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Numerical Simulations of the MHD Plasma Equilibrium Using Block Adaptive Grids IGOR SOKOLOV, TAMAS GOMBOSI, ILIA ROUSSEV, University of Michigan — A numerical simulation of the MHD equilibrium in toroidal plasma devices is a central problem of the magnetic confinement fusion. This is also an important problem for solar physics, because active regions on the Sun prior to coronal mass ejection are believed to include a magnetic configurationthat very closely resembles that of a half toroid. For both versions of the problem, the large variety of spatial scales ispertinent. To simulate them numerically we applied a block adaptive technology, what allows us to reach the higher resolution in the regions of interest (like magnetic islands or reconnetion sites), with a reasonably low total amount of computational cells. Assuming the outer plasma boundary to be an axially symmetric magnetic surface which satisfies the Grad-Shafranov equation, we constructed the vortex-based grid, which exactly fits the plasma boundary. We studied the equilibrium in the tokamak of a D-shaped cross-section. For solar physics application, we analyzed the quasi-steady-state configurations in the region having a semi-toroidal form by applying the "shearing motion" at the ending cross-sections, which are to represent the photospheric motions at the Sun.

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