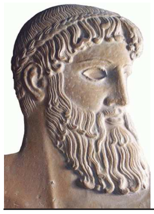
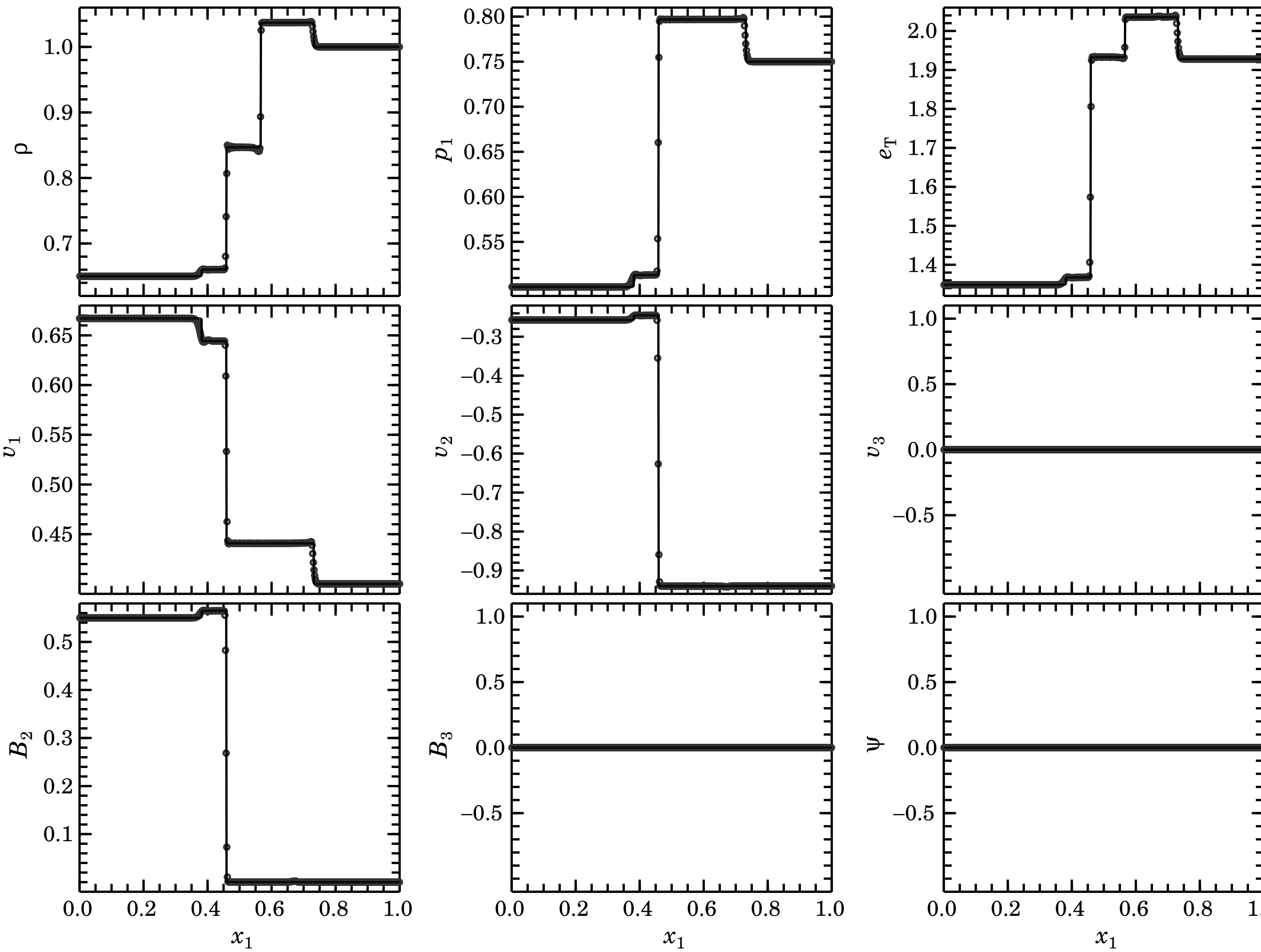


ZEUS-3D 1-D Gallery #17: "Switch-off" shock



This is Fig. 4*c* from Ryu & Jones (1995, ApJ, 442, 228), showing the solution of the MHD shock tube problem 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 $x_1 = 0.5$. 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) an Euler (*i.e.*, HD since $B_\perp = 0$ on both sides) shock (at $x_1 \sim 0.73$). See Problem 15 in the 1-D Gallery for a definition of a "switch-off" wave.

Open circles are the `dzeus36` solution using 512 zones, `CMoC`, the total energy equation, and third-order interpolation with the contact steepener engaged. `dzeus36` 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.

There are no significant differences between the `dzeus36` and `dzeus35` solutions. The slight undershoot in ρ at the base of the contact disappears if second order interpolation is used, but this smears the contact over several zones.