# Modelling the NTM evolution directly from JET experimental data

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A quasi-analytic model [1] and appropriate code are built in order to calculate the evolution of the NTM delta prime stability index and subsequent island width. The former is an explicitly time dependent derived quantity whereas the latter satisfies a modified Rutherford equation having the previously derived analytic delta prime term and a heuristic quantity for the bootstrap term. To obtain explicitly dynamic quantities, the following strategy is used: the involved perturbed equations are Laplace transformed in order to get rid of intrinsic time derivatives. The Laplace transformed perturbed equations are solved and the solutions are arranged via partial fraction decomposition method in order to be easily inverse Laplace transformed, the latter procedure being the final step to be achieved.

JET hybrid discharge experimental data are used to test the model accuracy regarding the evolution of a 3/2 NTM triggered by a sawtooth. No triggering sawtooth is considered in our approach, which would pointlessly complicate the model. Instead, a resonant external perturbation is considered to replace the sawtooth as a trigger for the NTM. Despite the fact that the theoretical model is built in order to describe the behavior of the small perturbations from the equilibrium state, therefore seeking for constant equilibrium quantities in order to be valid, the model uses stepwise varying JET data tables for the latter quantities and seems to simply work. The equilibrium quantities time growth rates are smooth enough in order to not break the perturbed model validity and to not significantly affect the NTM evolution during the period of interest. The NTM amplitude and frequency behavior are finally shown along with its corresponding magnetic island evolution.

## References

[1] I.G. Miron, P2.060, 43rd EPS Conference on Plasma Physics, 4-8 July 2016, Leuven, Belgium.