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Vessel Forces from a Vertical Displacement Event in ITER

Disruptions are one of the major concerns in ITER and other future tokamaks [1]. A particularly troublesome type of disruption is a vertical displacement event (VDE) where control of the vertical position of the plasma column is lost. In addition to heat, particle flux, and energetic electrons impacting the first wall, significant electromagnetic loads will arise.. For realistic modelling of a VDE disruption, a detailed 3D model of the disrupting plasma and an accurate description of the conducting structures surrounding the plasma is required. The structure affects the plasma evolution itself and the plasma acts as a source of currents and fields which produce the electromagnetic loads. Most of the VDE modeling work to date has used the axisymmetric evolving equilibrium codes TSC [2], DINA [3], and CarMa0NL[4] to describe the disrupting plasma. This paper describes more recent efforts to extend this analysis by using the fully 3D MHD codes M3D-C1 [5], NIMROD [6], and JOREK [7]. We describe our efforts in benchmarking these 3 codes on VDE relevant calculations, validation with some experimental data, and projection to ITER vessel and plasma conditions. Attention is given to the role of the currents shared by the plasma and the structure (halo currents)[8].

References:
1. T. Schioler, C. Bachmann, G. Mazzone, et al, Fusion Engin. Design, 86, 11, pp. 1963-1966, (2011).
2. S. C. Jardin, N. Pomphrey, and J. Delucia, J. Comp. Phys., 66, pp. 481–507 (1986).
3. R. Khayrutdinov and V. Lukash, J, Comp. Phys., 109, pp. 193–201 (1993)
4. F. Villone et al., Plasma Phys. Control. Fusion 55 (2013) 09500
5. S. Jardin, N. Ferraro, J. Breslau et al, Comput. Sci. & Disc., 5 p 014002 (2012)
6. C. Sovinec, A. Glasser, T. Gianakon, et al, J. Comp. Phys, 195 pp. 355386 (2004)
7. M. Hoelzl, P. Merkel, G. Huysmans, et al. JPCS, 401, 012010 (2012)
8. C. F. Clauser, S. C. Jardin, and N. M. Ferraro, Nuclear Fusion 59 126037 (2019)

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