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Simulations of ELMs in realistic tokamak geometry with the nonlinear MHD code JOREK ISABEL KREBS, MATTHIAS HOELZL, Max Planck Institute for Plasma Physics, EURATOM Association, Boltzmannstr. 2, 85748 Garching, Germany, STEPHEN JARDIN, Princeton Plasma Physics Laboratory, Princeton, NJ, USA, KARL LACKNER, SIBYLLE GUENTER, Max Planck Institute for Plasma Physics, EURATOM Association, Boltzmannstr. 2, 85748 Garching, Germany, MAX-PLANCK/PRINCETON CENTER FOR PLASMA PHYSICS COLLABORATION — Edge-localized modes (ELMs) are relaxation-oscillation instabilities which occur at the edge of high confinement (H-mode) plasmas, ejecting particles and energy. The suitability of H-mode as operational regime for future fusion devices depends crucially on the occurrence and detailed dynamics of ELMs. We simulate ELMs in realistic ASDEX Upgrade geometry including the scrape-off layer using the nonlinear MHD code JOREK. Emphasis is put on including many toroidal Fourier harmonics in the simulations in order to study nonlinear interaction between these. Several experimental observations, such as a toroidal and poloidal localization of the perturbation and a drive of Fourier components with low toroidal mode numbers, are reproduced by the simulations. A simple model describing the three-wave interaction by quadratic terms in the equations is used to explain and interpret the nonlinear evolution of the toroidal Fourier spectrum in the simulations. It is investigated how sheared toroidal plasma rotation influences the nonlinear coupling between the toroidal Fourier harmonics. A benchmark of the two-fluid versions of JOREK and M3D-C1 is in progress.

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