

The SWiFT Benchmarks
Phase 2 - Part 1
Model-Model Comparison

April 18, 2019

1 Results

1.1 Neutral Benchmark

1.1.1 Atmospheric Inflow

1.1.2 Wind Turbine Response

1.1.3 Wind Turbine Wake

1.2 Unstable Benchmark

1.2.1 Atmospheric Inflow

1.2.2 Wind Turbine Response

1.2.3 Wind Turbine Wake

1.3 Stable Benchmark

1.3.1 Atmospheric Inflow

1.3.2 Wind Turbine Response

1.3.3 Wind Turbine Wake

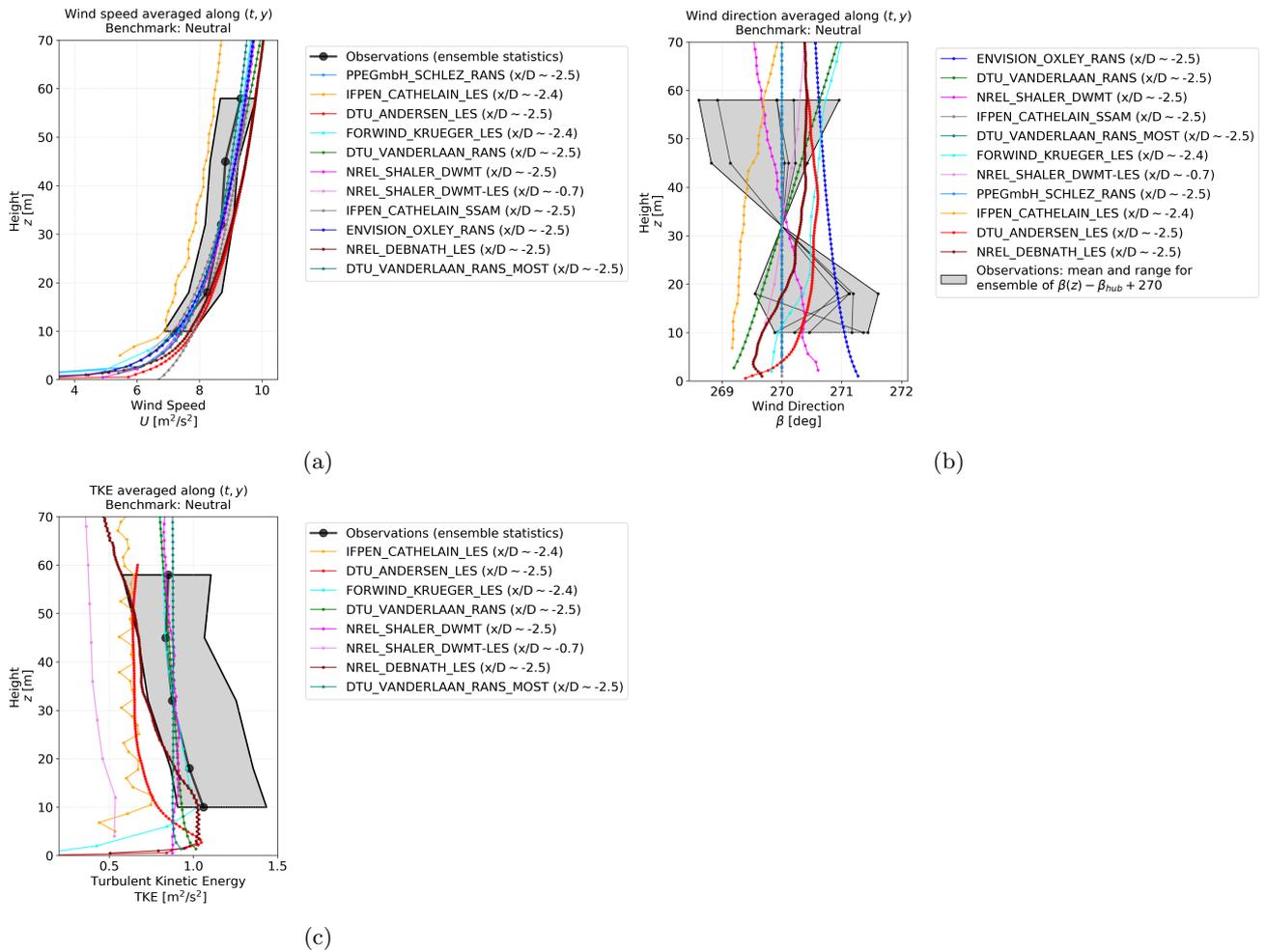


Figure 1: Vertical profiles characterizing measured [ensemble mean (dotted line) and range (shaded area) of temporally averaged profiles] and simulated (temporally and laterally averaged) inflow in the upstream plane provided by participants. Data for the neutral benchmark.

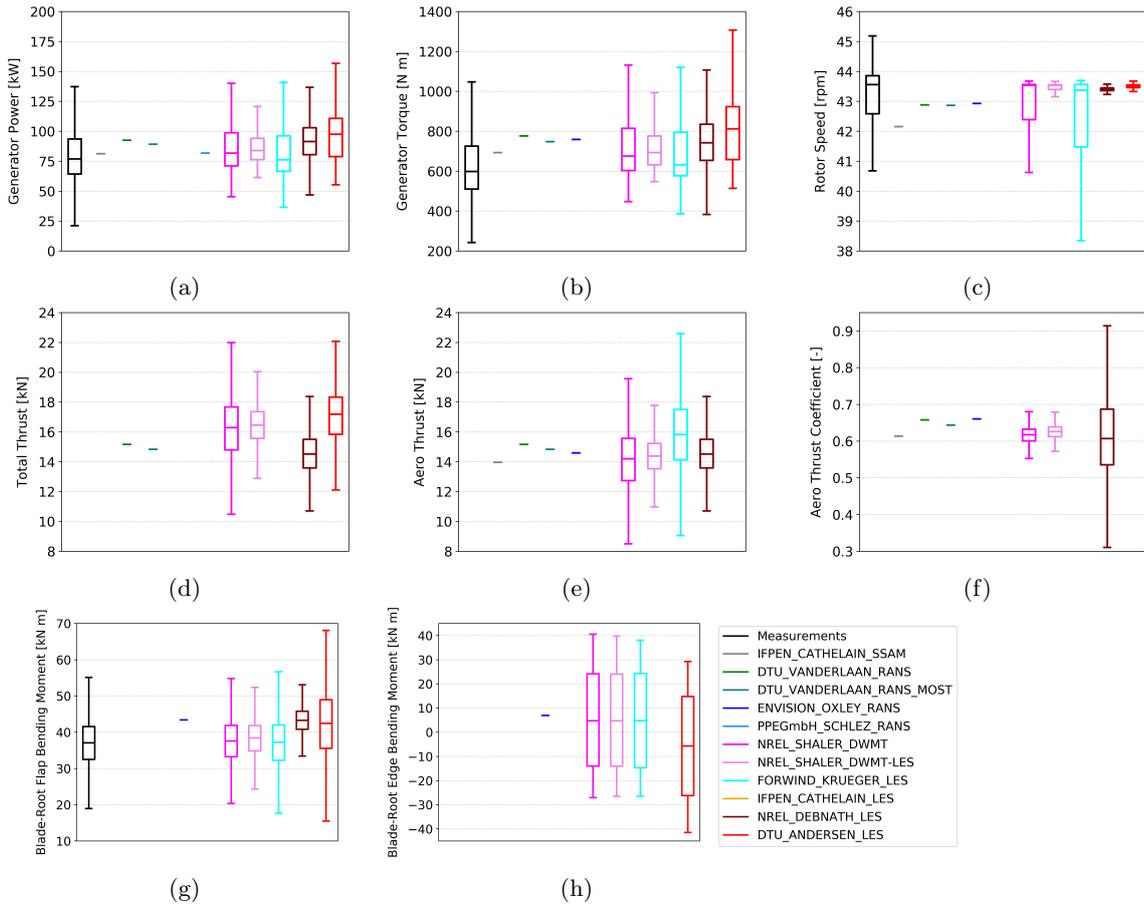


Figure 2: Statistics of wind turbine behavior for the neutral benchmark. The box extends from the lower (0.25) to upper (0.75) quartile values of the data, with a line at the median. Each whisker extends beyond the box by 1.5 times the inter-quartile range in both directions.

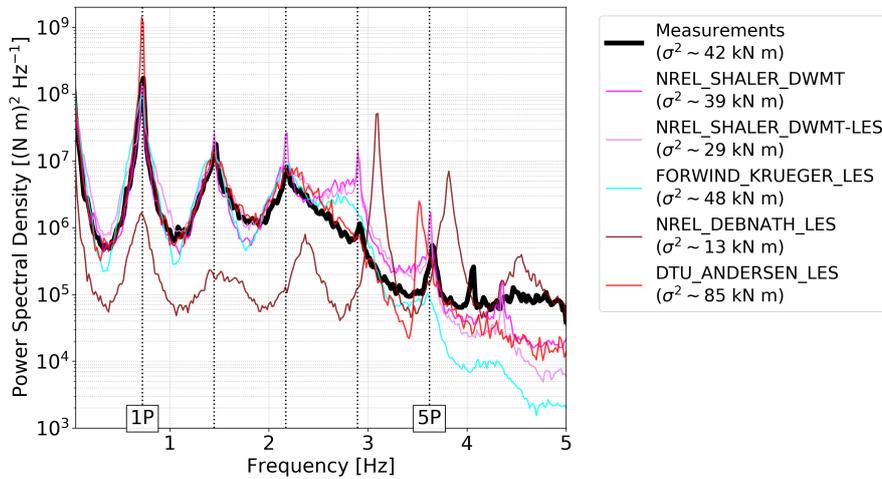


Figure 3: Power spectral density of flapwise bending moment at the root of one blade.

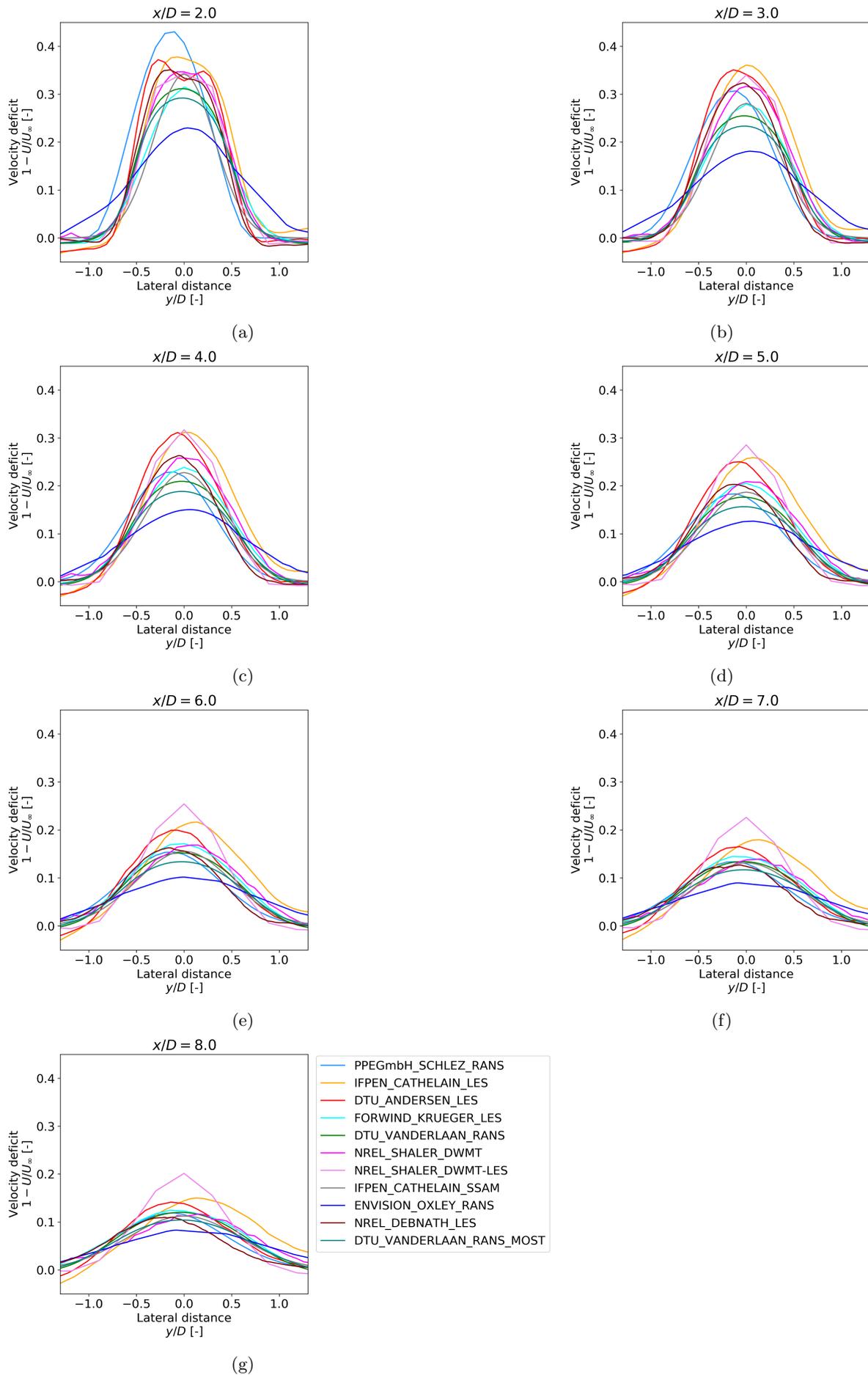


Figure 4: Profiles of temporally averaged velocity deficit (in fixed frame of reference) along the lateral direction, where \bar{U}_∞ is the vertical profile of the temporally and laterally averaged inflow provided by the participants. Given here for neutral benchmark.

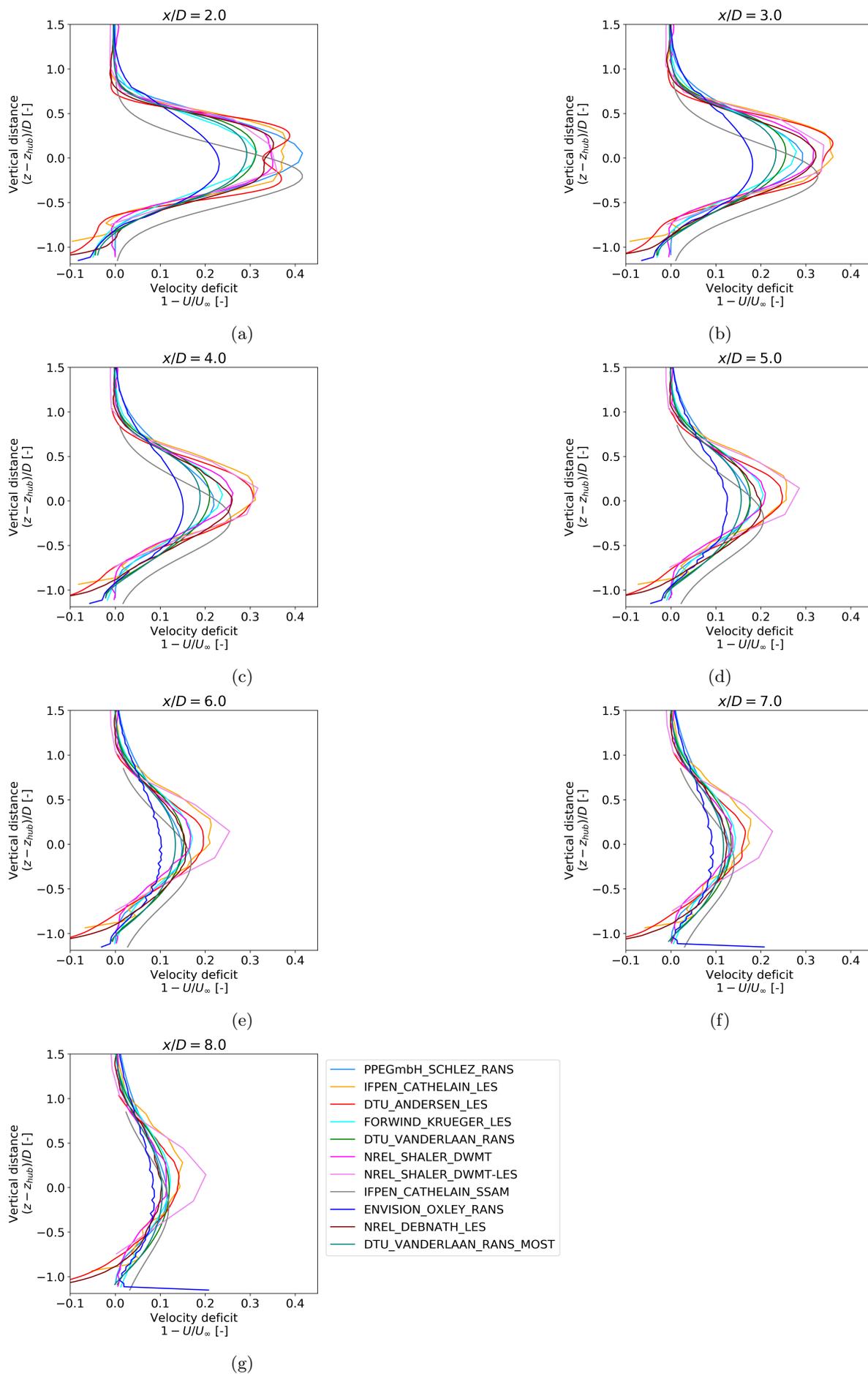


Figure 5: Profiles of temporally averaged velocity deficit (in fixed frame of reference) along the vertical direction, where \bar{U}_∞ is the vertical profile of the temporally and laterally averaged inflow provided by the participants. Given here for neutral benchmark.

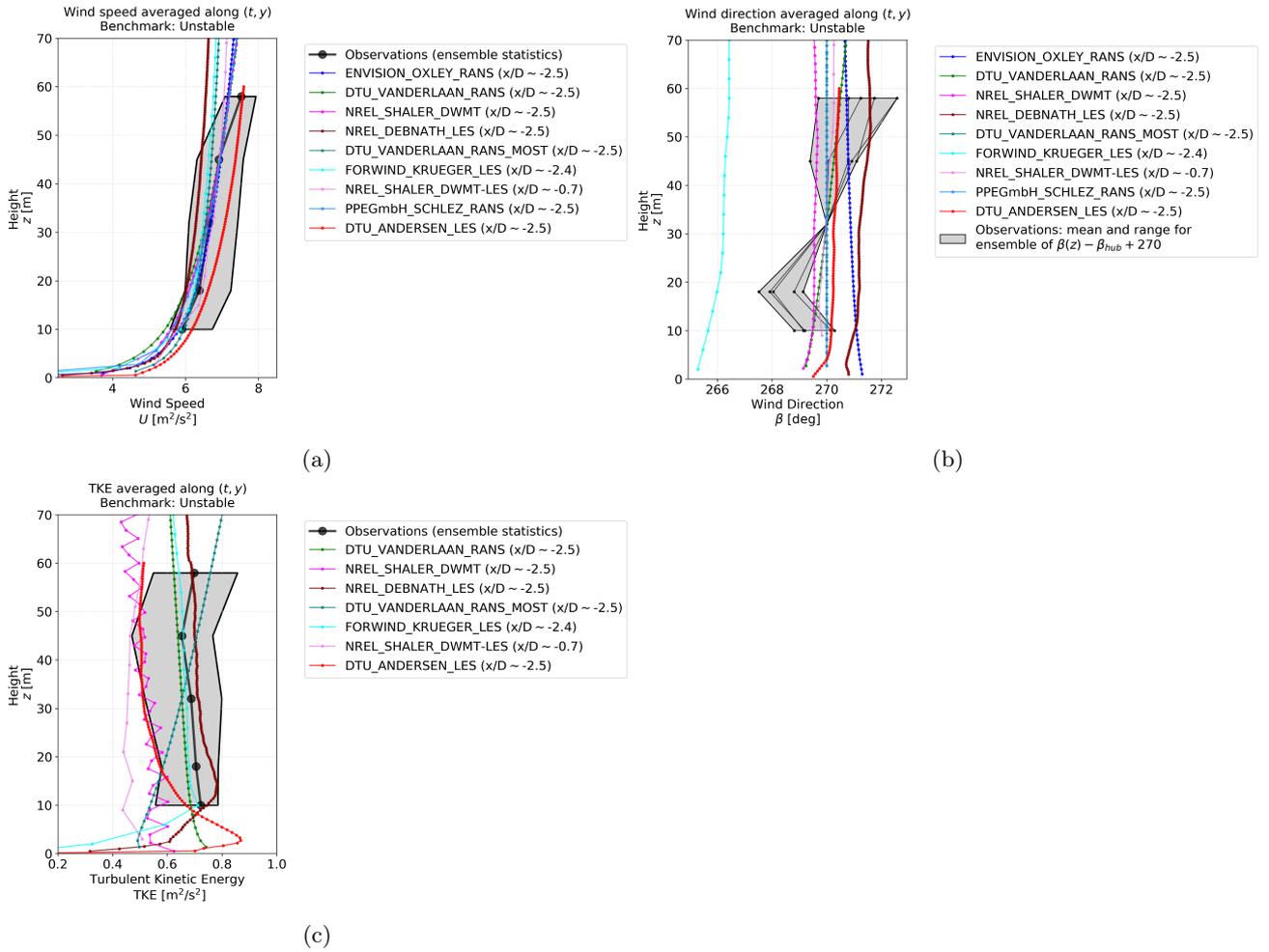


Figure 6: Vertical profiles characterizing measured [ensemble mean (dotted line) and range (shaded area) of temporally averaged profiles] and simulated (temporally and laterally averaged) inflow in the upstream plane provided by participants. Data for the unstable benchmark.

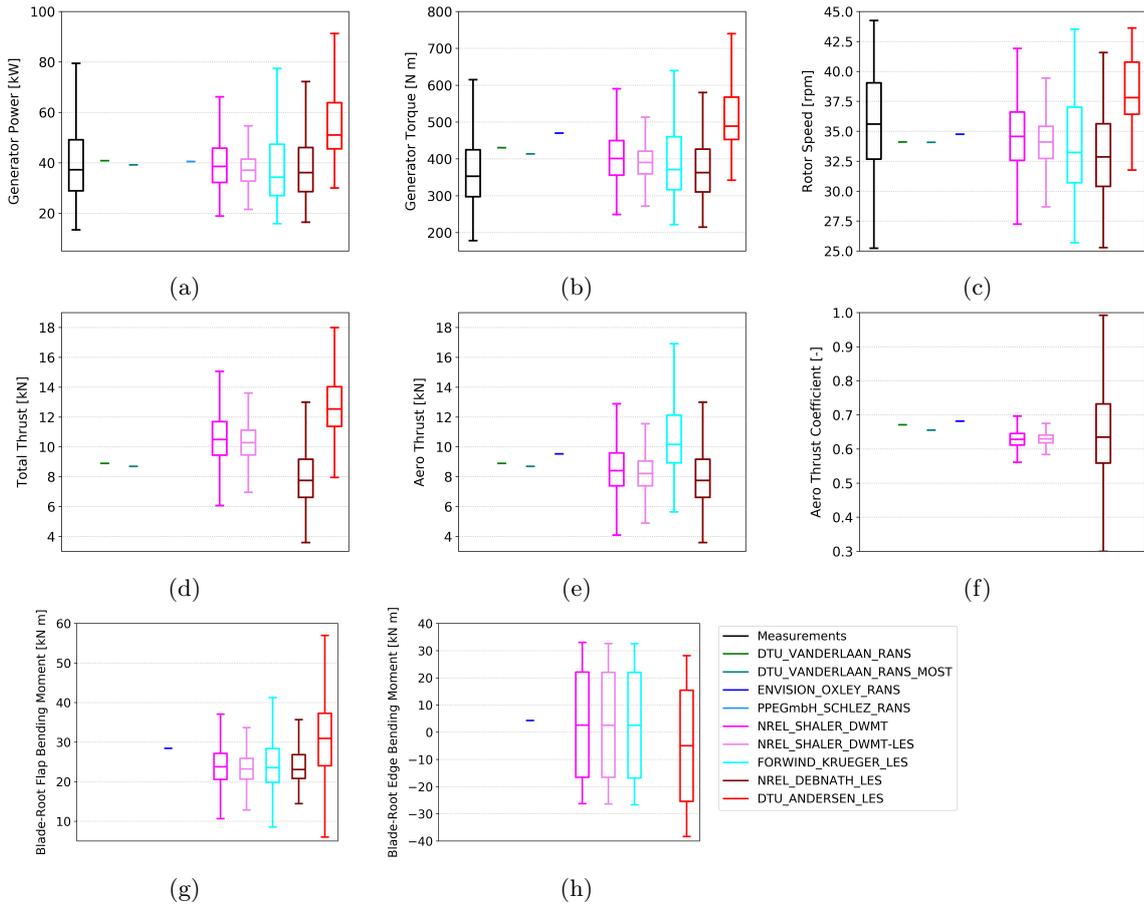


Figure 7: Statistics of wind turbine behavior for the unstable benchmark. The box extends from the lower (0.25) to upper (0.75) quartile values of the data, with a line at the median. Each whisker extends beyond the box by 1.5 times the inter-quartile range in both directions.

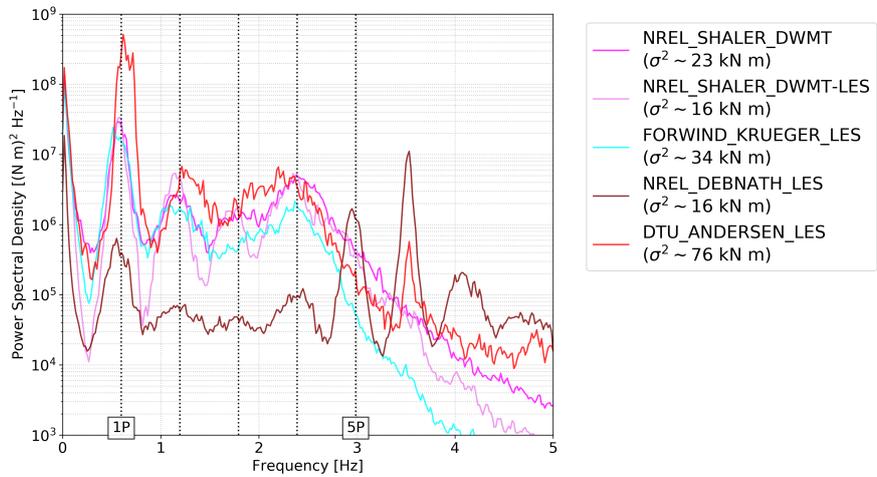


Figure 8: Power spectral density of flapwise bending moment at the root of one blade.

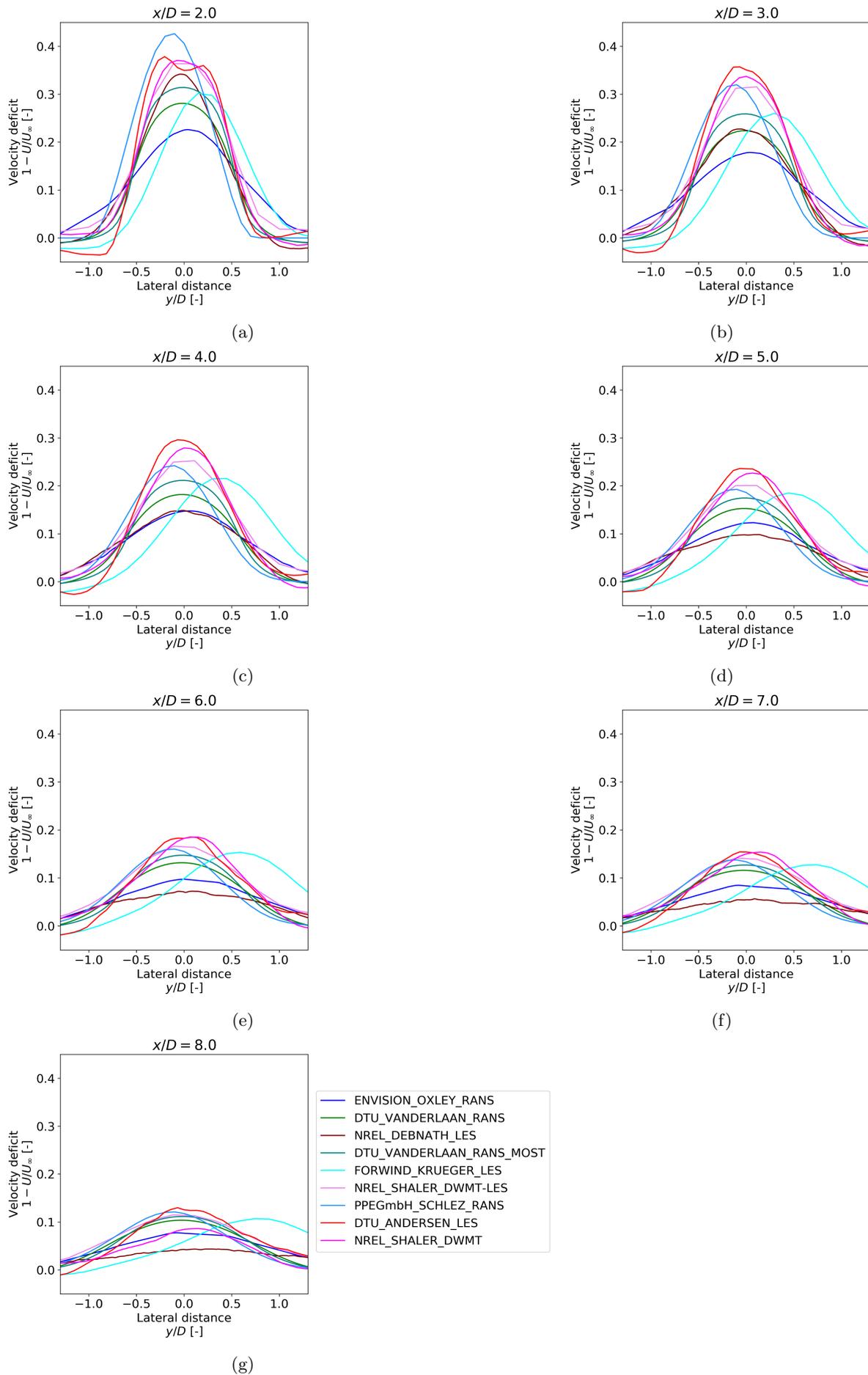


Figure 9: Profiles of temporally averaged velocity deficit (in fixed frame of reference) along the lateral direction, where \bar{U}_∞ is the vertical profile of the temporally and laterally averaged inflow provided by the participants. Given here for unstable benchmark.

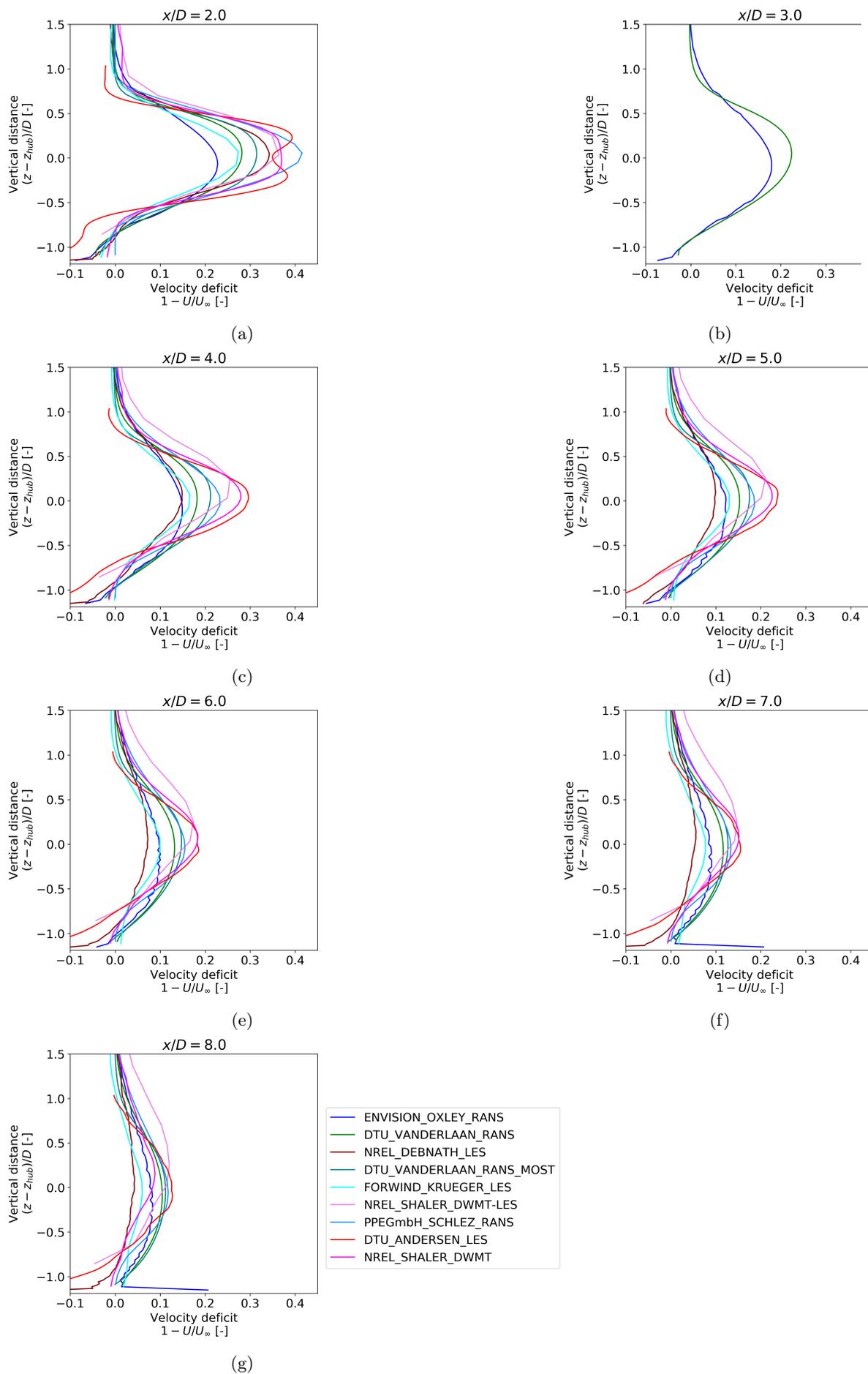


Figure 10: Profiles of temporally averaged velocity deficit (in fixed frame of reference) along the vertical direction, where \bar{U}_∞ is the vertical profile of the temporally and laterally averaged inflow provided by the participants. Given here for unstable benchmark.

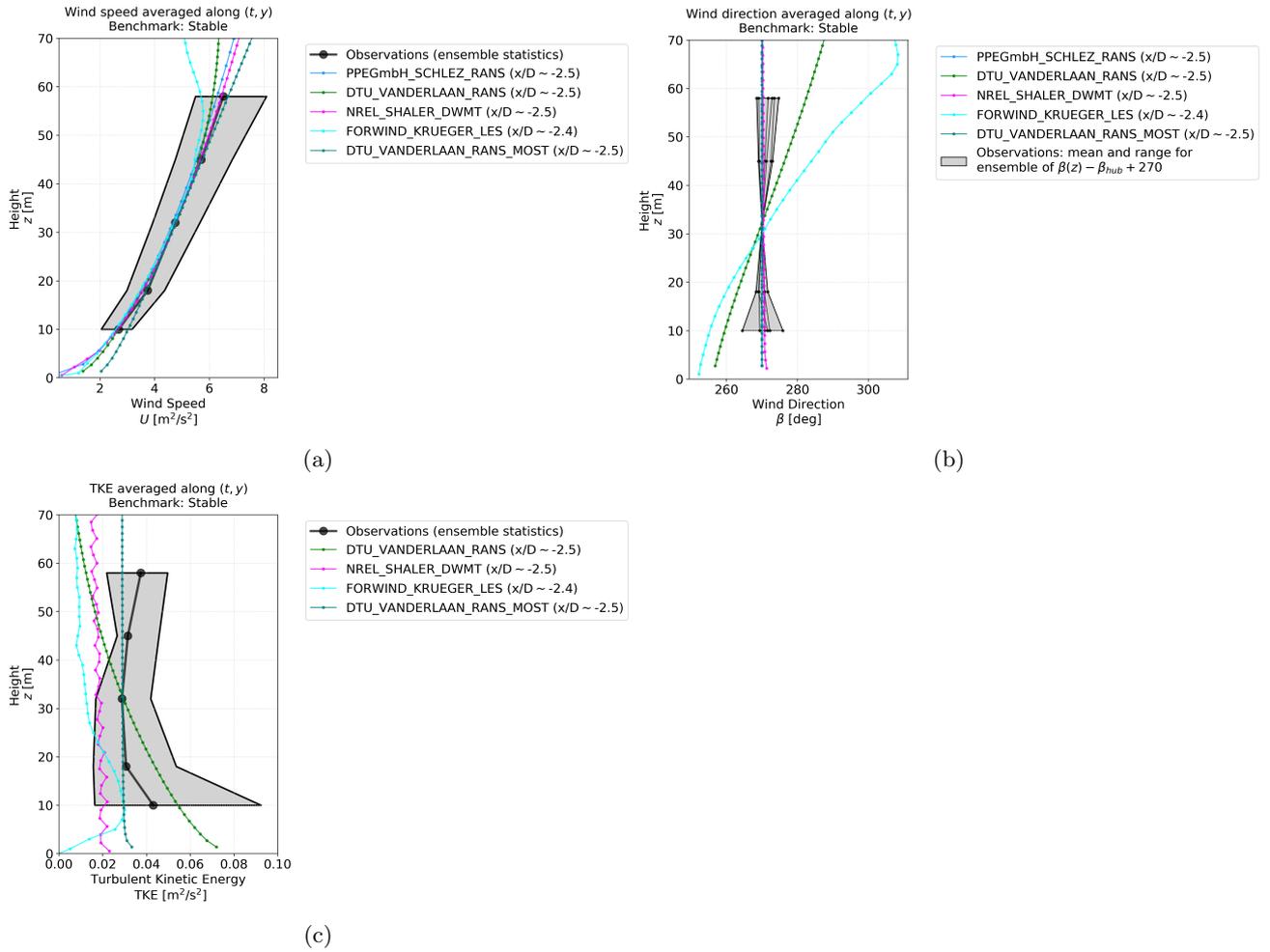


Figure 11: Vertical profiles characterizing measured [ensemble mean (dotted line) and range (shaded area) of temporally averaged profiles] and simulated (temporally and laterally averaged) inflow in the upstream plane provided by participants. Data for the stable benchmark.

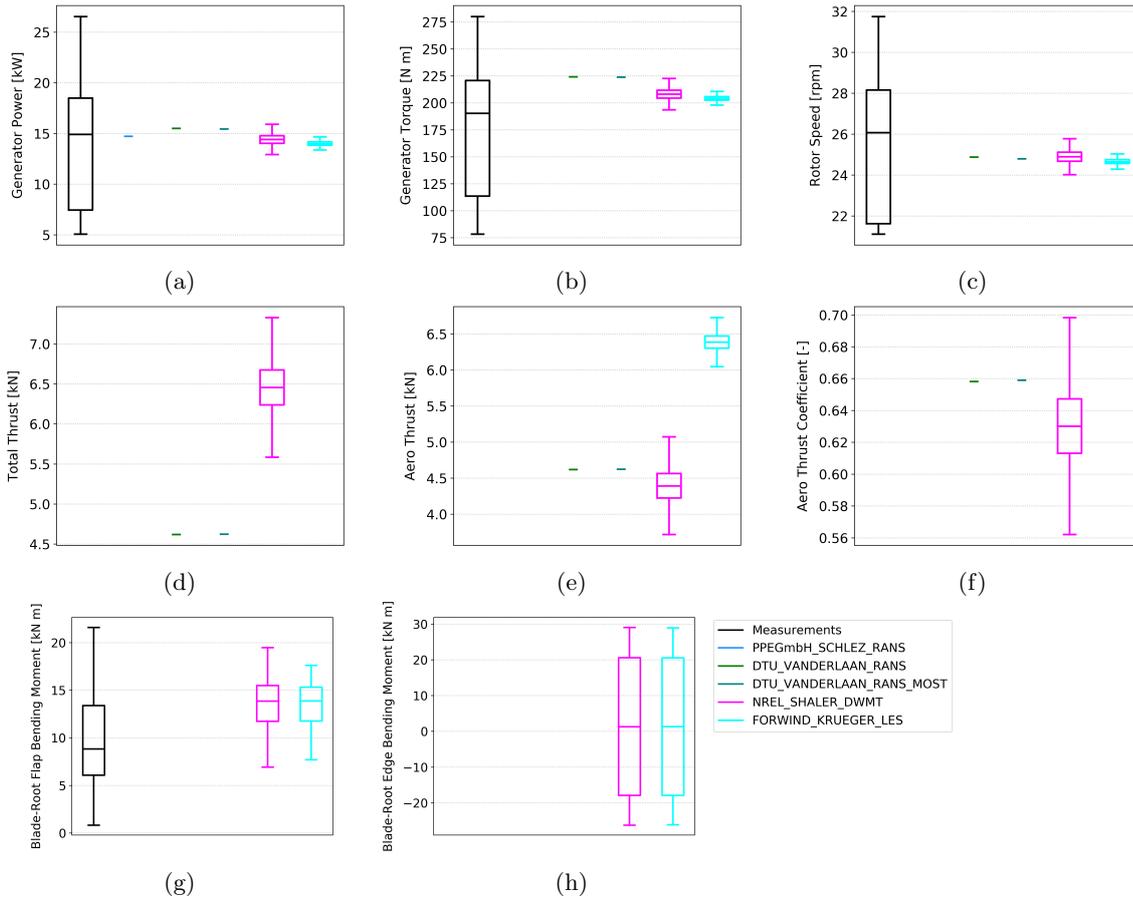


Figure 12: Statistics of wind turbine behavior for the stable benchmark. The box extends from the lower (0.25) to upper (0.75) quartile values of the data, with a line at the median. Each whisker extends beyond the box by 1.5 times the inter-quartile range in both directions.

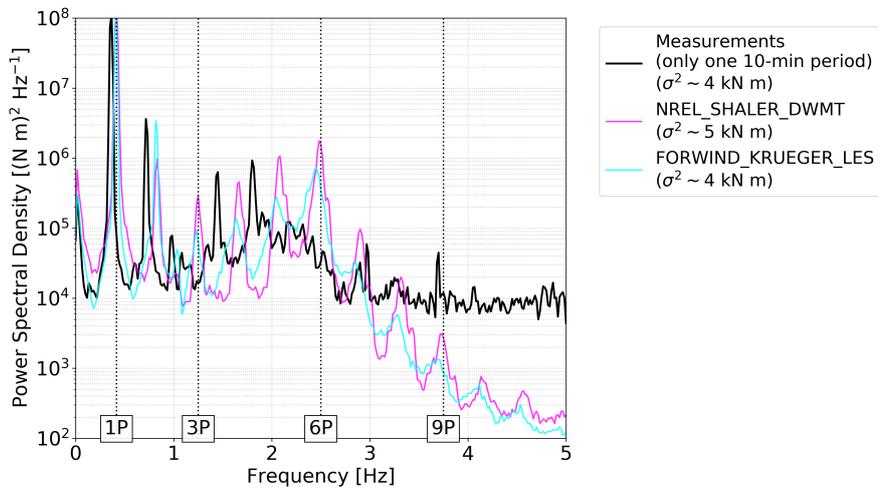


Figure 13: Power spectral density of flapwise bending moment at the root of one blade. Only one of the 10-minute measurement time series is shown here.

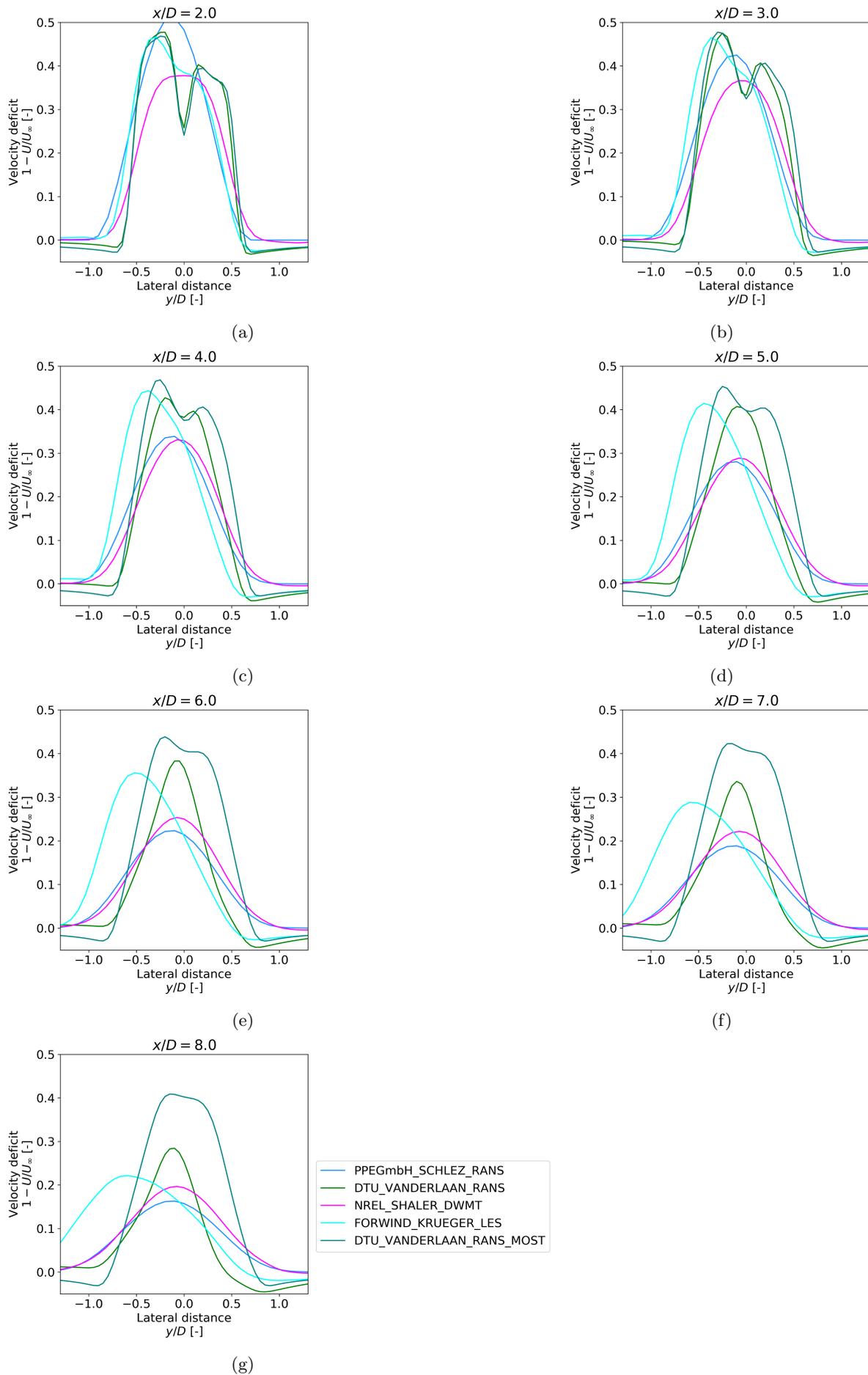


Figure 14: Profiles of temporally averaged velocity deficit (in fixed frame of reference) along the lateral direction, where \bar{U}_∞ is the vertical profile of the temporally and laterally averaged inflow provided by the participants. Given here for stable benchmark.

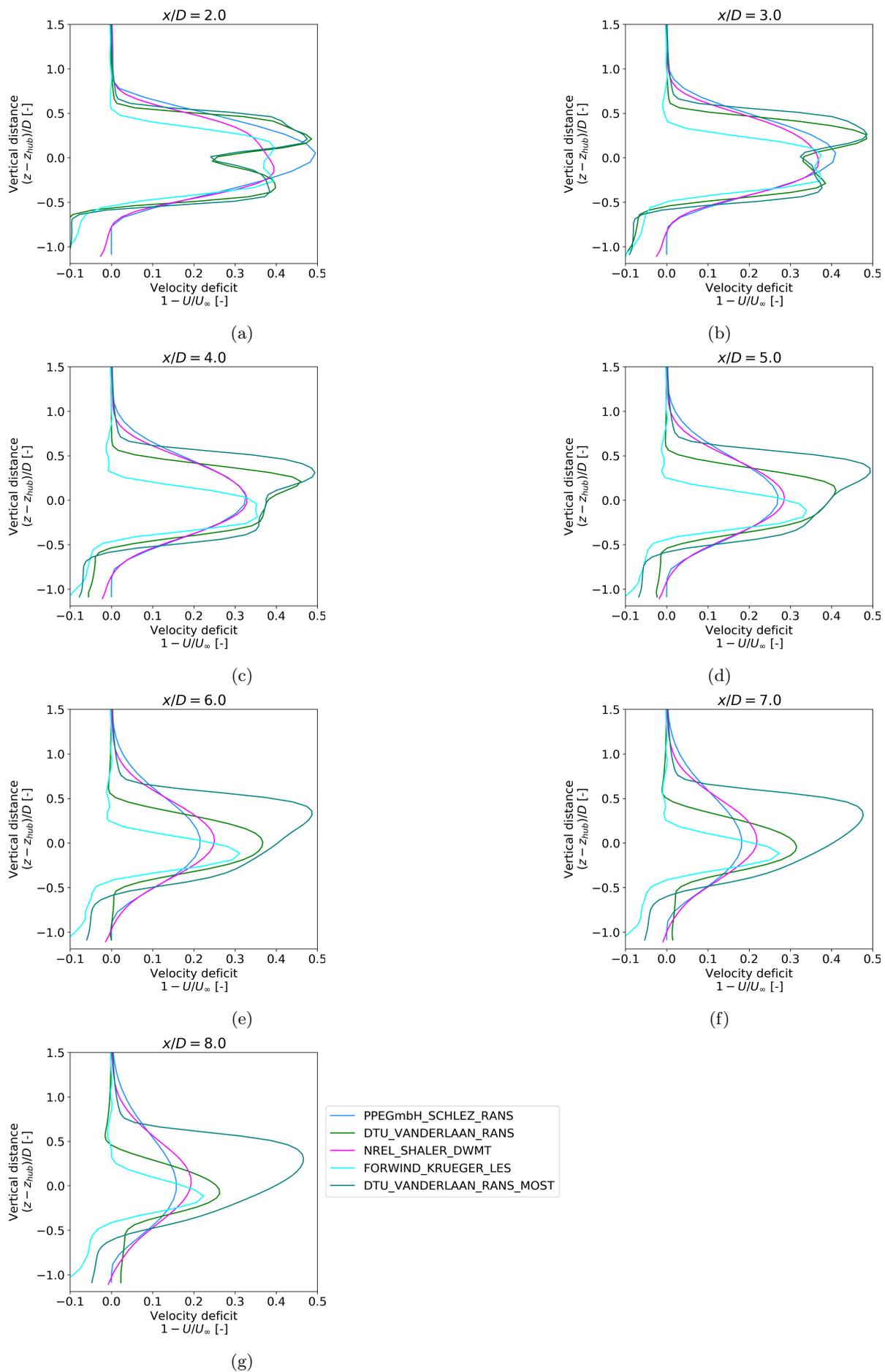


Figure 15: Profiles of temporally averaged velocity deficit (in fixed frame of reference) along the vertical direction, where \bar{U}_∞ is the vertical profile of the temporally and laterally averaged inflow provided by the participants. Given here for stable benchmark.