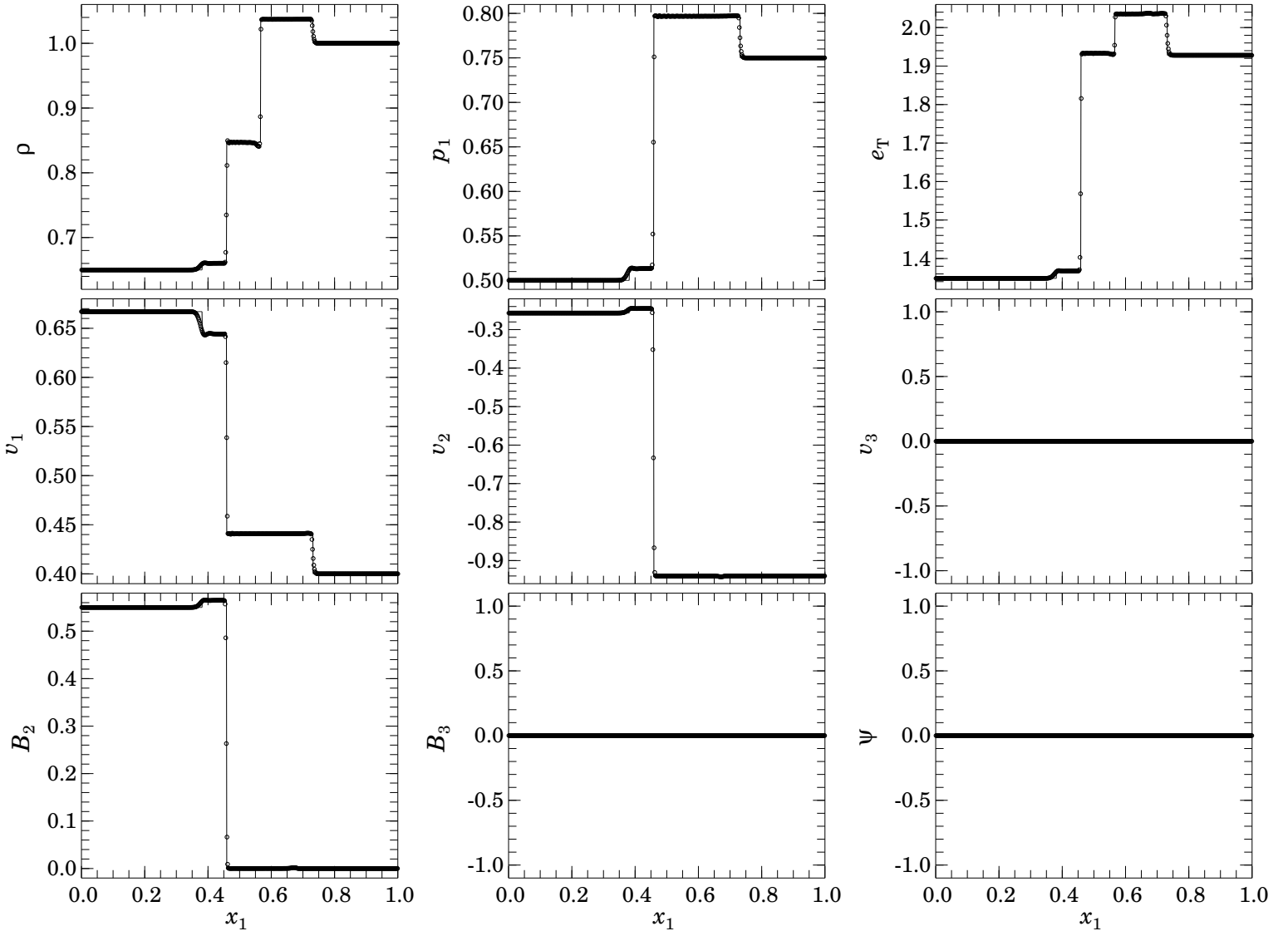


# ZEUS-3D 1-D Gallery #9: “Switch-on/off” waves



This is Fig. 4c from Ryu & Jones (1995, ApJ, 442, 228), showing the solution of the MHD shock tube test with the left state  $(\rho, v_1, v_2, v_3, B_2, B_3, p_1) = [0.65, 0.667, -0.257, 0, 0.55, 0, 0.5]$  and the right state  $[1, 0.4, -0.94, 0, 0, 0, 0.75]$  with  $B_1 = 0.75$  and  $\gamma = 5/3$  at time  $t = 0.15$ . At  $t = 0$ , the discontinuity is at  $x_1 = 0.5$ .

Open circles are the `dzeus35` solution using 512 zones, `CMoC`, the total energy equation, and third-order interpolation with the contact steepener engaged. `dzeus35` parameters controlling the time step and artificial viscosity are: `courno=0.75`, `qcon=1.0`, and `qlin=0.2`. Lines are the results from the non-linear Riemann solver described in Ryu & Jones.

Plots show from left to right: (1) fast (weak) shock (at  $x_1 \sim 0.38$ ), (2) “switch-off” slow shock (at  $x_1 \sim 0.46$ ), (3) contact discontinuity (at  $x_1 \sim 0.56$ ), and (4) hydrodynamical (because the tangential magnetic field is zero on both sides) shock (at  $x_1 \sim 0.73$ ). The slight undershoot in  $\rho$  at the base of the contact disappears if second order interpolation is used, but this smears the contact over several zones.

See Problem #7 in the 1-D Gallery for a definition of “switch-on” and “switch-off” waves.