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Structure of a horizontal rectangular surface jet ERIC SAVORY, IFTEKHAR NAQAVI, University of Western Ontario, ROBERT MARTINUZZI, University of Calgary, ROI GURKA, University of Western Ontario — A jet issuing close to or on a free surface is called a surface jet. Here a direct numerical simulation of a rectangular jet (hydraulic diameter D) issuing at the free surface at Re=4420 and Fr=0.49 is studied. The mean velocity vectors on a spanwise-wall normal plane at a downstream location of x=4D (within the transition zone) shows a counter rotating vortex pair (CVP). Further downstream in the fully developed region at x=16D the CVP disappears and entraining fluid from below comes to the surface and spreads out. The surface normal vorticity on the $x-y$ plane at z=-0.25D shows that the shear layers remain stable in the lateral direction up to x≈*4-5D*. However, the lateral vorticity on the $x-z$ plane at y=0 suggests that the shear layers in the vertical planes become unstable earlier. This earlier instability is responsible for CVP development in the transition region in the mean flow field. Once the shear layers become unstable in the lateral direction the CVP vanishes and the jet entrains fluid from below, mixes it with the jet fluid and expands along the surface.

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