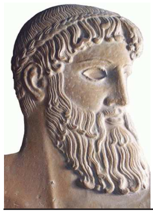
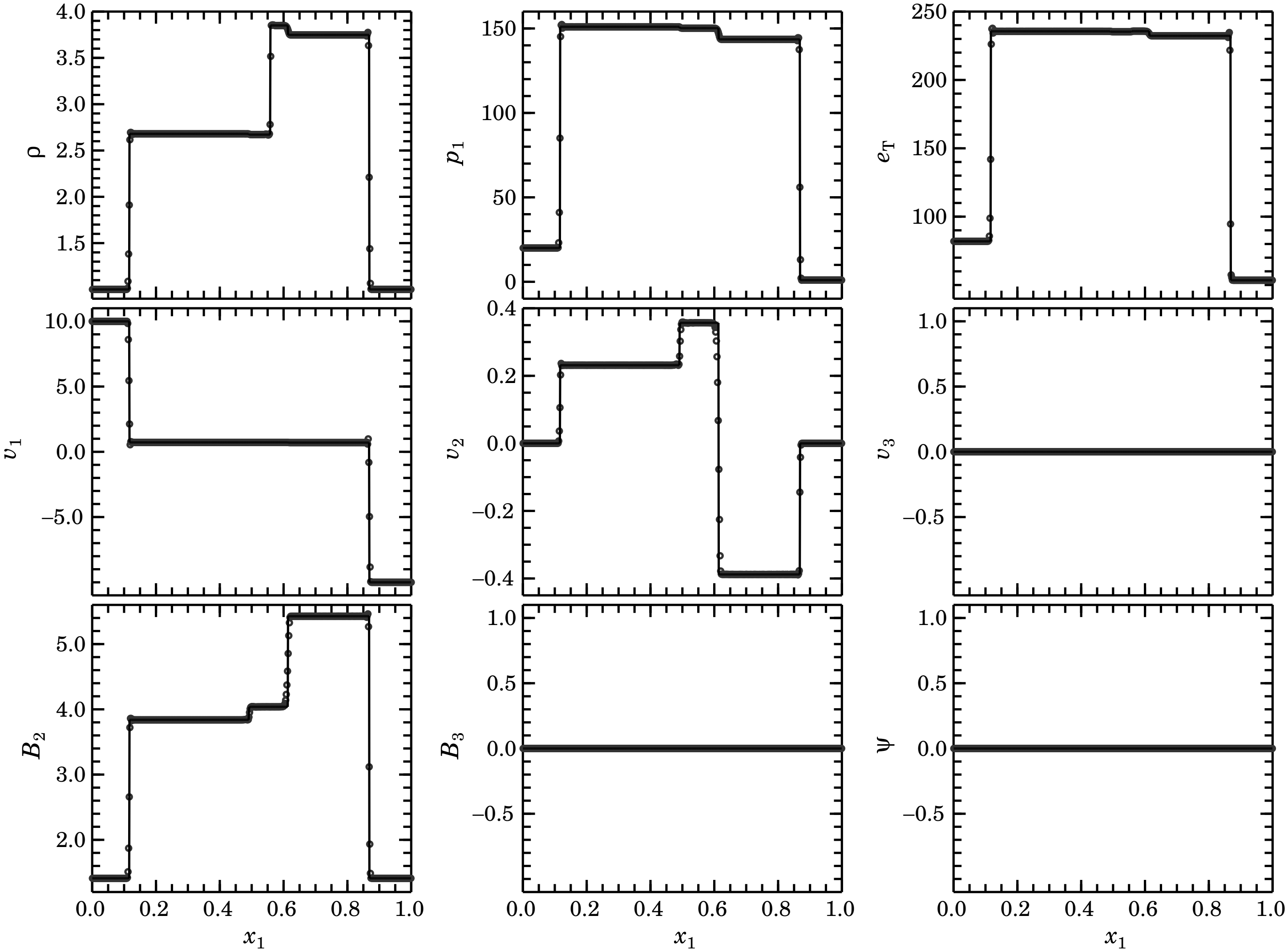


ZEUS-3D 1-D Gallery #9: “2-D field”



This is Fig. 1*a* from Ryu & Jones (1995, ApJ, 442, 228), showing the solution of the MHD shock tube problem with the left state $(\rho, v_1, v_2, v_3, B_2, B_3, p_1) = [1, 10, 0, 0, 5/(4\pi)^{1/2}, 0, 20]$ and the right state $[1, -10, 0, 0, 5/(4\pi)^{1/2}, 0, 1]$ with $B_1 = 5/(4\pi)^{1/2}$ and $\gamma = 5/3$ at time $t = 0.08$. At $t = 0$, the discontinuity is at $x_1 = 0.5$. Plots show from left to right: (1) fast shock, (2) slow rarefaction (at $x_1 \sim 0.5$), (3) contact discontinuity (at $x_1 \sim 0.55$), (4) slow shock (at $x_1 \sim 0.62$), and (5) fast shock.

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.

The main improvement over the `dzeus35` solution is the disappearance of the small undershoots in v_2 and B_2 at the base of the slow rarefaction, credited to the use of the new (to version 3.6) *Finely Interleaved Transport* algorithm (`FIT`).