Abstract Submitted
for the DFD07 Meeting of
The American Physical Society

Dynamics of recirculating flows around a surface-piercing rectangular block mounted at the side of an open channel[1] MEHRAN PARSHEH, JEFF MARR, JOONGCHEOL PAIK, FOTIS SOTIROPOULOS, FERNANDO PORTE-AGEL, University of Minnesota — The instantaneous velocity field of the flow upstream and downstream of a long rectangular obstacle mounted on both the side and the bottom walls of a large aspect ratio open channel ($L/H = 2.2$, L: obstacle length, H: depth) at Fr = 0.2 and Re =150,000 is measured using ADV and PIV. The rich dynamics of the flow is visualized by time-averaging the gray-scale of the seeding particles imaged at the free-surface. The resulting flow structure is broadly consistent with the DES computations by Paik and Sotiropoulos [*Phys. Fluids* 17, 2005] who studied a shallower case (L/H =27). A new and persistent feature of the surface flow in the upstream region is the presence of an aperiodic source-like flow which acts to deflect tracers away from the obstacle wall and triggers the emergence of a strong jet-like flow along the side wall, associated with bimodal histograms of velocity fluctuations at the region. In the downstream recirculating region, the source flow occurs less frequently and acts to disorganize the main recirculation eddy, subsequently replenished by vorticity extracted from outer shear layer.

[1]This work was supported by NSF Grant EAR-0120914 as part of the National Center for Earth-surface Dynamics

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Date submitted: 02 Aug 2007 Electronic form version 1.4