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Dynamische Systeme

Organised by
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Abstract. This workshop continued the biannual series at Oberwolfach on Dynamical Systems that started as the "Moser-Zehnder meeting" in 1981. The main themes of the workshop are the new results and developments in the area of dynamical systems, in particular in Hamiltonian systems and symplectic geometry related to Hamiltonian dynamics.

Mathematics Subject Classification (2010): 37, 53D.

Introduction by the Organisers

The workshop was organized by H. Eliasson (Paris), H. Hofer (Princeton) and J.-C. Yoccoz (Paris). It was attended by more than 50 participants from 13 countries and displayed a good mixture of young, mid-career and senior people. The workshop covered a large area of dynamical systems centered around classical Hamiltonian dynamics: symplectic dynamics and geometry; billiards; Hamiltonian PDE's; dynamics of vector fields and mappings on manifolds; Hamilton-Jacobi theory and weak KAM; celestial mechanics; circle diffeomorphisms; diffusion. Also other parts of dynamics were represented.

J. Fish presented a new result showing that Hamiltonian flows on compact hypersurfaces in 4-space are not minimal. This answers a question raised by M. Herman in his 1998 ICM address. The result constitutes a significant progress on a problem raised by Gottschalk in 1958 concerning the existence of a minimal flow on the three-sphere.

L. Polterovich reported on work finding robust obstructions to represent a Hamiltonian diffeomorphism as a k-th power using a Floer-theoretic version of

persistence modules and described applications to the geometry and dynamics of Hamiltonian diffeomorphisms.

D. Christofaro-Gardiner discussed an important relationship between the Reeb dynamics on a three-dimensional closed manifold equipped with a contact form and volume considerations coming from Seiberg-Witten theory. In particular there always have to be at least two periodic orbits.

N. Roettgen displayed examples of Reeb vector fields in higher dimensions, where the existence of trapped orbits does not implies the existence of periodic orbits unlike the three-dimensional case, where it was established by Eliashberg and Hofer. P. Albers talked about Hofer-Zehnder capacities and S. Hohloch about semi-toric integrable Hamiltonian systems.

D. Peralta-Salas presented, in a beautiful talk, new stationary solutions of the 3D Euler equation and studied their dynamics by KAM-theory. These solutions possess linearly stable periodic orbits surrounded by invariant tori (vortex tubes). M. Berti talked about quasi-periodic solutions for water wave equations, and Z. Zhao discussed ballistic motion in lattice Schrödinger equations. The talk of S. Kuksin focused on wave turbulence.

V. Baladi presented in a masterful manner the proof of exponential decay for Sinai billiards, the conclusion of a long search that has led to the creation of important tools in the functional-analytic approach to hyperbolic dynamics. G. Forni focused on non-rational polygonal billiards pointing out many important open questions. He presented a criterion for the ergodicity of such billiards related to the Cheeger constant of the phase space equipped with a renormalized metric.

A. Katok asked a natural and intriguing question about Lyapunov exponents of volume-preserving diffeomorphisms. P. Berger presented new results on the Newhouse phenomenon, and K. Kuperberg discussed the Seifert and the Modified Seifert conjecture.

M. Zavidovique presented a convergence result of viscosity solutions of Hamiltonian – Jacobi equations which lies at the basis of weak KAM-theory. Transposing to the context of optimal transport in compact metric spaces, he demonstrated how elementary arguments may lead to deep results.

M. Guardia, A.Knauf and Y. Long presented new results in celestial mechanics. V. Kaloshin displayed a new phenomenon of stochastic Arnold diffusion, and R. Krikorian discussed recent results on almost linearization of circle diffeomorphism.

J. Bochi proved results on linear representations using dominated splitting for co-cycles. A. Gorodetski presented new results on sums of Cantor sets. M. Levi discussed high-frequency vibrations in mechanical models and S. Katok Fuchsian groups and coding of geodesics.

The meeting was held in an informal and stimulating atmosphere. The weather was excellent and many participants attended the traditional walk to St. Roman under the leading of Sergei Tabachnikov.

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Workshop: Dynamische Systeme

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