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PIV ANALYSIS OF THE BOTTOM GAP EFFECT ON THE FLOW AROUND A FIR TREE

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Visualization method(s): PIV (particle image velocimetry)
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ABSTRACT: Windbreak forest has been used for centuries for various purposes including reduction of wind speed, control of heat and moisture transfer and pollutant diffusion, improvement of climate and environment, or increase of crop yields. These functional effects of windbreaks are directly related to reduction of oncoming wind speed. There are several factors influencing on the leeward flow behind windbreak such as porosity, height and shape of windbreak, and so on. In present study, flow around a small white fir tree was investigated with varying bottom gap (a gap between the bottom of the tree canopy and the ground surface). Velocity fields around the tree which is placed in a closed-type wind tunnel were quantitatively measured using a PIV technique. Three different flow regions are observed behind the tree and each flow region exhibits different flow structure as a function of bottom gap ratio. Depending on the gap ratio, the aerodynamic porosity of the tree is changed and different turbulence structure is induced. These changes in the flow and turbulence structures around a tree significantly affect the shelter effect of the tree.

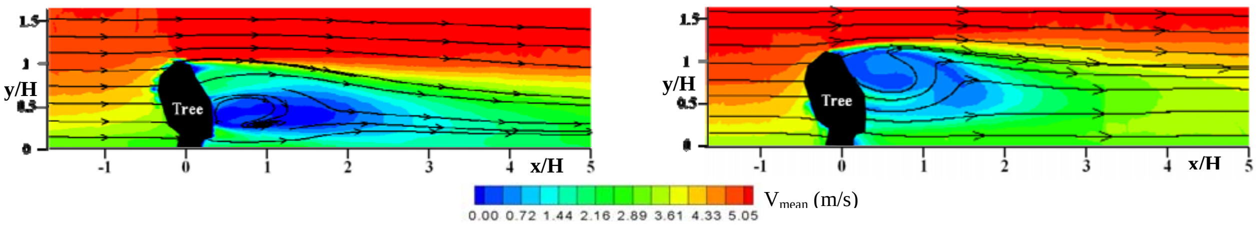

Fig. 1 Mean velocity contours and streamlines in the vertical center plane around a single tree with G/H = 0 (right) and G/H = 0.2 (left). G = bottom gap, H = height of model tree

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