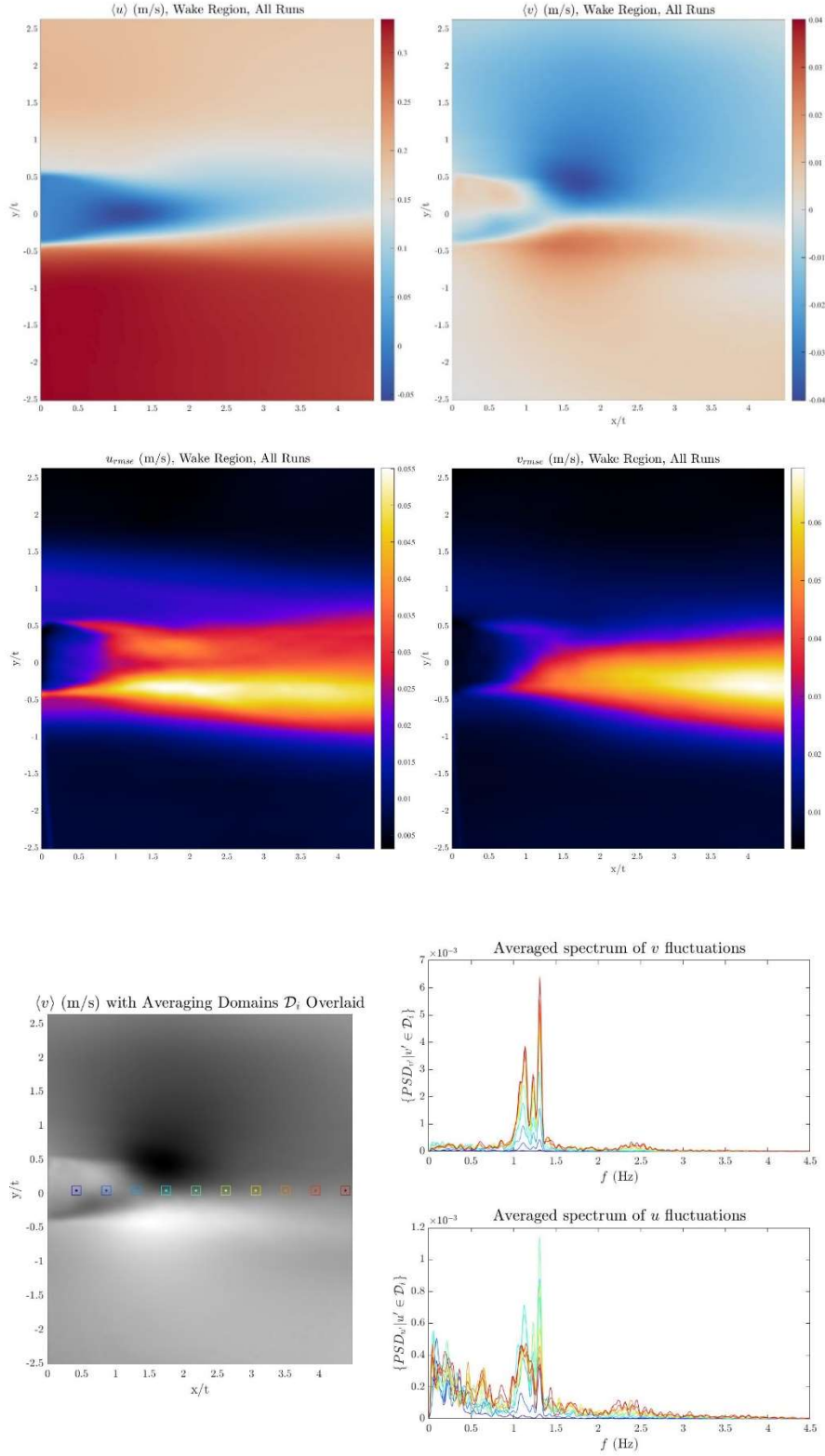


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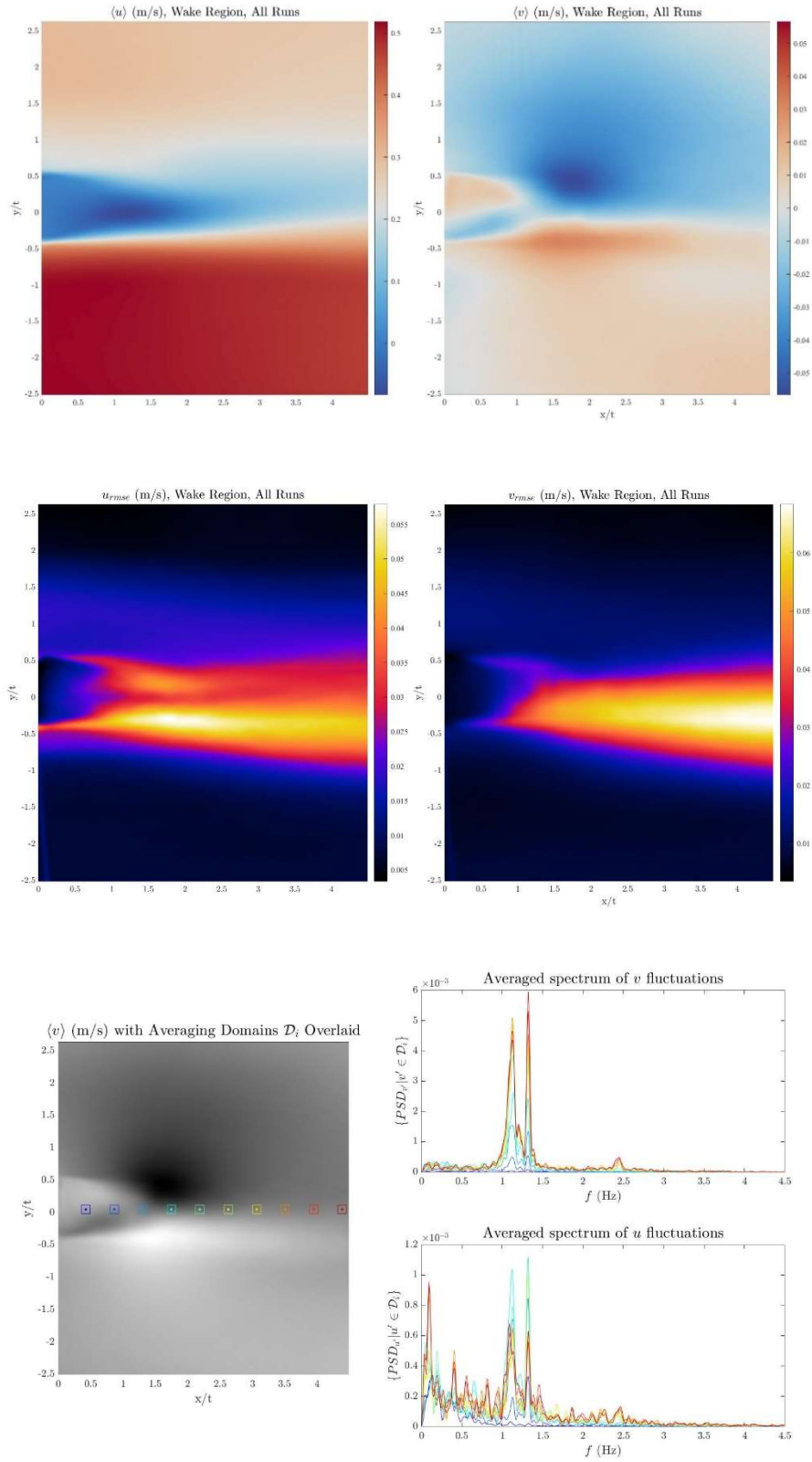


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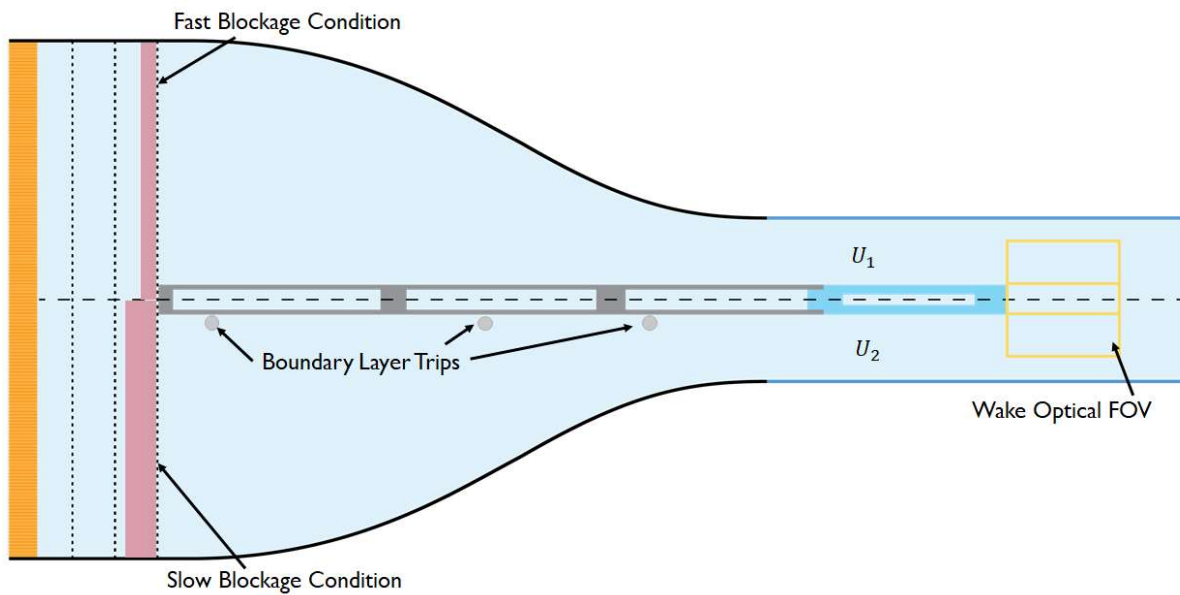


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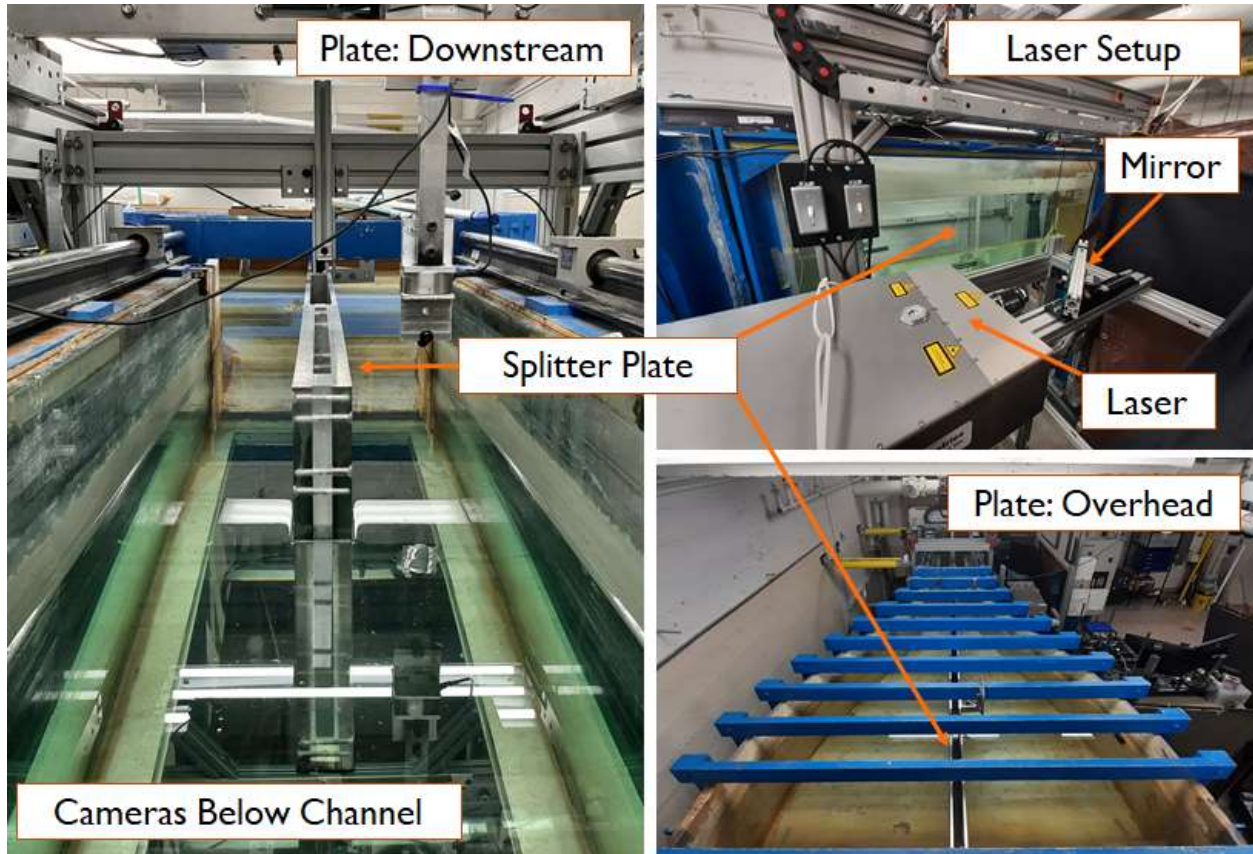


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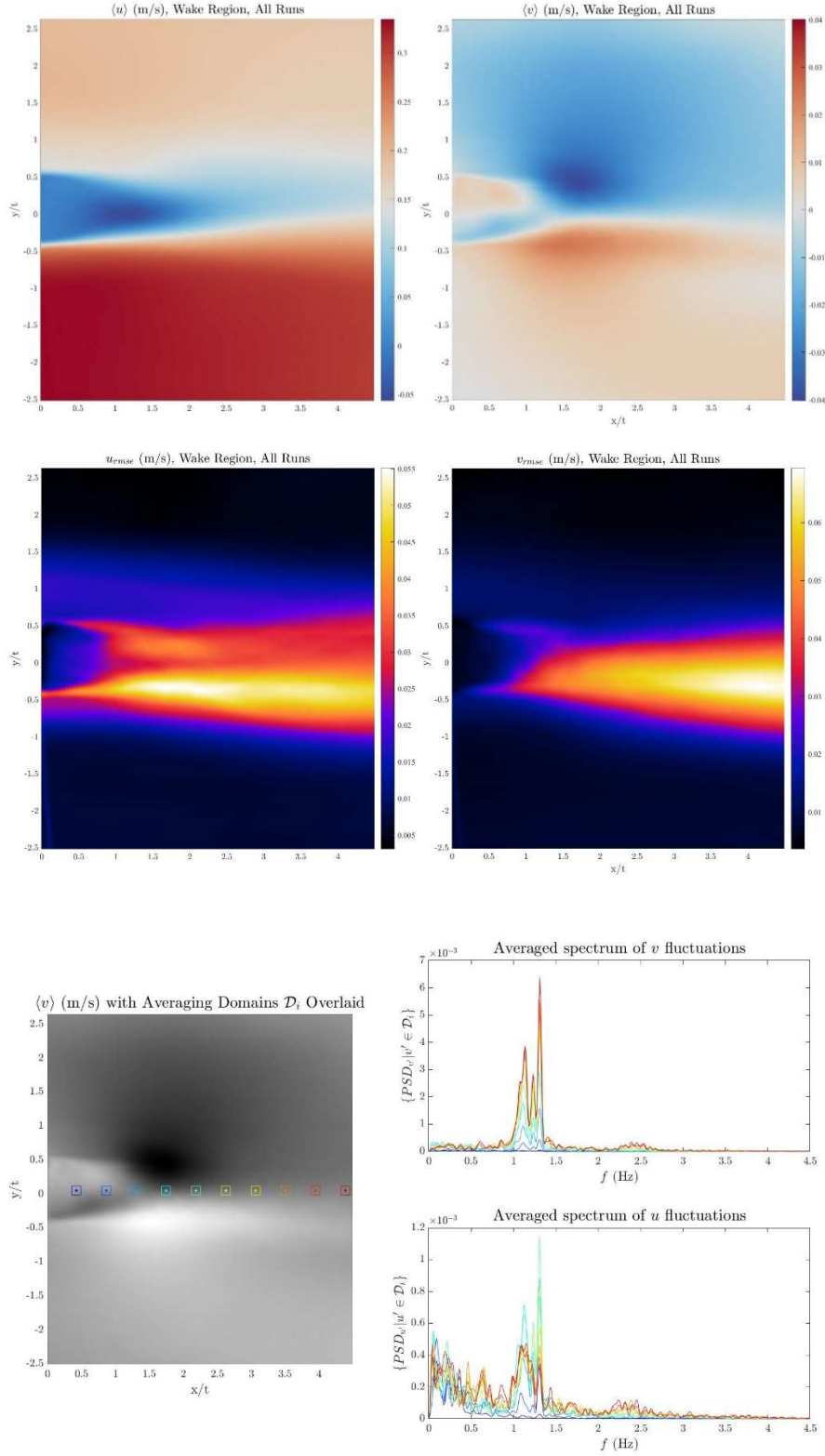


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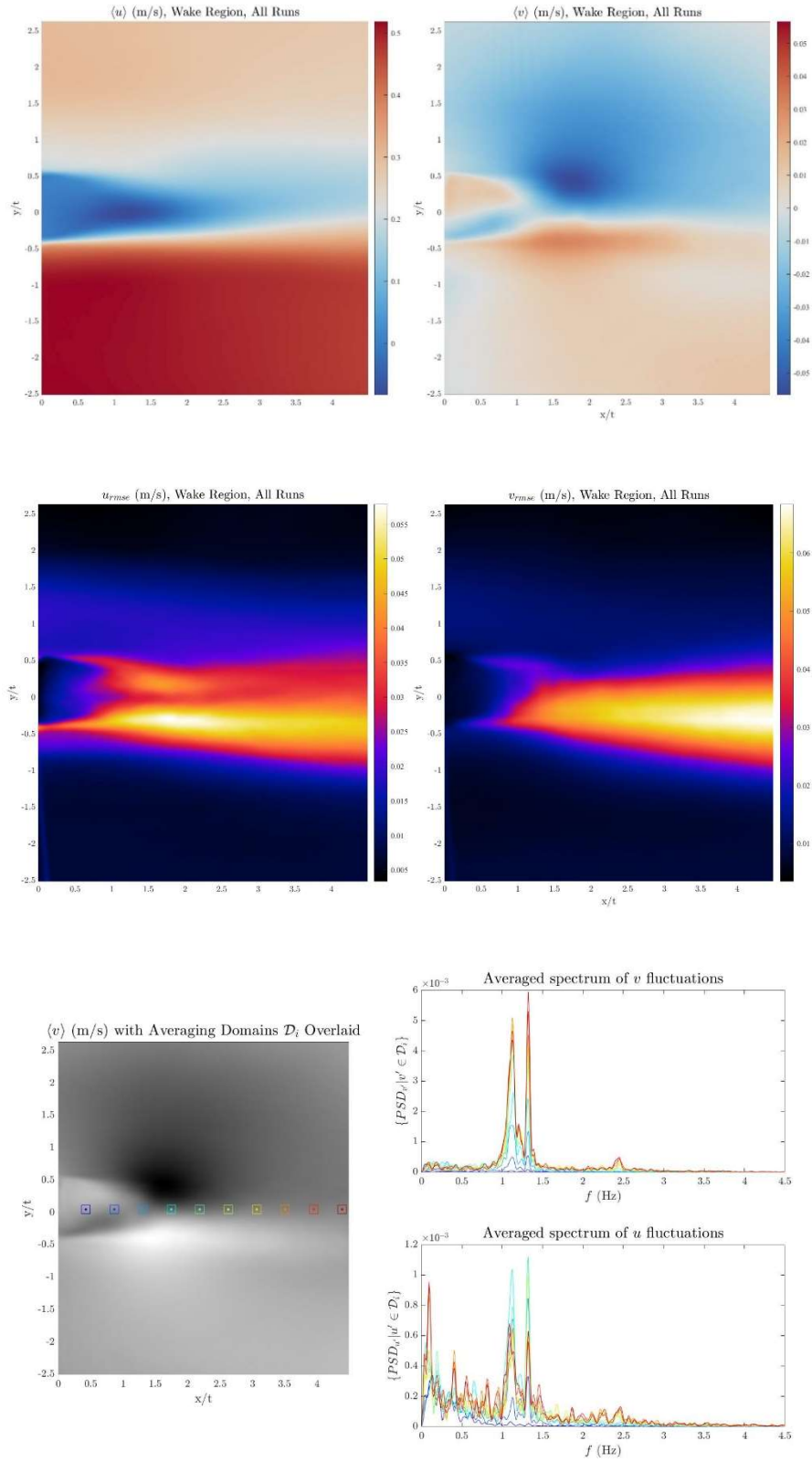


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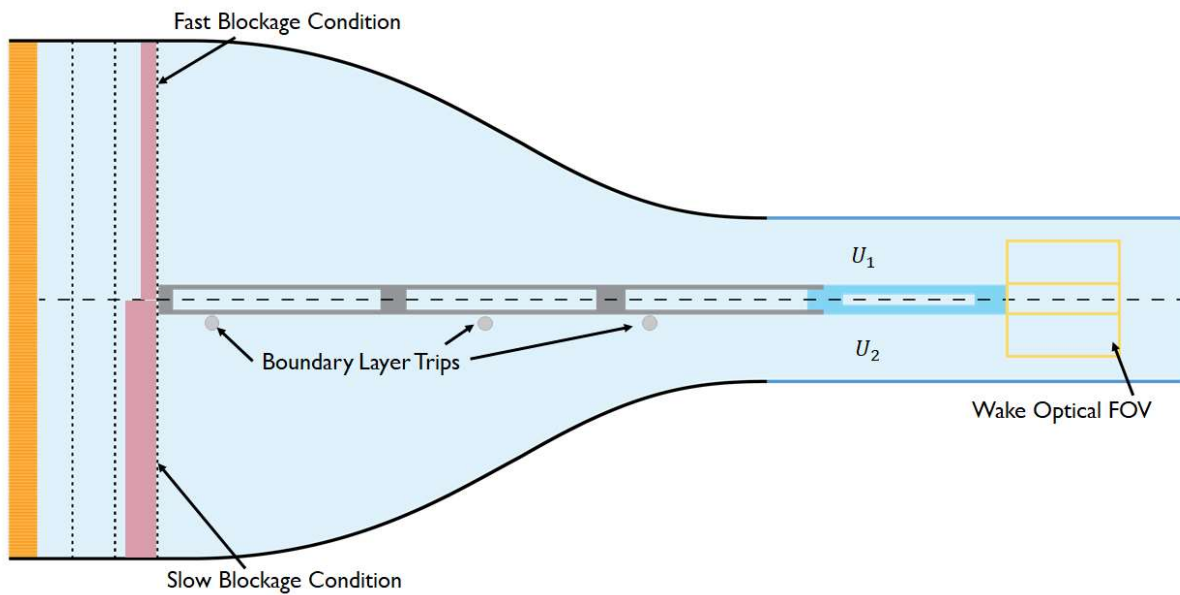


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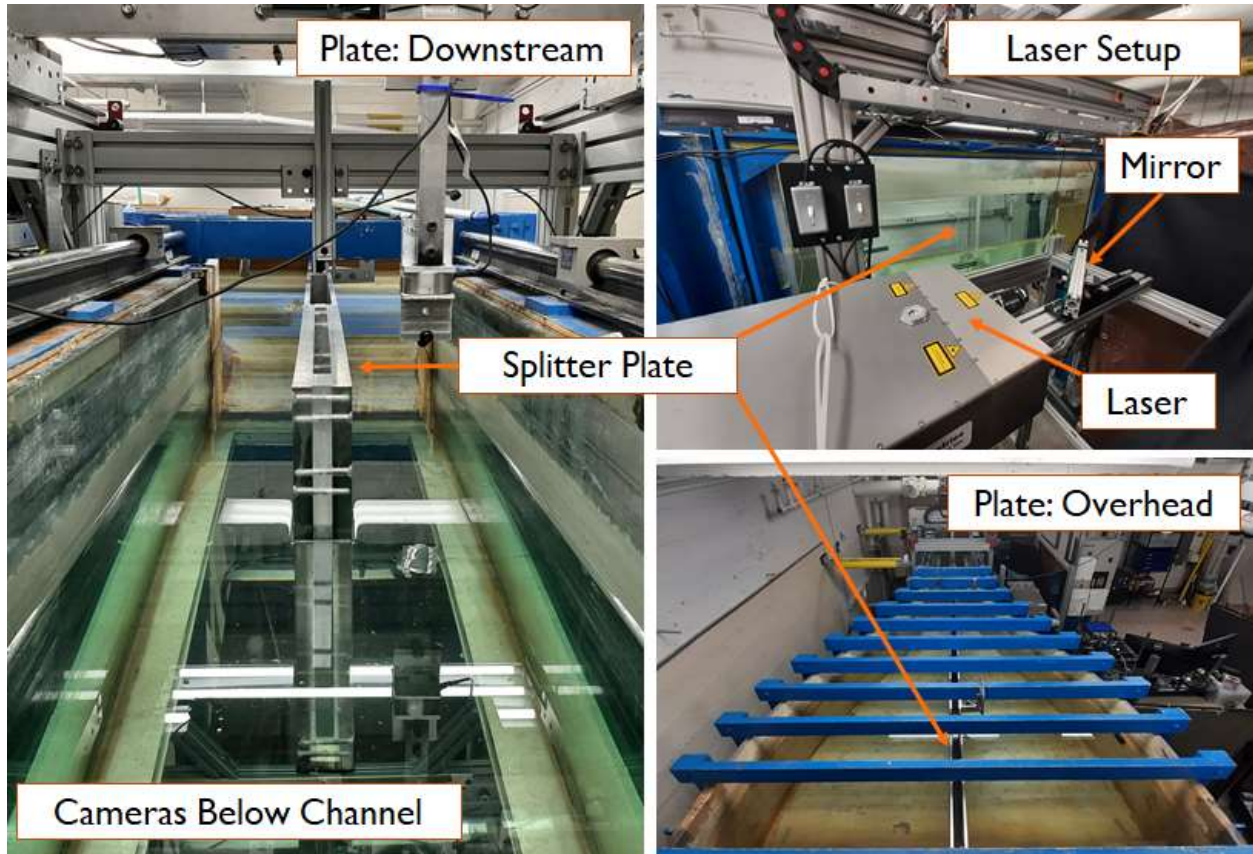


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Sample PIV results are given for the two cases B1 and B3, both with a thickness and mean velocity-based Reynolds number of around 15×10^3 . The latter case shows two distinct peaks in the power spectra of both u and v fluctuations in the wake.

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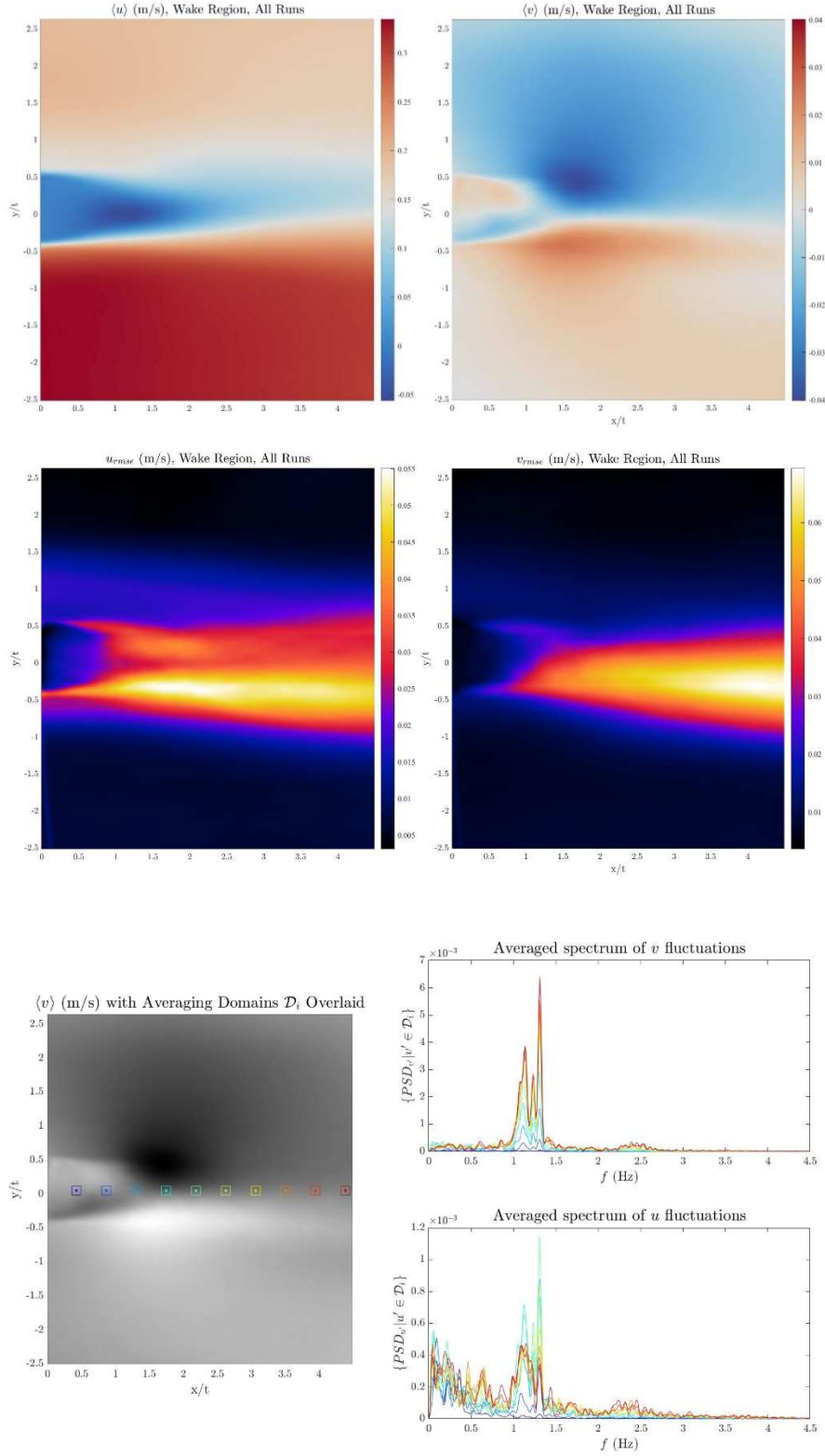


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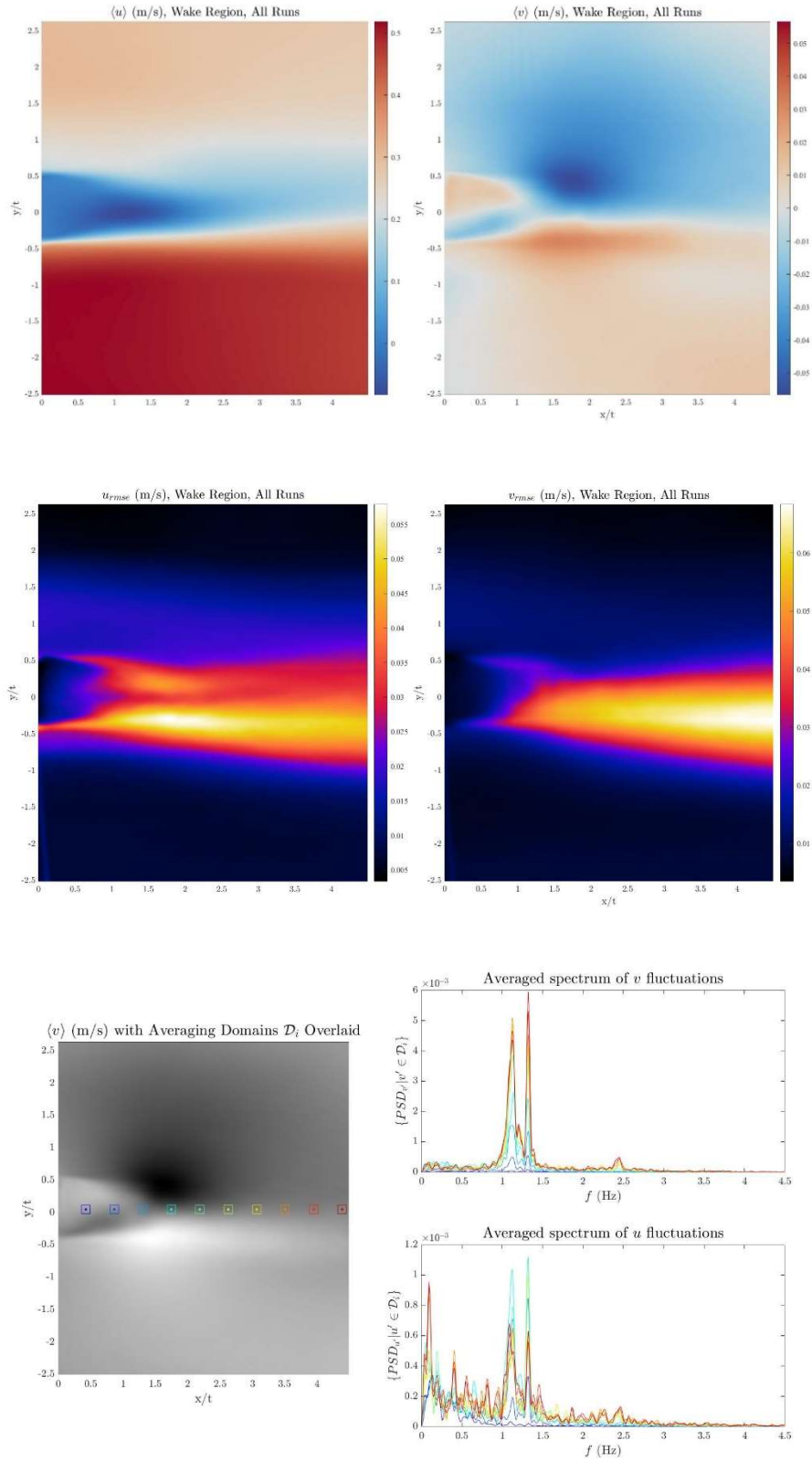


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P.I.: Beverley J. McKeon

California Institute of Technology

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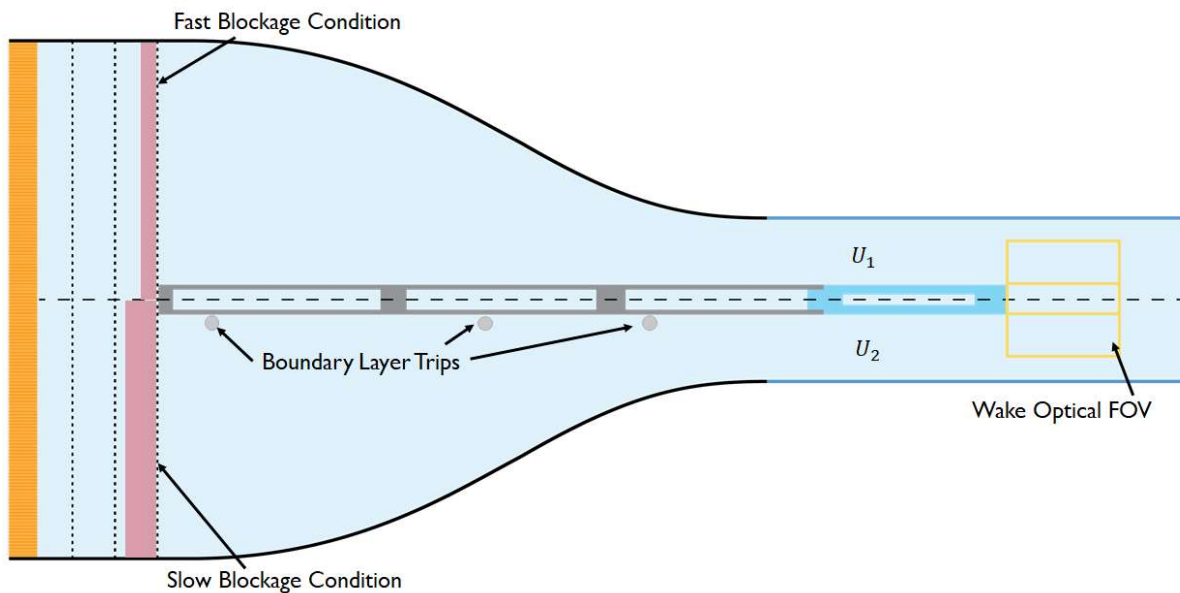


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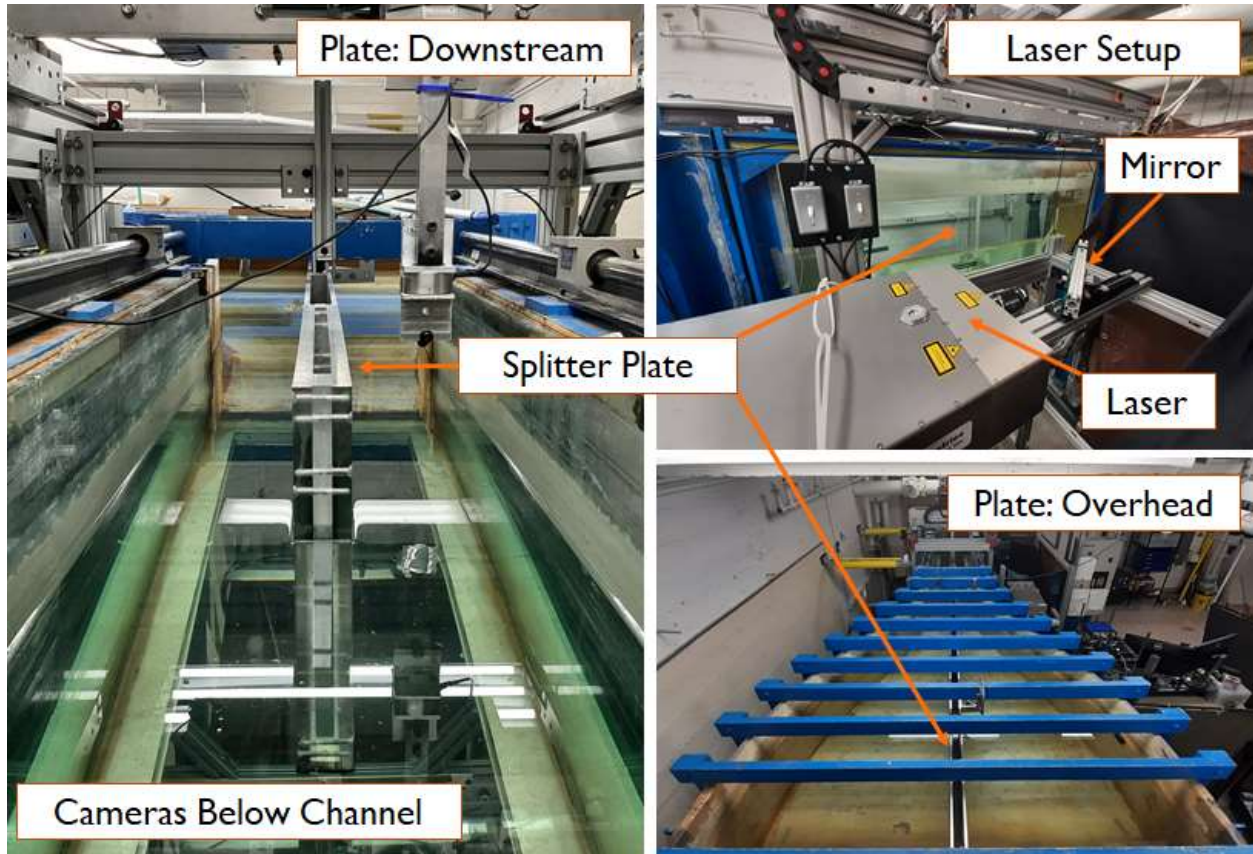


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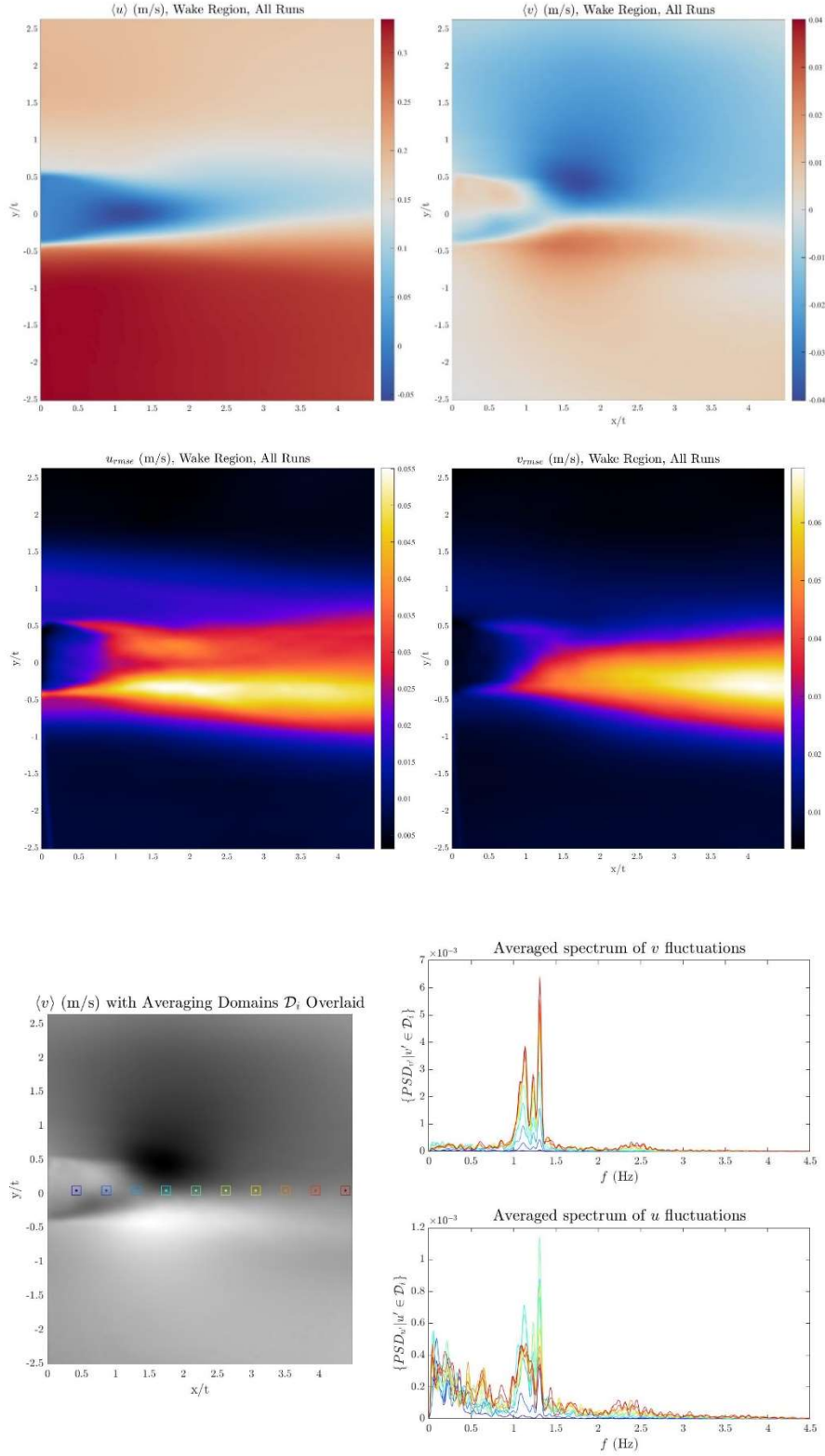


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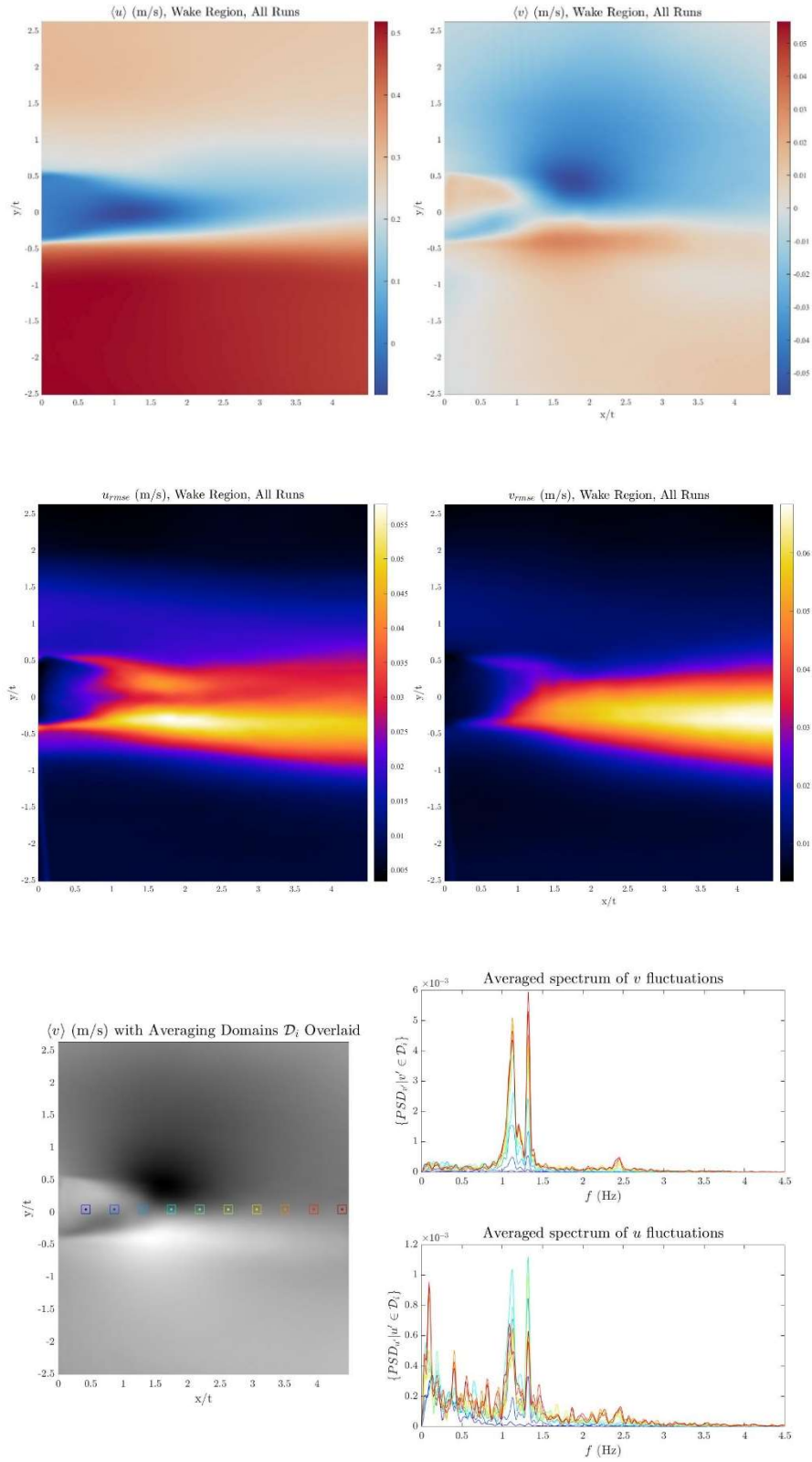


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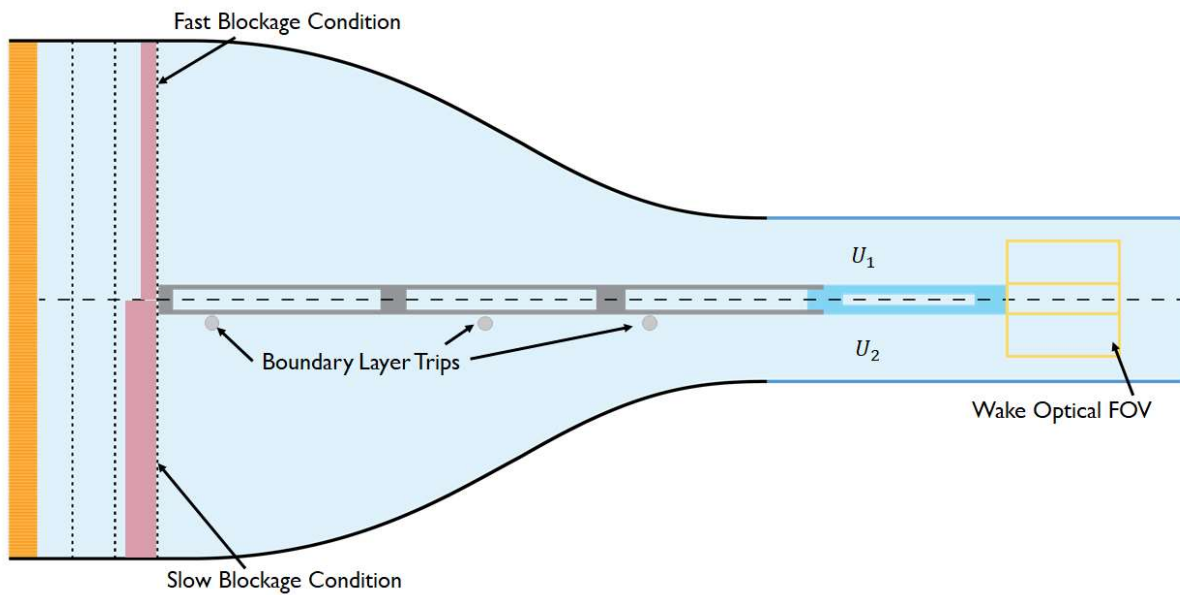


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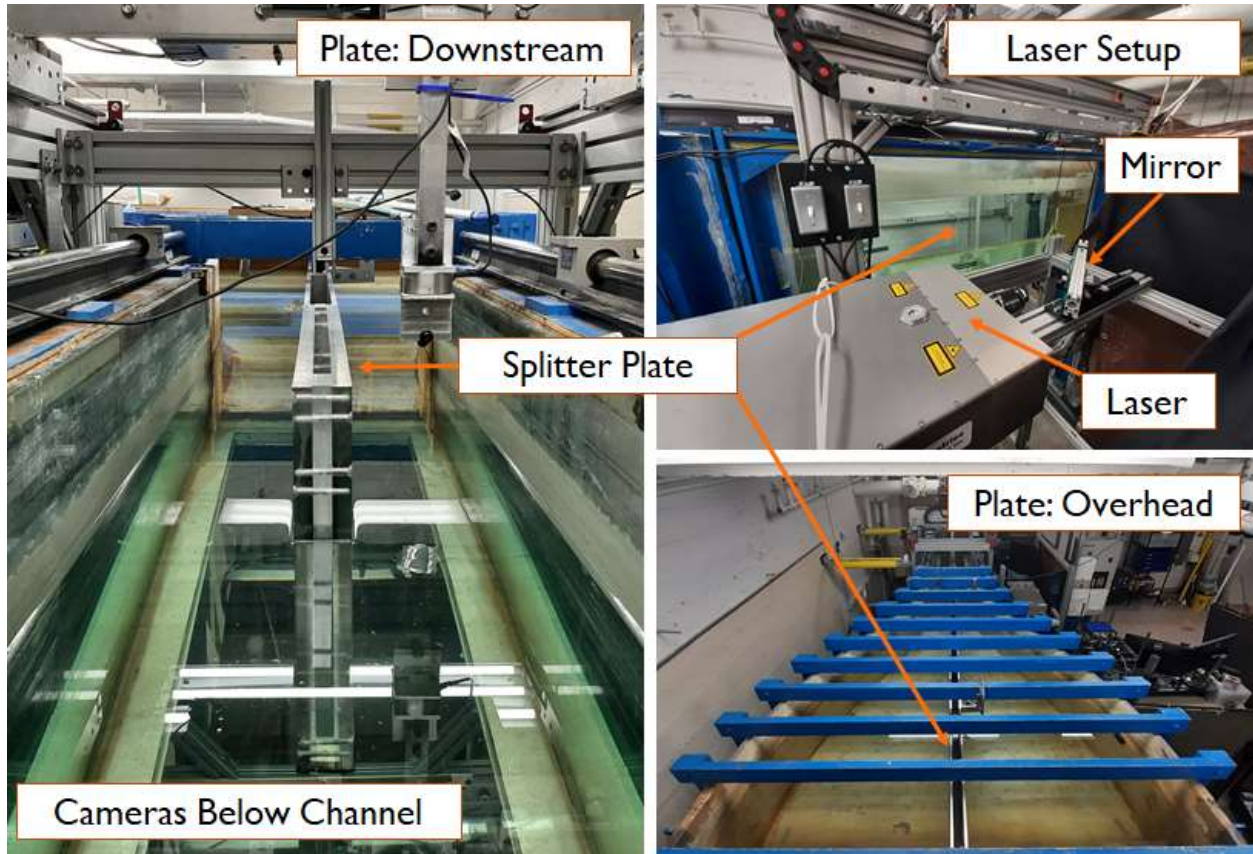


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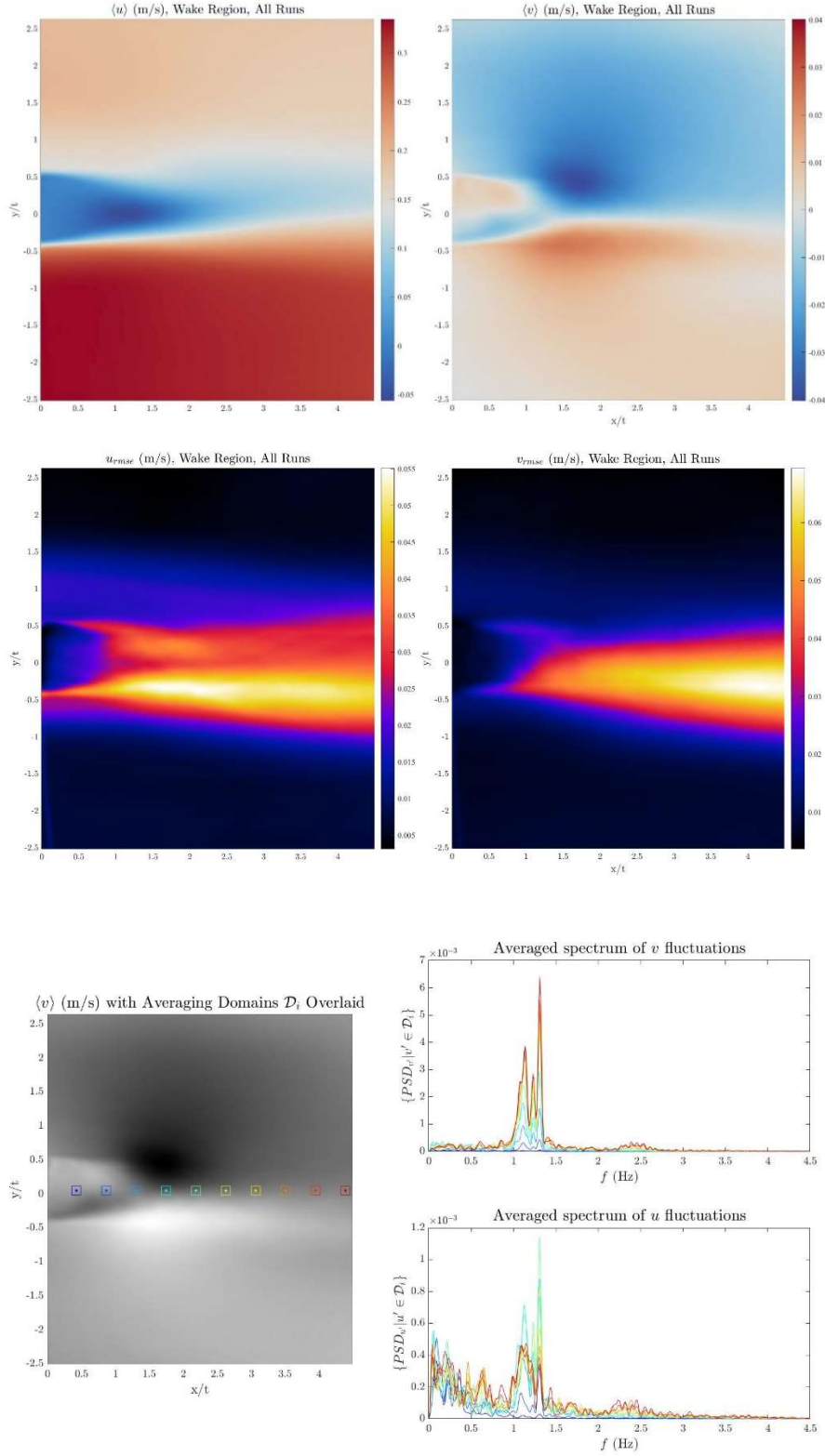


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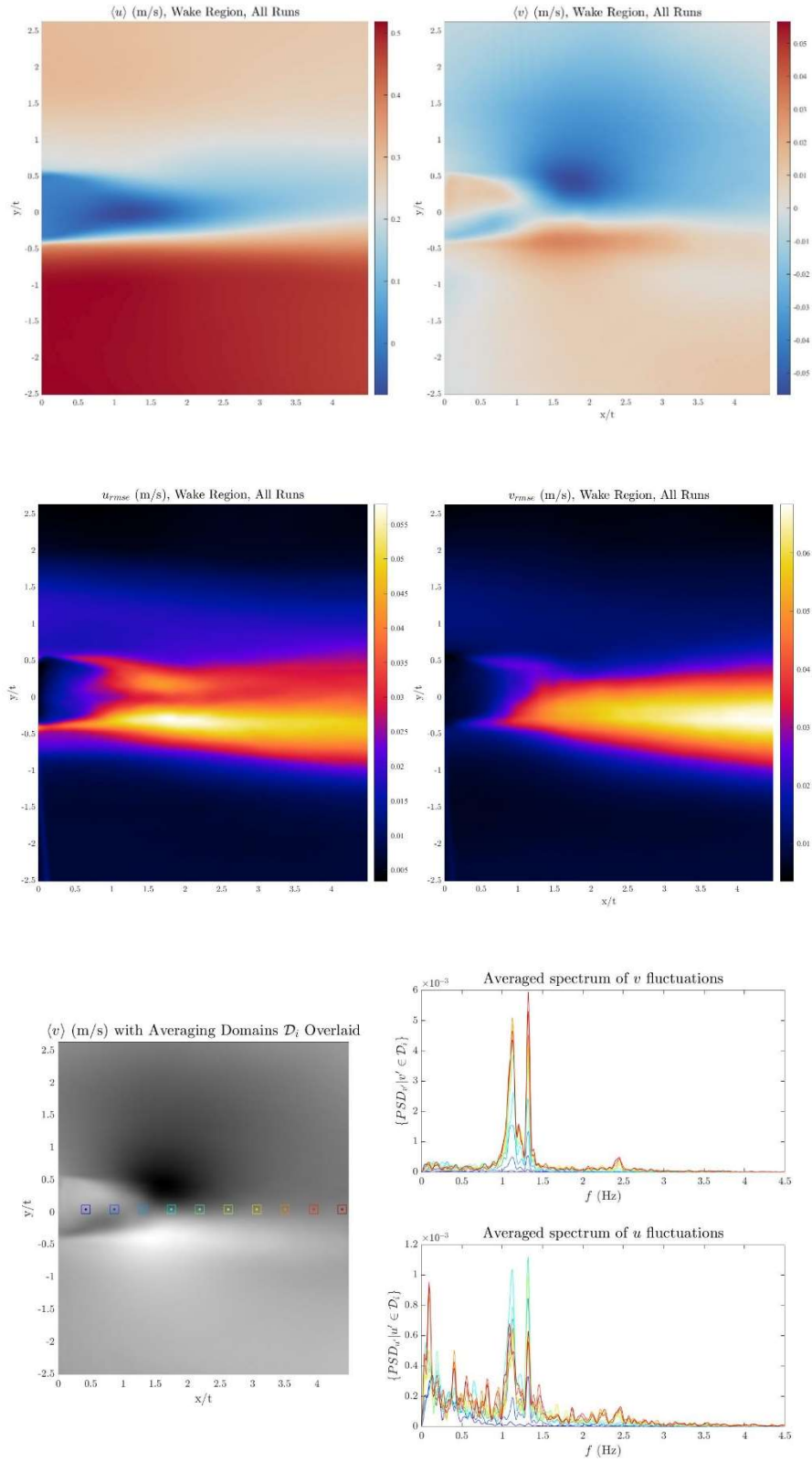


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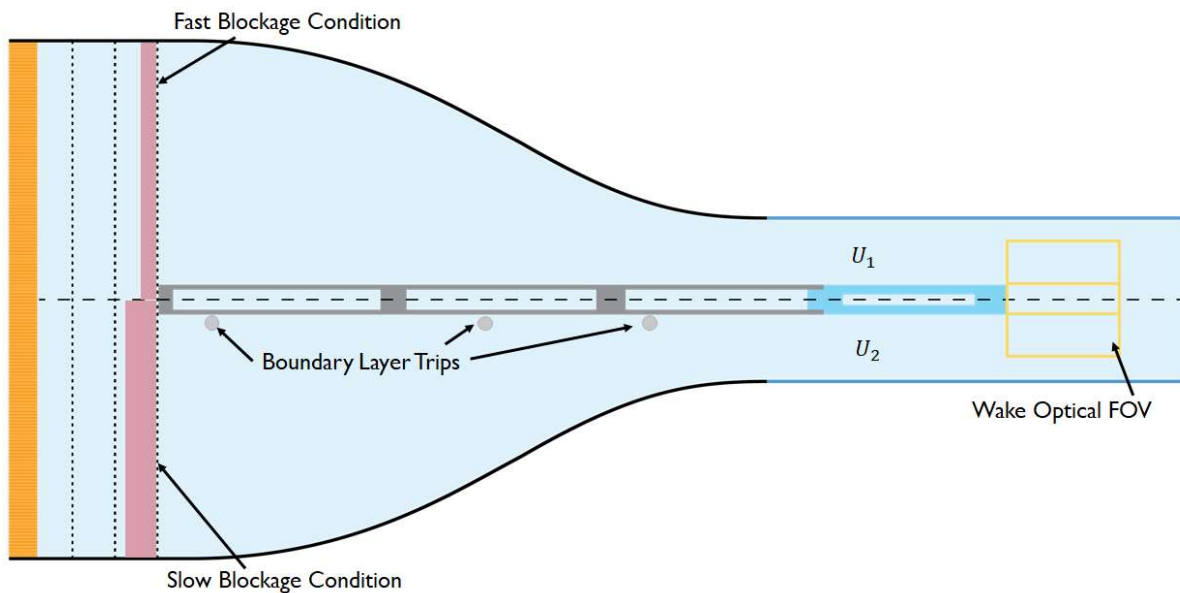


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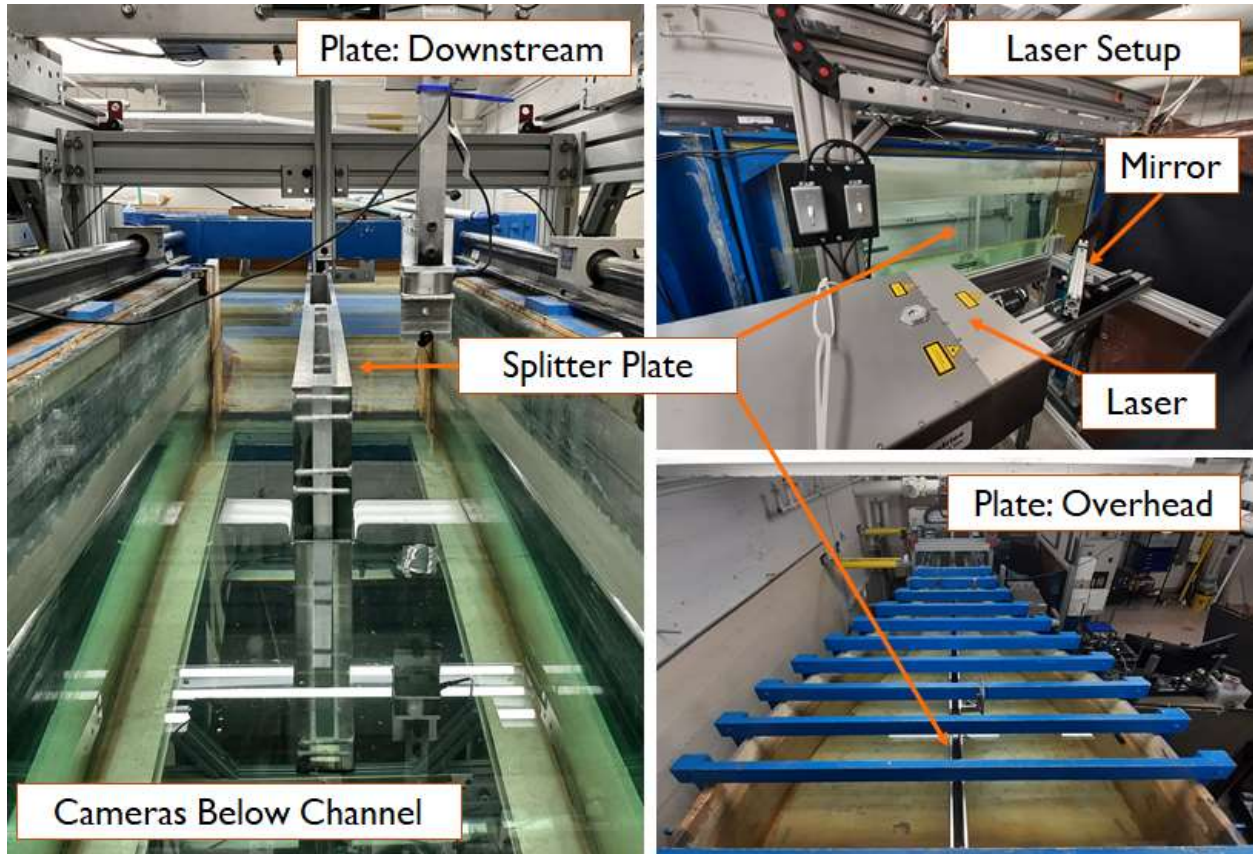


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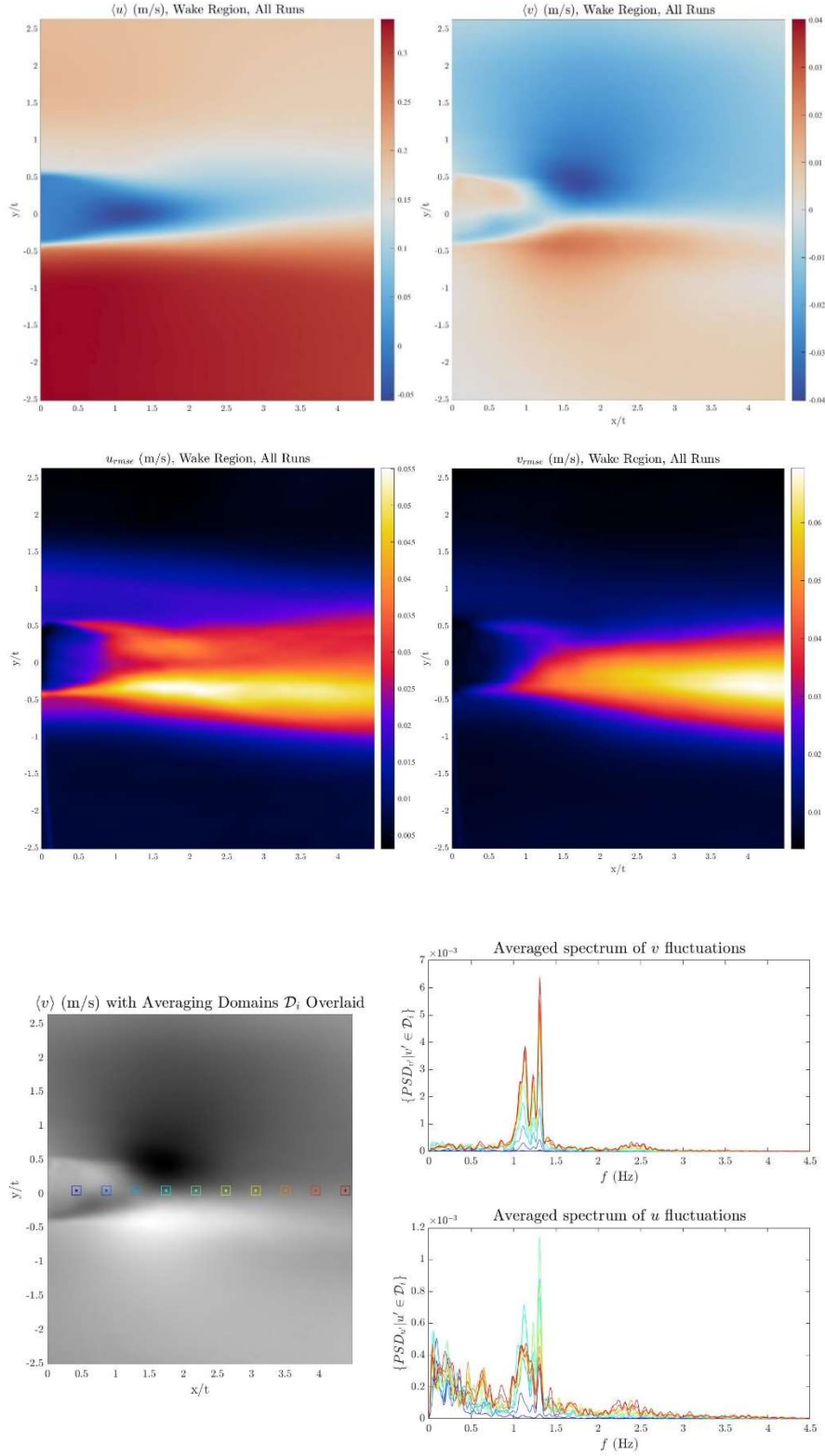


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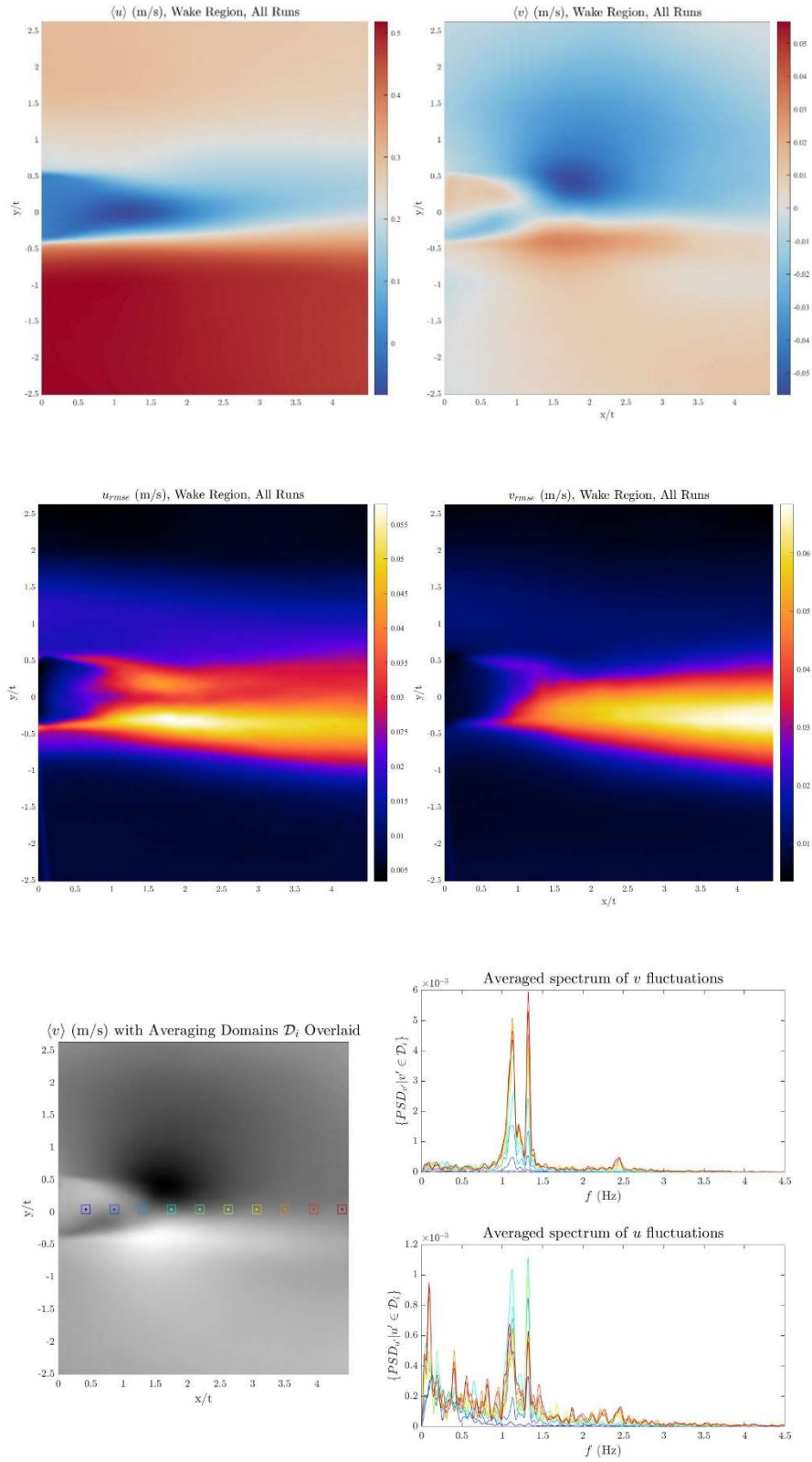


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Report Coversheet

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Distribution A – Approved For Public Release

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Principal Investigator Name

Dr. Beverley J. McKeon

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Absolute Instability of Interacting Planar Mixing Layers and Wakes

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FINAL REPORT

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P.I.: Beverley J. McKeon

California Institute of Technology

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1. [Caltech and UFF] Finalize experimental test matrix.
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Changes

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Upstream blockages on both the fast and slow stream side of the flow were created using a range of materials, including honeycomb, mesh and linen. Obtaining the desired fast and slow side boundary layer momentum thicknesses, θ_1 and θ_2 , to transit through the region of absolute instability while maintaining the VR was an iterative process.

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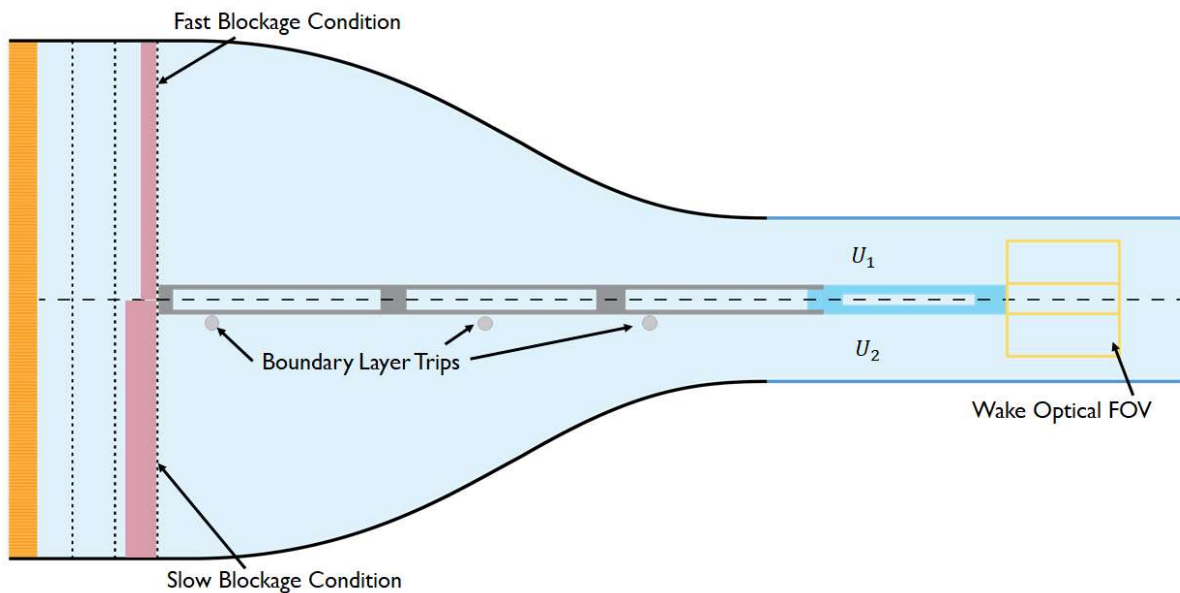


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An iterative process was implemented to determine the experimental conditions and, in particular, the measurement parameters to match the experiments to the analytical predications for similar test conditions. After a first round of experiments, the test matrix was refined to traverse the absolutely unstable region in parameter space. A summary of the two sets of operating conditions is listed in Table 1 below.

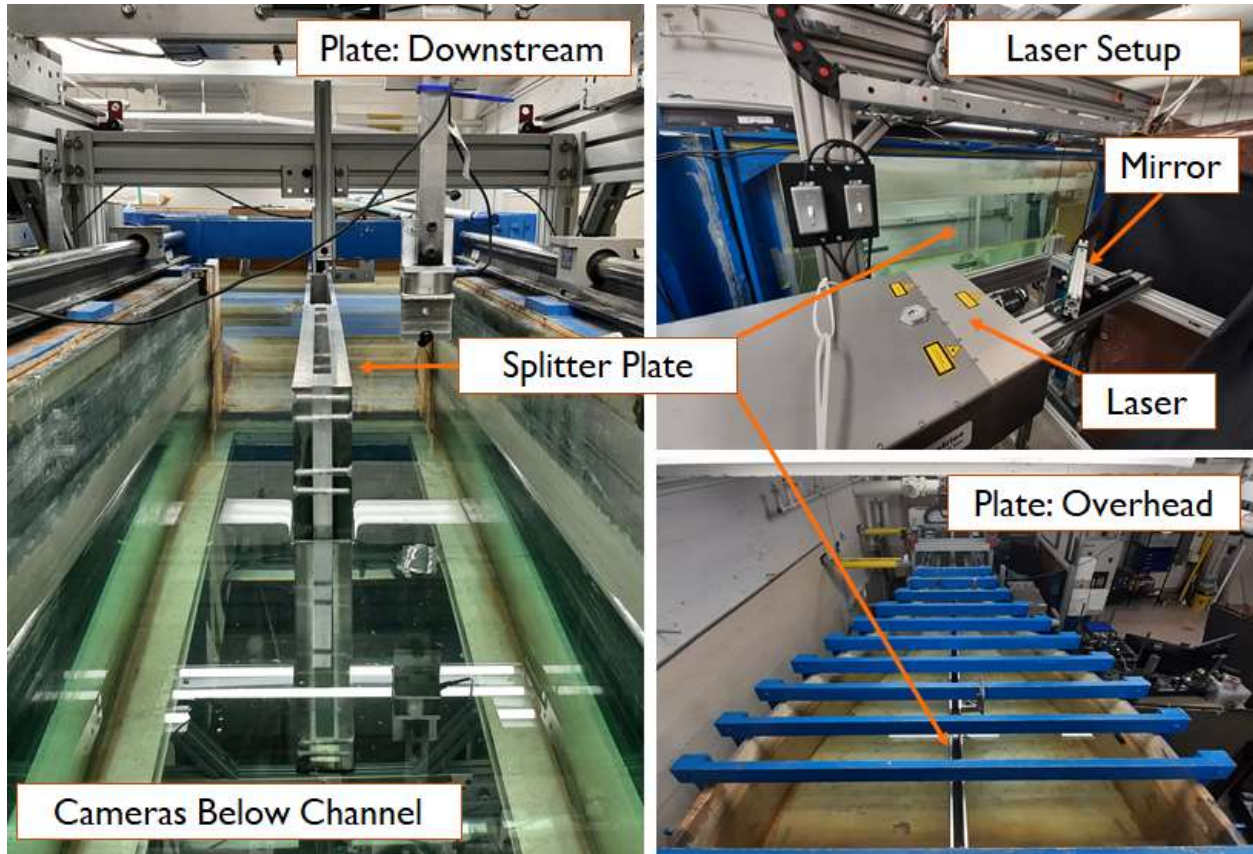


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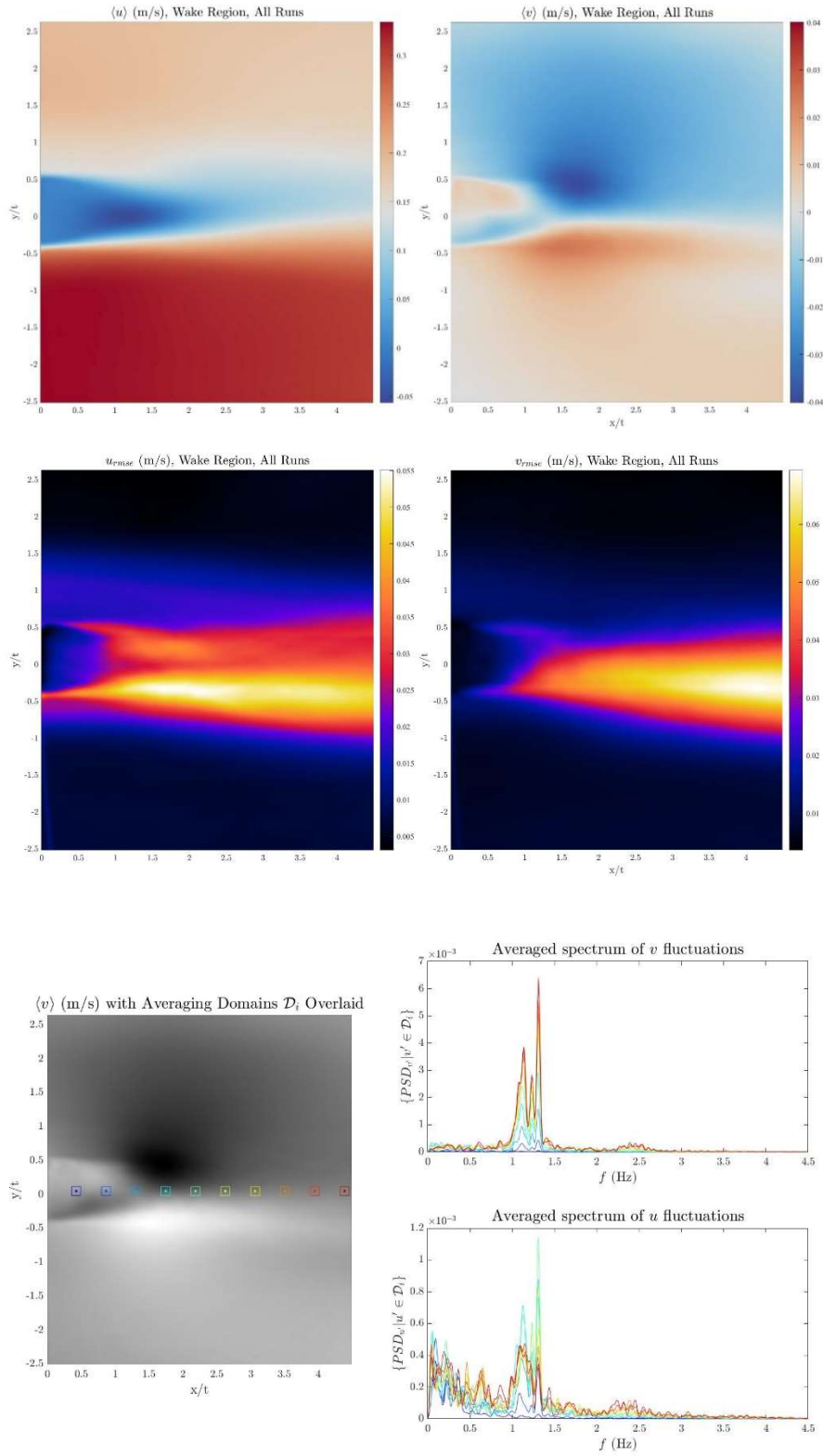


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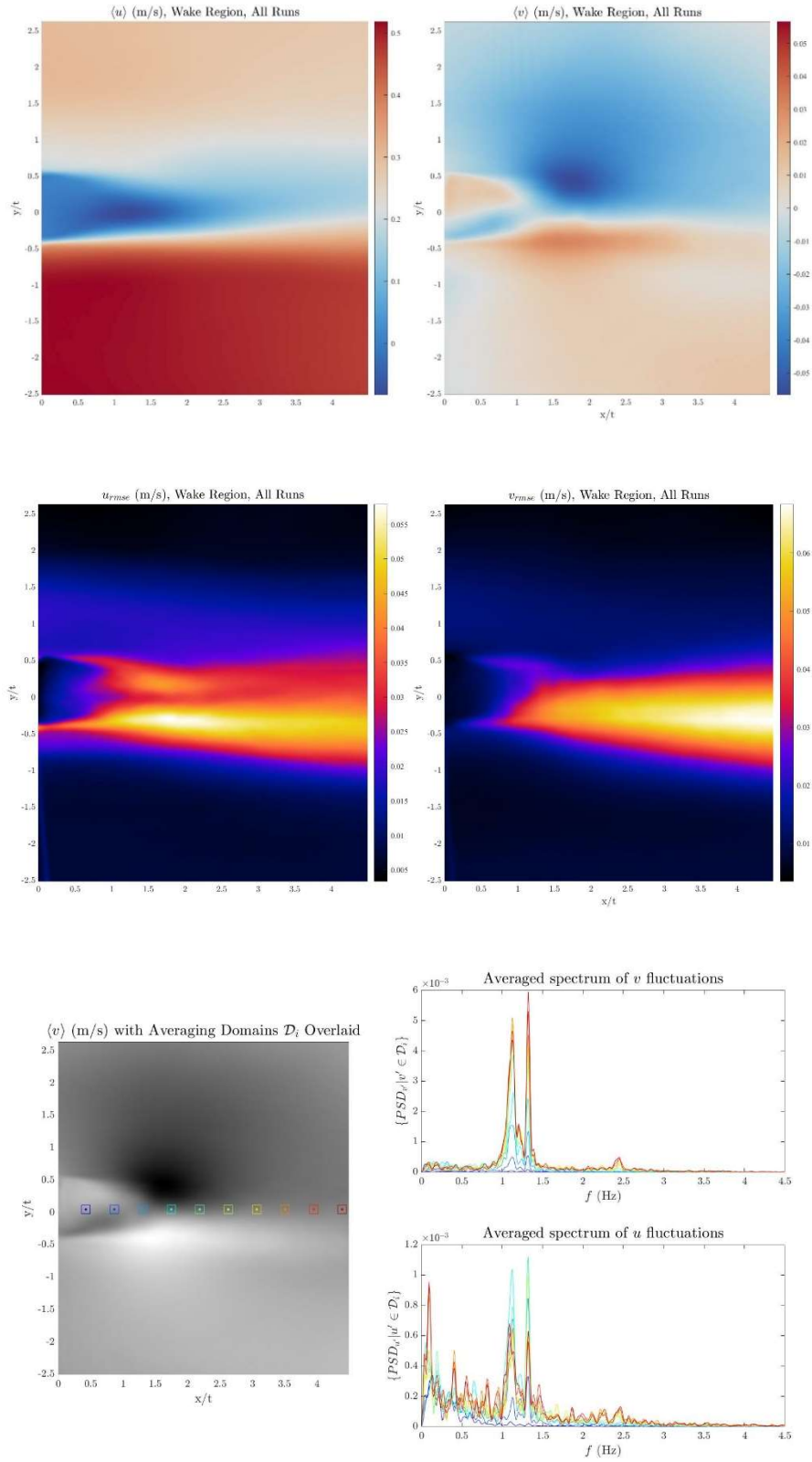


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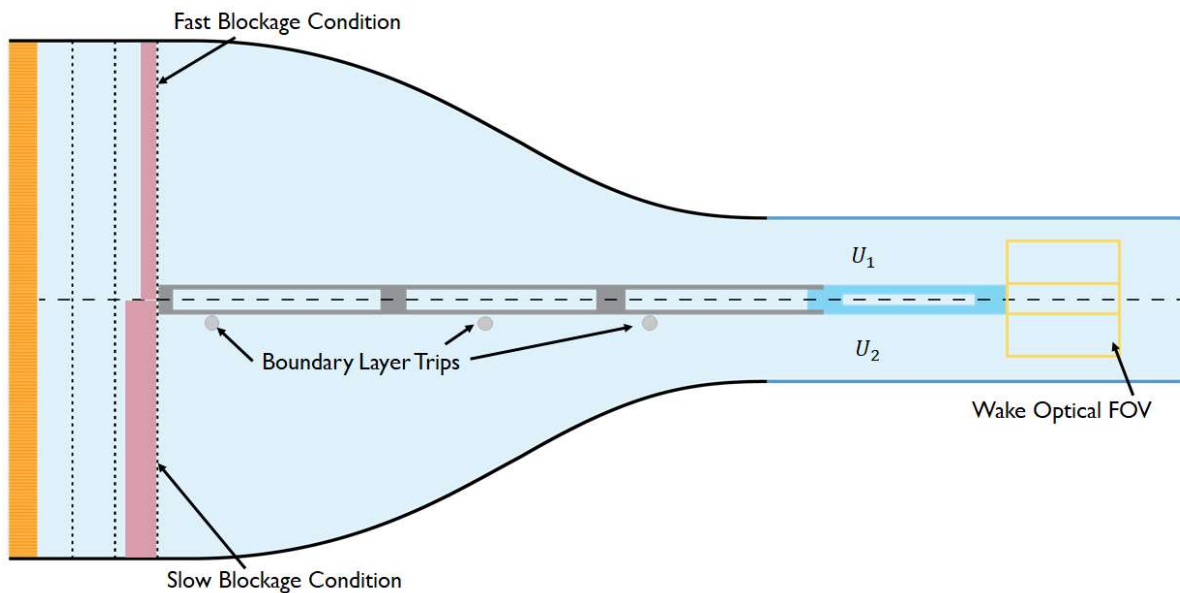


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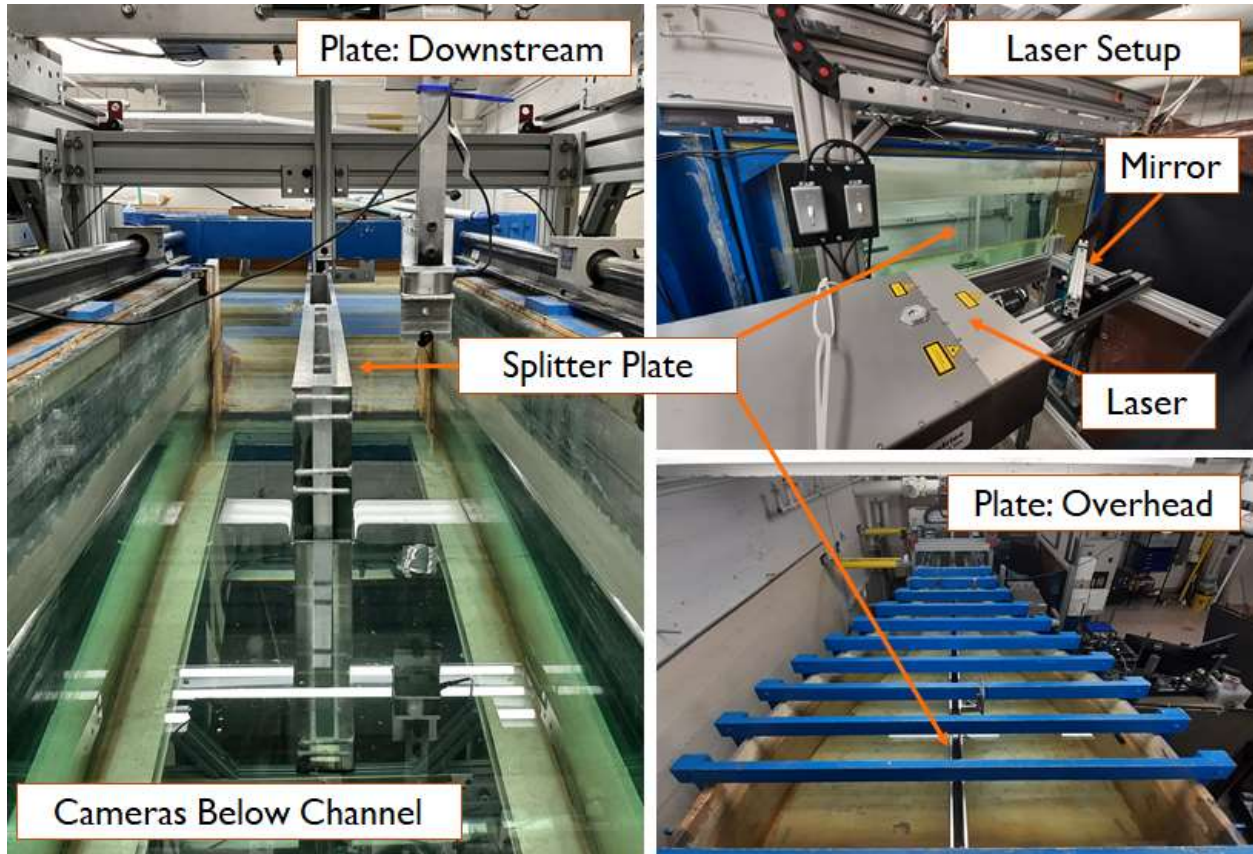


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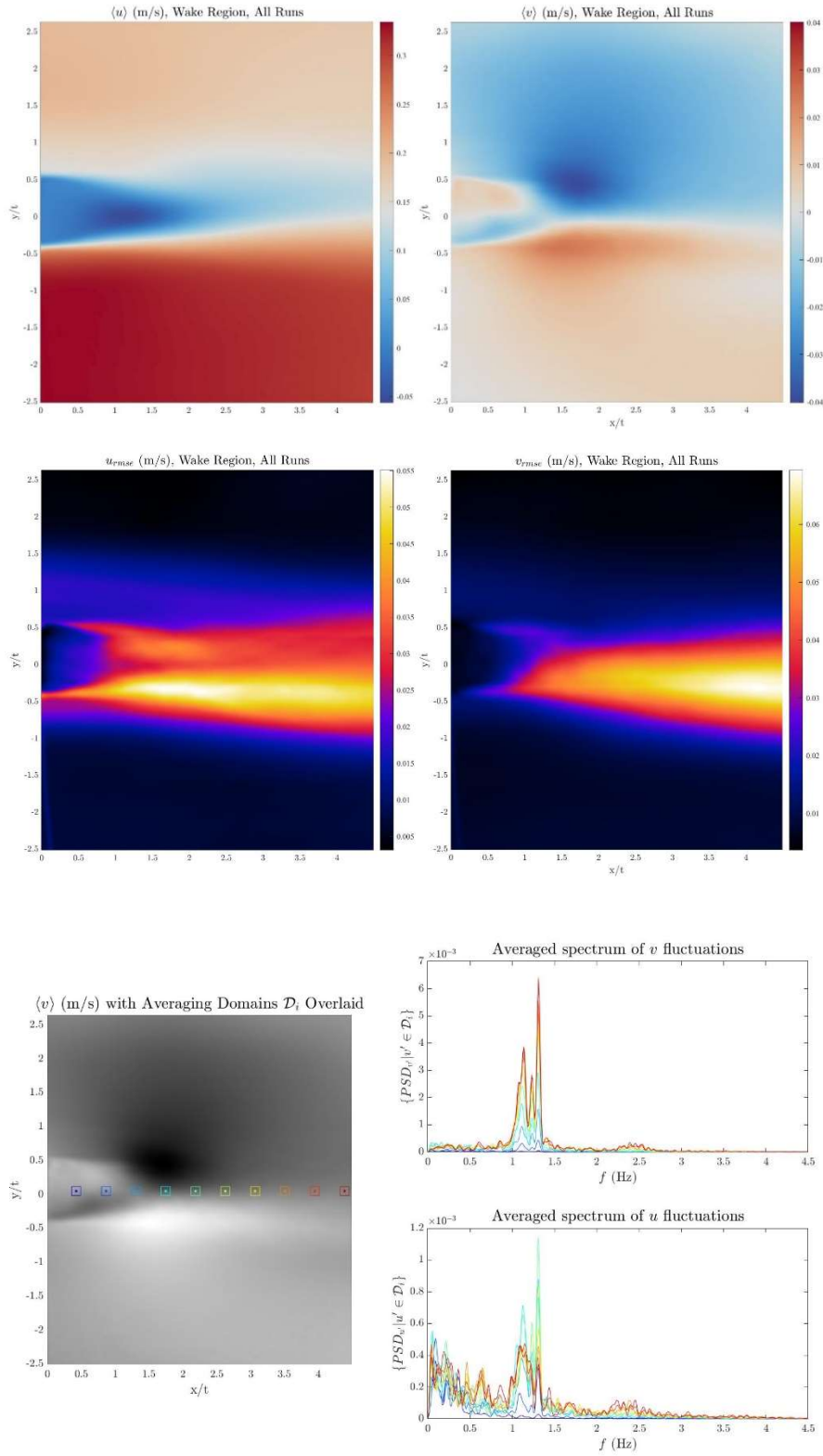


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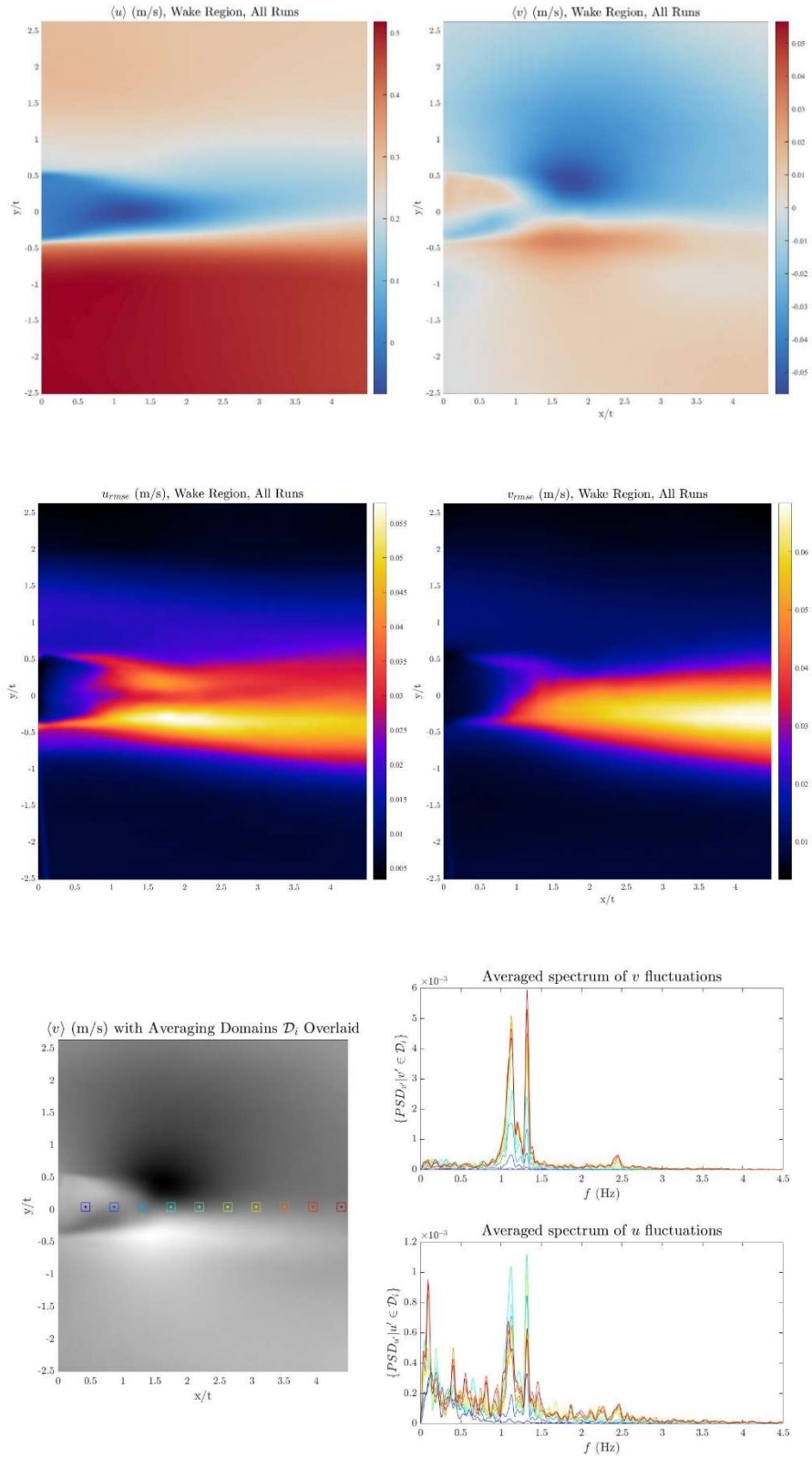


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