1. Selection of publications

1) D. Gaidashev, R. Radu, M. Yampolsky, *Renormalization and Siegel disks for complex Hénon maps*, J. Eur. Math. Soc. (JEMS), **23**(4) (2021), 1053-1073.

Note: Here, we prove the long-standing renormalization hyperbolicity conjecture for golden mean Siegel disks. Stated differently: complex maps with a golden mean rotation number at their fixed point exhibit self-similarity of their invariant rotational domains (Siegel disks) whose quantifies are universal - identical for all such maps.

2) D. Gaidashev, M. Yampolsky, *Renormalization of almost commuting pairs*, Invent. Math. **221** (2021), 203-236.

Note: Here, we extend renormalization to two-dimensional dissipative maps of the annulus which are small perturbations of one-dimensional critical circle maps using newly developed techniques. We demonstrate that a two-dimensional map which lies in the stable set of the renormalization operator possesses an attractor which is topologically a circle. We resolve an important conjecture in dynamical systems, that such a circle is critical: the dynamics on it is topologically, but not smoothly, conjugate to a rigid rotation.

3) D. Gaidashev, T. Johnson, M. Martens, *Rigidity for infinitely-renormalizable area-preserving maps*, Duke Math J. **165**(1) (2016), 129-159.

Note: It has been shown by M. Lyubich, M. Martens and collaborators that the period doubling Cantor sets of strongly dissipative Henon-like maps with different average Jacobian are not smoothly conjugated. Here, we demonstrate that, surprisingly, in the extreme case when the maps preserve area, the period doubling Cantor set of area-preserving maps in the universality class of the renormalization fixed point are smoothly conjugated.

Additional recent publications relevant to the application which are not peer-reviewed yet:

4) D. Gaidashev, A. Luque, *Renormalization and existence of the finite-time blow up solutions for a one-dimensional analogue of the Navier-Stokes equations*, e-print: `math/DS: 2203.14651.`

Note: Here, we use ideas from dynamical systems - those of construction of *a-priori*

bounds - to prove existence of a family of renormalization fixed points, and deduce existence of real $C^\infty([0,T), C^\infty(\mathbb{R}) \cap L^2(\mathbb{R}))$-solutions to the one-dimensional quasi-geostrophic equation whose energy and enstrophy become unbounded in finite time.

5) D. Gaidashev, *Renormalization and a-priori bounds for Leray self-similar solutions to the generalized mild Navier-Stokes equations*, e-print: `math/DS:2203.14648.`

Note: Here, we demonstrate that the problem of existence of Leray self-similar blow up solutions in a generalized mild Navier-Stokes system with the fractional Laplacian can be stated as a fixed point problem for a "renormalization" operator. We construct *a-priori* bounds in an appropriate weighted L^p-space. As a consequence of *a-priori* bounds, we prove existence of non-trivial Leray self-similar mild solutions in $C^\infty([0,T), (H^k)^d \cap (L^p)^d)$, $k > 0, p \geq 2$, whose $(L^p)^d$-norm becomes unbounded in finite time.

2. Peer-reviewed articles

1) D. Gaidashev, A. Luque, Renormalization and existence of the finite-time blow up solutions for a one-dimensional analogue of the Navier-Stokes equations, to appear in *SIAM J. Math. Anal.*, `math/DS:2203.14651.`

2) D. Gaidashev, M. Yampolsky, Golden mean Siegel disk universality and renormalization, *Moscow Math. J.*, **22**(3) (2022), 451–491

3) D. Gaidashev, I. Gorbovickis, Complex a-priori bounds for Lorenz maps, *Nonlinearity*, **34**(3) (2021), 1263.

4) D. Gaidashev, R. Radu, M. Yampolsky, Renormalization and Siegel disks for complex Hénon maps, *J. Eur. Math. Soc. (JEMS)*, **23**(4) (2021), 1053-1073.

5) D. Gaidashev, M. Yampolsky, Renormalization of almost commuting pairs, *Invent. Math.* **221** (2021), 203-236.

6) D. Gaidashev, Renormalization for Lorenz maps of monotone combinatorial types, *Ergod. Theor. and Dyn. Sys.*, **39**(1) (2019), 132-158

7) D. Gaidashev, T. Johnson, Spectral properties of renormalization for area-preserving maps, *Discrete Contin. Dyn. Syst. A* **36**(7) (2016).

8) D. Gaidashev, T. Johnson, M. Martens, Rigidity for infinitely-renormalizable area-preserving maps, *Duke Math J.* **165**(1) (2016), 129-159.

9) D. Gaidashev, On scaling ratios for Siegel disks, *Commun. Math. Physics*, **333**(2) (2015), 931-957.

10) D. Gaidashev, B. Winckler, Existence of a Lorenz renormalization fixed point of an arbitrary critical order, *Nonlinearity* **25** (2012), 1819.

11) D. Gaidashev, T. Johnson, A Numerical Study of Infinitely Renormalizable Area-preserving Maps, *Dyn. Sys.* **27**(3) (2012), 283-301.

12) D. Gaidashev, Period Doubling Renormalization for Area-Preserving Maps and Mild Computer Assistance in Contraction Mapping Principle, *Int. Journal of Bifurcations and Chaos*, **21**(11) (2011), 3217-3230.

13) D. Gaidashev, On analytic perturbations of a family of Feigenbaum-like equations, *J. Math. Anal. And Appl.* **374**(2) (2010), 355–373.

14) D. Gaidashev, H. Koch, Period doubling in area-preserving maps: an associated one-dimensional problem, *Ergod. Theor. and Dyn. Sys.* **31**(4) (2011), 1193–1228.

15) D. Gaidashev, T. Johnson, Dynamics of the Universal Area-Preserving Map: Stable Sets, *J. Mod. Dyn.* **3**(4) (2009), 1–39.

16) D. Gaidashev, T. Johnson, Dynamics of the Universal Area-Preserving Map: Hyperbolic Sets, *Nonlinearity* **22**(10) (2009), 2487–2521.

17) D. Gaidashev, D. Khmelev, On Numerical Algorithms for the Solution of a Beltrami Equation, *SIAM J Numer Anal.* **46**(5) (2008), 2238–2253.

18) D. Gaidashev, M. Yampolsky, Cylinder renormalization of Siegel disks, *Exp. Math.* **16**(2) (2007), 215–226.

19) D. Gaidashev, Cylinder renormalization for Siegel disks and a constructive Measurable Riemann Mapping Theorem, *Nonlinearity* **20**(3) (2007), 713–741.

20) D. Gaidashev, Renormalization of isoenergetically degenerate Hamiltonian flows and associated bifurcations of invariant tori, *Discrete Contin. Dyn. Syst.* **13**(1) (2005), 63–102.

21) D. Gaidashev, H. Koch, Renormalization and shearless invariant tori: numerical results, *Nonlinearity* **17**(5) (2004), 1713–1722.

22) D. Gaidashev, S. Zhdanov, On the transverse instability of the two-dimensional Benjamin-Ono solitons, *Phys. Fluids* **16**(6) (2004), 1915–1921.

3. E-prints

1) D. Gaidashev, Renormalization and a-priori bounds for Leray self-similar solutions to the generalized mild Navier-Stokes equations, e-print: `math/DS:2203.14648.`

2) D. Gaidashev, R. Pihlström, M. Ryner, On some spectral properties of stochastic similarity matrices for data clustering, e-print: `math/DS:1910.01392.`

3) D. Gaidashev, D. Lilja, On the geometry of period-doubling invariant sets for area-preserving maps, *submitted*, e-print: `math/DS:1803.00917`.

4) D. Gaidashev, D. Lilja, Universality but no rigidity for two-dimensional perturbations of almost commuting pairs, e-print: `math/DS:2204.02775`.

5) D. Gaidashev, M. Gonchenko, Exponentially small splitting of separatrices near a period-doubling bifurcation in area-preserving maps, e-print: `math/DS:1204.2504`.