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Tearing and Kelvin-Helmholtz instabilities in the heliospheric plasma: 2D hybrid compact shock capturing scheme

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We analyze the linear evolution and successive nonlinear regime of perturbed systems consisting in sheared flows in the presence of strong magnetic field gradients. Kelvin-Helmholtz and tearing instabilities, such as those arising in the solar wind or, in general, in stellar and disk outflows, are investigated by using a 2D high order upwind "weno+compact" scheme which allows both a shock capturing and a pseudospectral analysis of the evolution of a system characterized by high values of sonic and alfvénic Mach number. This dynamics has relevance to magnetohydrodynamic structures in several solar and astrophysical environments: starting from our previous analysis using 2D MHD simulations, we applied our results to the wake model of the solar wind on the solar equatorial plane above the helmet streamer cusp considering arbitrary angles between the magnetic field and the velocity field and to the post-termination shock jet found in 3D global heliospheric simulations.