Monodromy and Circle Actions

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Abstract

Standard Hamiltonian monodromy was introduced by Duistermaat as an obstruction to the existence of global action-angle coordinates in integrable Hamiltonian systems [1]. It refers to the monodromy of torus bundles that typically exist in such systems. Fractional Hamiltonian monodromy, introduced by Nekhoroshev, Sadovskií, and Zhilinskií in [2], generalizes standard monodromy by considering not only torus bundles but also more general fibrations with singular fibers.

In this talk I present results concerning both standard and fractional monodromy that were recently obtained in collaboration with Nikolay Martynchuk [3, 4]. It turns out that, in integrable Hamiltonian systems with a Hamiltonian circle action, both standard and fractional monodromy can be solely determined through a careful study of the fixed points of the circle action and their weights. A basic ingredient of this approach is the definition of generalized parallel transport of homology cycles introduced in [5]. These results will be demonstrated in several examples of integrable Hamiltonian systems.

References

[1] J. J. Duistermaat. "On global action-angle coordinates". In: *Communications on Pure and Applied Mathematics* 33.6 (1980), pp. 687–706. DOI: 10.1002/cpa.3160330602.

[2] N. N. Nekhoroshev, D. A. Sadovskií, and B. I. Zhilinskií. "Fractional Hamiltonian Monodromy". In: *Annales Henri Poincaré* 7.6 (2006), pp. 1099–1211. DOI: 10.1007/s00023-006-0278-4.

[3] K. Efstathiou and N. Martynchuk. "Monodromy of Hamiltonian systems with complexity 1 torus actions". In: *Journal of Geometry and Physics* 115 (2017), pp. 104–115. ISSN: 0393-0440. DOI: http://dx.doi.org/10.1016/j.geomphys.2016.05.014.

[4] N. Martynchuk and K. Efstathiou. "Parallel Transport along Seifert Manifolds and Fractional Monodromy". In: *Communications in Mathematical Physics* 356.2 (2017), pp. 427–449. DOI: 10.1007/s00220-017-2988-5.

[5] K. Efstathiou and H. W. Broer. "Uncovering fractional monodromy". In: *Communications in Mathematical Physics* 324.2 (2013), pp. 549–588. DOI: 10.1007/s00220-013-1816-9.