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Generation of compound structure of shock/discontinuity in the outflow region of magnetic reconnection in an asymmetric current sheet

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The double discontinuities, which are composed of a rotational discontinuity layer attached to an adjacent leading slow shock layer, have been observed in both the interplanetary space and geomagnetic tail. Weng et al. [2012] simulated the generation and evolution of MHD discontinuities associated with magnetic reconnection in a symmetric current sheet. Four types of compound structures were found in their research : (a) RD-SS compound structure: SS is attached to the downstream of RD, (b) SS-RD: SS is following by an adjacent RD, (c) SS-RD-SS: RD is trapped inside SS, and (d) switch-off slow shock (SSS) with a rotational wave train. However, the current sheets observed in the solar wind, magnetopause, and nightside plasma sheet can be asymmetric, in which the plasma densities and/or magnetic field magnitudes on the two sides of the current sheet are not equal. In our research, we used a hybrid code to simulate the 1-D Riemann problem for the generation and evolution of MHD discontinuities in the outflow region of magnetic reconnection in an asymmetric current sheet.