Regularization by noise for some modulated dispersive PDEs

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Résumé

It is known that for ODEs driven by a rough vector field, uniqueness of the solution can be recovered by adjunction of an additive noise in the equation. Improvement on the behaviour of an ODE or PDE by adding a noise term is therefore referred to as a regularization by noise phenomenon, and is widely believed to hold for a large class of ODEs/PDEs and perturbative noises. In this talk, I will consider nonlinear dispersive PDEs where a deterministic noise is added as a distributional time coefficient in front of the dispersion. Despite the roughness of the noise term, we will see that any semilinear dispersive PDE with this noise term is well-posed at least in the same range of regularity as its noiseless counterpart, as soon as well-posedness relies on linear space-time estimates. Building on previous works on this model, we will also observe several regularization by noise phenomena provided that the noise is irregular enough : large data global well-posedness for focusing mass-critical equations, well-posedness at super-critical regularity for strongly non-resonant equations through improved multilinear estimates, and improvement on the Cauchy theory for Kadomtsev-Petviashvili equations through short-time multilinear estimates on longer time scales.

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