

Workshop on Diophantine problems and p -adic period mappings

Hotel Böglerhof, Alpbach/Austria
June 30-July 5, 2019

Organizers: J. Ayoub, C. Fuchs, Ph. Habegger, R. Pink, G. Wüstholz
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This summer school, the 13th in a series of workshops in Alpbach, will continue a tradition of summer schools in Alpbach in arithmetic and geometry (e.g. 2010, p -adic periods; 2011, motives, periods and transcendence; 2012, multiple zeta-values; 2013; p -adic modular forms; 2014, periods and heights of CM abelian varieties; 2015, special cycles on Shimura varieties). PhD students and postdocs present the topics. We study the very recent paper of Brian Lawrence and Akshay Venkatesh on Diophantine problems and p -adic period mappings.

Talks given by:

Ziyang Gao (IMJ-PRG)
Sergey Gorchinskiy (Steklov Math. Inst., NRU HSE, Moscow)
Fritz Hörmann (Freiburg)
Emil Jacobsen (Zurich)
Lars Kühne (Basel)
Brian Lawrence (Columbia)
Lorenzo Mantovani (Zurich)
Alberto Merici (Zurich)
Maxim Mornev (Zurich)
Nicola Nesa (Freiburg)
Doosung Park (Zurich)
Harry Schmidt (Basel)

Invited Talks:

Ariyan Javanpeykar (Mainz)
Yunqing Tang (Princeton)

Program

All lectures take place in the seminar room at Hotel Böglerhof.

Sunday, June 30, 2019:

- 17:00 - 17:15: Opening
Welcome words and organizational matters
- 17:15 - 18:45: **Brian Lawrence** (Columbia U.)
Introduction to Diophantine problems and p -adic period mappings

Monday, July 1, 2019:

- 09:00 - 10:30: **Doosung Park** (U. Zurich)
Introduction to p -adic Hodge theory. I
- 11:00 - 12:30: **Maxim Mornev** (ETH)
Introduction to p -adic Hodge theory. II
- 13:45 - 15:15: **Harry Schmidt** (U. Basel)
The S -unit equation

Tuesday, July 2, 2019:

- 09:00 - 10:30: **Nicola Nesa** (U. Freiburg)
Construction of the Kodaira-Parshin family
- 11:00 - 12:30: **Emil Jacobsen** (U. Zurich)
Friendly places and generic simplicity
- 13:45 - 14:45: **Ariyan Javanpeykar** (U. Mainz)
Arithmetic hyperbolicity: birational self maps, from number fields to finitely generated fields, and period domains
- 15:00 - 16:00: **Yunqing Tang** (Princeton)
Reductions of abelian surfaces over global function fields

Wednesday, July 3, 2019:

09:00 - 10:30: **Fritz Hörmann** (U. Freiburg)
The main argument. I

11:00 - 12:30: **Ziyan Gao** (IMJ-PRG)
The main argument. II

Thursday, July 4, 2019:

09:00 - 10:30: **Alberto Merici** (U. Zurich)
Monodromy. I

11:00 - 12:30: **Lorenzo Mantovani** (U. Zurich)
Monodromy. II

13:45 - 14:45: **Sergey Gorchinskiy** (Steklov Math. Inst., NRU HSE,
Moscow)
Hypersurfaces. I: introduction

Friday, July 5, 2019:

09:00 - 10:30: **Sergey Gorchinskiy** (Steklov Math. Inst., NRU HSE,
Moscow)
*Hypersurfaces. II: reduction of Theorem 10.1 to Proposition
10.6*

11:00 - 12:30: **Lars Kühne** (U. Basel)
*Hypersurfaces. III: combinatorics on reductive groups, proof
of Proposition 10.6*

Abstracts

Ariyan Javanpeykar (Mainz)

Title: *Arithmetic hyperbolicity: birational self-maps, from number fields to finitely generated fields, and period domains*

Abstract: Let X be a projective variety over a number field K such that $X(L)$ is finite for every number field L/K . What properties should such a variety have? We first present joint work with Junyi Xie in which we prove that $\text{Bir}(X)$ is finite. This result is in accordance with Lang's conjecture that X should be of general type (as such varieties have only finitely many birational self-maps). In the second part of this talk I will discuss the question of whether $X(M)$ is finite for every finitely generated field extension M/K (still assuming that $X(L)$ is finite for every number field), and present joint work with Raymond van Bommel and Ljudmila Kamenova. I will conclude with results on integral points on period domains. The latter is joint with Daniel Litt.

Yunqing Tang (Princeton)

Title: *Reductions of abelian surfaces over global function fields*

Abstract: For a non-isotrivial ordinary abelian surface A over a global function field with everywhere good reduction, under mild assumptions, we prove that there are infinitely many places modulo which A is geometrically isogenous to the product of two elliptic curves. This result can be viewed as a generalization of a theorem of Chai and Oort, which is a function field version of a result by François Charles. This is joint work with Divesh Maulik and Ananth Shankar.