Abstract Submitted
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Rotating MHD torque balance analysis and island width measurement in support of disruption event characterization and forecasting[1] J.D. RIQUEZES, S.A. SABBAGH, J.W. BERKERY, Y.S. PARK, J.H. AHN, Y. JIANG, Columbia University, R.E. BELL, E. FREDRICKSON, PPPL, J.G. BAK, NFRI, A. THORNTON, CCFE — Effective disruption forecasting and mitigation tools will be critical to the lifetime and successful operation of reactor-scale tokamaks such as ITER. A forecaster has been built based on the automated and validated characterization of events relevant to the plasma evolution towards a disruption. This includes an automated characterization of born-rotating non-ideal MHD modes employing a toroidal array of Mirnov coils to measure the toroidal mode number and frequency that has been developed. A toroidal torque balance model initially assuming a "no-slip" electromagnetic drag of the mode is introduced for forecasting. A set of criteria based on the measured mode and relevant plasma parameters (e.g. plasma rotation profile data, equilibrium quantities including normalized beta and internal inductance) are used to determine warning levels to a disruption. Preliminary couplings of the bulk single-solid torque model to cylindrical approximations of the tearing mode island width (the evolution of which is indicative of the mode stability) are generated to further validate and improve the characterization. Wide aspect ratio ranges and differences in amplitude of error fields are examined using this model for NSTX/U, MAST, and KSTAR plasmas supporting disruption forecasting (DECAF code).

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