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Vertical Force during Vertical Displacement Events in an ITER Plasma and the Role of Halo Currents[1] CESAR CLAUSER, STEPHEN JARDIN, NATHANIEL FERRARO, Princeton Plasma Physics Laboratory — Vertical displacement events (VDEs) can occur in elongated tokamaks causing large currents to flow in the vessel and other adjacent metallic structures. Any new device must be designed to withstand the associated forces. Due to the importance of these events, many calculations have been performed using different approximations in order to include the forces due to the poloidal (halo) currents flowing to the vessel. To better understand the potential magnitude of these forces and the role of halo currents in producing them, we have used the M3D-C1 code to simulate potential VDEs in ITER. In a first for an initial-value MHD code simulation of VDEs in ITER, we used actual values for the vessel resistivity and pre-quench temperatures. The halo region is naturally formed by triggering the thermal quench with an increase in the plasma thermal conductivity. We used the 2D non-linear version of the code and varied the post-thermal quench thermal conductivity profile as well as the boundary temperature in order to generate a wide range of possible cases that could occur in the experiment. We also show that, for similar conditions, increasing the halo current does not increase the total force on the wall since it is offset by a decrease in the toroidal contribution.

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