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Vortex Identification above the free-end of finite-height prisms and cylinders RAJAT CHAKRAVARTY, NOORALLAH ROSTAMY, DONALD BERGSTROM, DAVID SUMNER, University of Saskatchewan — The local flow field above the free end of a surface-mounted finite-height square prism of aspect ratio = AR = 5 was experimentally studied using 2D PIV measurements on the vertical symmetry plane. The velocity field data were post-processed using Proper Orthogonal Decomposition (POD) and swirling strength. POD was performed using 100 instantaneous snapshots to generate a reconstruction of the vorticity field. It was observed that flow separation from the leading edge of the free-end surface led to the formation of a separated shear layer and a mean recirculation zone below it. POD and swirling strength comparisons successfully isolated small-scale vortices at the shear layer interface not resolved in previous studies. These vortices became progressively larger and weaker, finally smearing out into the wake. Swirling strength, though inherently a 3D concept, was able to isolate the corresponding vortex structures even in regions where the 2D local velocity gradient tensor yielded complex eigenvalues. It was concluded that swirling strength can also be used in 2D flow fields on planes of symmetry to isolate vortices whose axes have no component in the mean flow direction.

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