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Link between turbulence production and surface current for a horizontal rectangular surface jet. ROBERT MARTINUZZI, University of Calgary, IFTEHKAR NAQAVI, ERIC SAVORY, ROI GURKA, The University of Western Ontario — The surface jet provides a case study for the interaction of turbulence with the free surface. In the present work the TKE budget will be discussed for a rectangular surface jet at a Reynolds number of 4420 and a Froude number of 0.49. The relevant terms in the TKE budget are calculated through direct numerical simulation (DNS) of surface jet. The DNS has been validated thoroughly through comparison with the experimental results. It is observed that all the terms involved in the TKE budget except the production show a sudden change on approaching the free surface at the jet plane of symmetry. It is also observed that TKE production $P = -\langle u'_i u'_j \rangle \partial U_i / \partial x_j$ becomes negative near the free surface. A detailed analysis of the turbulent production term shows that the normal stresses component in the spanwise direction contributes negative values to the production. This is a direct consequence of the free surface, which is responsible for the high level of lateral fluctuations resulting in higher normal stress, $\langle v'^2 \rangle$ while the entrainment and spread of the jet along the free surface, provides a positive value for the mean normal strain of the spanwise velocity $\frac{\partial V}{\partial y}$. The negative production drives the lateral mean flow along the surface, which contributes towards the development of the surface current.

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