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Non-linear dynamics of plasma with surface current in tokamak disruption events[1] S.A. GALKIN, V.A. SVIDZINSKI, J.E. GRUBERT, Far-Tech Inc., L.E. ZAKHAROV, PPPL — The Disruption Simulation Code (DSC), which was initially implemented in 2D (single helicity) geometry, has recently been developed in a fully 3D toroidal geometry with adaptation to the moving plasma boundary. DSC-3D simulates free-boundary ideal one-fluid MHD non-linear dynamics of plasma separated from conducting in-vessel structures by a vacuum region. The vacuum magnetic field is calculated using both Green's functions and Poisson equation methods. Different regimes of plasma-touching-wall scenarios, leading to the formation of a Hiro current,[2,3] will be discussed. Corresponding sideways forces applied to the plasma-facing components and to the vacuum vessel will be calculated. Progress on the DSC-3D development, including both ideal and resistive one-fluid MHD models, will be presented. Implementation of the resistive MHD model, together with a realistic wall model, will enable DSC-3D to address the MHD issues of the entire disruption problem. This will also be an important step toward the prediction of disruptions in ITER and understanding opportunities for mitigation schemes.

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[2]L.E. Zakharov. Phys. Plasmas, v.15, 062507 (2008)
[3]L.E. Zakharov, S.A. Galkin, S.N. Gerasimov, Phys. Plasmas 19, 055703 (2012)

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