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Shear instabilities in laboratory arrested salt-wedge flows[1] ADAM JIANKANG YANG, EDMUND TEDFORD, JASON OLSTHOORN, GREGORY LAWRENCE, University of British Columbia — The spatial variation in the properties of an arrested salt wedge and its resulting Holmboe instabilities have been investigated, both analytically and in the laboratory. In the laboratory particle image velocimetry and laser induced fluorescence are used to obtain flow velocities and the height of the density interface. The positive and negative Holmboe wave modes are separated by the 2D Fourier transform. An analytical solution for the profile of interface height, in the absence of interfacial flow instabilities, has been developed from two-layer internal hydraulic theory. The evolution of the velocity profile is predicted using a momentum diffusion equation following a Lagrangian frame of reference along the interface of the salt wedge. The centre of the shear layer is predicted to lie above the density interface, with this offset decreasing in the downstream direction. Due to the offset and lower boundary, the growth rate of the negative instability is smaller than that of the positive instability. Our theoretical predictions are in good agreement with the laboratory measurements.

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