Recent Progress in Numerical Modeling of Relaxation Phenomena in ST

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Recent three topics related to numerical simulation study on the magnetohydrodinamics (MHD) relaxation processes in the spherical tokamak(ST) plasma, including (1)ST with a current hole, (2)MHD equilibria with sheared toroidal flows, and (3)the explosive ballooning instabilities, are presented. A numerical equilibrium code that can treat ST equilibria with very flat pressure profile which is sustained mainly by off-axis plasma current is developed. The extreme of such a profile, so-called a current hole profile, is examined. The nonlinear analysis is realized by using an MHD simulation code with higher resolution than our previous simulations. The disruptive process has been reproduced successfully. The effect of sheared toroidal plasma flow on the growth of the instabilities are investigated by using a modified equilibrium and a linearlized version of the MHD codes. The result shows changes in the growth rate due to the existence of the flows. Furthermore, our recent simulation activities which aims to model the explosive process in MAST experiments are reviewed. The preliminary simulation result shows a growth of the higher-n ballooning modes by using a numerical grids with much higher spatial resolution than before. The effect of the finite Lamor radius correction will be discussed.