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Canonical bases, toric degenerations, and collective integrable systems

There are three important settings for studying actions of reductive Lie groups: modules, algebraic group actions, and Hamiltonian group actions. In the study of modules one encounters various constructions of nice bases which are in some sense canonical (e.g. Gelfand-Zeitlin, Lusztig). In the study of algebraic group actions canonical bases give rise to toric degenerations; deformations of the G -variety to a toric variety (cf. Caldero, Alexeev-Brion). The symplectic analogue of these constructions is collective integrable systems. We show how canonical bases and toric degenerations give rise to collective integrable systems on arbitrary symplectic manifolds equipped with Hamiltonian group actions. This generalizes a family of well-known examples of collective integrable systems called Gelfand-Zeitlin systems. As a by-product, we generalize some results of Harada and Kaveh.

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