Can the Non-linear Ballooning Model describe ELMs?  

S.A. HENNEBERG, York Plasma Institute, University of York, S.C. COWLEY, CCFE, Culham Science Centre and Department of Physics, Imperial College, H.R. WILSON, York Plasma Institute, University of York — The explosive, filamentary plasma eruptions described by the non-linear ideal MHD ballooning model is tested quantitatively against experimental observations of ELMs in MAST. The equations describing this model were derived by Wilson and Cowley [1] for tokamak-like geometry which includes two differential equations: the linear ballooning equation which describes the spatial distribution along the field lines and the non-linear ballooning mode envelope equation, which is a two-dimensional, non-linear differential equation which can involve fractional temporal-derivatives, but is often second-order in time and space. To employ the second differential equation for a specific geometry one has to evaluate the coefficients of the equation which is non-trivial as it involves field line averaging of slowly converging functions. We have solved this system for MAST, superimposing the solutions of both differential equations and mapping them onto a MAST plasma. Comparisons with the evolution of ELM filaments in MAST will be reported in order to test the model.


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