Asymmetric wall force reduction in ITER and JET disruptions

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Asymmetric vertical displacement event (AVDE) disruptions in ITER should produce a relatively small electromechanical force on the conducting structures surrounding the plasma, in contrast to previous predictions based on JET data. This is shown in simulations [1, 2] with the M3D 3D MHD code [3] and confirmed in JET experiments [4] in which the current was quenched with massive gas injection (MGI). In ITER the current quench (CQ) time τ_{CQ} is less than or equal to the resistive wall penetration time τ_{wall}. JET is in a different parameter regime, with $\tau_{CQ}/\tau_{wall} > 1$. JET simulations were validated by comparison [1] to JET shot 71985 data and were in good agreement. The wall time τ_{wall} was then artificially increased, keeping τ_{CQ} fixed, and it was found that the wall force decreased. The reduction of the asymmetric wall force was also found in analysis of experimental data of JET MGI mitigated disruption shots, although the published data only concerned the symmetric wall force [4]. Further simulations [2] were carried out of ITER AVDEs. For $\tau_{CQ}/\tau_{wall} \leq 1$, the force was $4MN$, comparable to the force in JET. A fast CQ may cause production of runaway electrons (REs). Simulations using a modified version of M3D with a fluid RE model [5] will be presented.

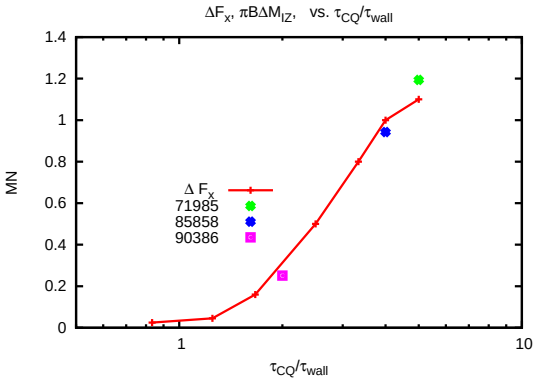

Figure 1: *simulated asymmetric wall force* ΔF_x*, and wall force estimated from MGI shots, labeled with JET shot number.*

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References

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