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A Kernel Based High Order "Explicit" Unconditionally Stable Constrained Transport Method for Ideal Magnetohydrodynamics

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The ideal Magnetohydrodynamics (MHD) equations are challenging because one needs to maintain the divergence free condition, divB=0. Many numerical methods have been developed to enforce this condition. In this work, we further our work on mesh aligned constraint transport by developing a new Kernel based approach for the vector potential in 2D and 3D. The approach for solving the vector potential is based on the method of lines transpose and is A-stable, eliminating the need for diffusion limiters needed in our previous work in 3D. The method is robust and has been tested on the 2D and 3D cloud shock, blast wave and field loop problems.

Authors: CAKIR, FIRAT (MICHIGAN STATE UNIVERSITY); Prof. CHRISTLIEB, Andrew (Michigan State University); Dr JIANG, YAN (University of Science and Technology of China)

Presenter: CAKIR, FIRAT (MICHIGAN STATE UNIVERSITY)

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