

# Noncommutative Integrable Systems

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I would like to discuss extension of integrable systems to noncommutative (NC) spaces, focusing on NC KdV, KP and anti-self-dual Yang-Mills (AS-DYM) equations. There are three good aspects of the NC theories:

- (1) Singularity could be resolved.
- (2) There is a physical meaning: presence of background magnetic fields.
- (3) Proofs and calculations become easier than commutative ones.

The aspect (1) brings new physical objects special to NC space, such as  $U(1)$  instantons. The aspects (2) and (3) lead to various successful applications to physics (via Ward's conjecture). The aspect (3) is sometimes due to the fact that quasideterminants make proofs simpler in the construction of exact solutions. (For reviews, see e.g. [arXiv:1012.6043, 1101.0005])

In the first talk, I would like to introduce how to obtain integrable systems in NC spaces and discuss the aspects (1) and (2). In the second talk, I would construct exact NC solitons in terms of the quasideterminants and discuss the aspect (3). If time allows, I would also mention recent developments on NC extension in the context of unification of integrable systems related to 4d/5d/6d Chern-Simons theories and 4d WZW models.