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How does numerical diffusion affect high resolution two-fluid simulations of magnetized turbulence?

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Numerical magnetohydrodynamic (MHD) simulations have become a dominant tool in studies of the non-linear dynamics of solar plasma, such as shock formation, instabilities or magnetic reconnection. Many of the numerical codes used for such simulations have to deal with the stability issues caused by unresolved motions on scales below the grid scale. For that, several algorithms have been developed, i.e. hyper diffusion algorithms, or algorithms based on filtering. Recently, the classical MHD approach is being expanded to treat multiple solar plasma components as independent fluids interacting by collisions. This approach required the numerical scales of fluid interaction to be resolved. In this contribution we study how the numerical diffusion in the explicit two fluid (charges-neutral) Mancha-2F code (Popescu Braileanu et al. 2019a) affects the dynamics of turbulently reconnecting current sheets produced as a results of the non-linear mixing during the Rayleigh-Taylor Instability in a solar prominence. We propose a method to evaluate an equivalent of the Ohmic-like numerical diffusion coefficient, and to estimate the order of dissipation of the numerical scheme.

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