

**SEASEN Session 3 (Nonlinear Evolution PDEs)**  
**Speaker 3**

**High modes spectral filtering and stabilization of  
time schemes for nonlinear parabolic PDEs**

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The region of stability of IMEX time schemes used to the long time numerical simulation of nonlinear parabolic PDEs is limited by its capability to contain the propagation of high mode components of the solution, even if, due to regularization effects, these components behave like corrections. We propose and study here a general framework, based on filter techniques [1], which allows to build stabilizers as additional operators of low-pass filter type. The new methods are based on a proper spectral-like decomposition of the solution into low and high mode components; modulo a small consistency error, they allow to stabilize the scheme while preserving the advantages of the IMEX: fast iterations, only linear problems have to be solved at each step). We then introduce new two-level schemes and also we recover stabilized time marching scheme proposed in [2, 3]. Application to coupled nonlinear parabolic systems are given.

This is joint work with Matthieu Brachet.

**References**

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