

“ p -adic method and its applications in arithmetic geometry, 2007”

As an international workshop of JSPS Core-to-Core Program No. 18005: “New Developments of Arithmetic Geometry, Motive, Galois Theory, and Their Practical Applications”, we have a workshop on p -adic geometry at Komaba, University of Tokyo.

Date : June 11 – 13, 2007

Place : Graduate School of Mathematics, University of Tokyo, Komaba, Meguro-ku, Tokyo

Homepage : <http://www.math.sci.hiroshima-u.ac.jp/m-mat/JSPS-CoreToCore/P-ADIC2007/index.html>

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Program

11 June (Monday)

9:30 – 10:30 Takeshi Tsuji (Tokyo)

“On purity for p -adic representations”

Abstract: Let A be a p -adic completion (or henselization) of a smooth ring over a complete discrete valuation ring of mixed characteristic $(0, p)$ with perfect residue field. In this talk, we discuss on the following question (an analogue of the purity of branch locus for p -adic representations): Is a p -adic representation of the fundamental group of the generic fiber of $\text{Spec}(A)$ is Hodge-Tate (resp. de Rham, resp. crystalline) if so is its localization to the generic point of the special fiber?

10:45 – 11:45 Vytautas Paskunas (Bielefeld, IHES)

“Towards mod p local Langlands correspondence: (joint work with Christophe Breuil)”

Abstract: Let F be a finite unramified extension of \mathbb{Q}_p and let ρ be a 2-dimensional continuous, “generic”, $\overline{\mathbb{F}}_p$ -representation of $\text{Gal}(\overline{\mathbb{Q}}_p/F)$. We associate to ρ a family of smooth irreducible admissible $\overline{\mathbb{F}}_p$ -representations of $\text{GL}_2(F)$, such that the $\text{GL}_2(\mathfrak{O}_F)$ -socle consists of the Buzzard-Diamond-Jarvis weights associated to ρ .

13:45 – 14:45 Elmar Grosse-Klönne (Muenster)

”On special representations of p -adic reductive groups”

Abstract : For a split reductive group G over a non-Archimedean locally compact field F and a parabolic subgroup $P \subset G$ I am going to consider the corresponding special G -representation with coefficients in a ring L :

$$C^\infty(G/P, L) / \sum_{P' \supsetneq P} C^\infty(G/P', L)$$

For example, if P is a Borel subgroup then this is the Steinberg representation (with coefficients in L). I will consider the restriction of these representations to Iwahori subgroups in G . Then I will give an application in the case where L is a field whose characteristic is the residual characteristic of F .

15:00 – 16:00 Xavier Caruso (Rennes)

“Torsion (quasi-)semi-stable representations”

Abstract: (Join work with T. Liu) We study the general structure of some categories of Breuil modules with high ramification. In particular, we will explain a generalization of the classical result of Raynaud about minimal and maximal models of groups schemes of type (p, \dots, p) over a p -adic field.

16:00 – 16:30 Tea

16:30 – 17:30 Atsushi Yamagami (Kyoto Sangyo)

“On p -adic analytic families of eigenforms of infinite slope”

Abstract: Let p be an odd prime number. In this talk, we shall see a construction of p -adic analytic families of eigenforms of infinite slope.

12 June (Tuesday)

9:30 – 10:30 Takeshi Kajiwara (Yokohama National), Chikara Nakayama (Tokyo IT)

“Log abelian varieties” (joint work with Kazuya Kato)

Abstract : We discuss the notions log complex torus and log abelian variety over the complex number field, which are new formulations of degenerations of complex torus and abelian variety over the complex number field, and which have group structures.

10:45 – 11:45 Takeshi Kajiwara (Yokohama National), Chikara Nakayama (Tokyo IT)

“Log abelian varieties” (joint work with Kazuya Kato)

13:45 – 14:45 Marco Garuti (Padova)

“On the fundamental group scheme”

Abstract: The fundamental group scheme of a scheme S over a base B , when it exists, classifies torsors over S under finite flat B -group schemes, thus generalizing the algebraic fundamental group. I will report on old and new results about the fundamental group scheme when B is either a field of positive characteristic or a discrete valuation ring.

15:00 – 16:00 Noriyuki Suwa (Chuo)

“Around the Kummer theory”

Abstract : It is an interesting problem to generalize the Kummer theory, which gives a concrete description on cyclic extensions of a field or on cyclic coverings of an algebraic variety. There are various variants of the Kummer theory such as the Artin-Schreier theory, the Kummer-Artin-Schreier theory and the theory of generic polynomials.

In this talk we develop an argument based on the unit group schemes of group algebras, which was mentioned by Serre in <Groupes algebriques et corps de classes>, Ch.VI. We discuss also compactifications of Kummer theories.

16:00 – 16:30 Tea

16:30 – 17:30 Yuichiro Taguchi (Kyushu)

“Moduli of Galois representations and their applications”

Abstract : We construct a moduli scheme which parametrizes the absolutely irreducible representations (of a fixed finite degree) of a certain topological non-commutative ring (such as the completed group ring of a Galois group). It can be used, for example, to show a relation between some finiteness conjectures on p -adic and mod p Galois representations of algebraic number fields.

18:30 – Reception

13 June (Wednesday)

9:30 – 10:30 Kiran Kedlaya (MIT)

“The differential Swan conductor”

Abstract: We describe a numerical invariant, the differential Swan conductor, that can be attached to an overconvergent isocrystal on a variety, depending on the choice of a boundary divisor. (The construction should be viewed as an analogue of the irregularity of a meromorphic connection on a higher-dimensional complex variety.) The construction also applies to a representation of the absolute Galois group of an equal characteristic local field, possibly with imperfect residue field, as long as the image of inertia is finite. We will describe some properties of this invariant, including some results about how it varies in the choice of the boundary divisor; some of these appear in the proof of semistable reduction for overconvergent F -isocrystals on surfaces.

10:45 – 11:45 Robert Carls (Ulm)

“Asymptotically optimal point counting on abelian varieties”

Abstract: This talk is about joint work with D. Lubicz. We outline an algorithm for point counting on ordinary abelian varieties over finite fields of ‘small’ characteristic. The asymptotic time complexity of this algorithm is quadratic in the degree of the finite field. Our method forms a generalization of both, Satoh’s p -adic algorithm for elliptic curves and Mestre’s 2-adic arithmetic-geometric mean method.

13:45 – 14:45 Andreas Langer (Exeter)

”Overconvergent de Rham-Witt-theory”

Abstract: For a smooth scheme X defined over a perfect field k we define an overconvergent de Rham-Witt complex that computes the rigid cohomology of X . The idea is to extend for a smooth affine algebra A the notion of overconvergent (bounded) Witt-vectors of A to the de Rham-Witt complex of Deligne-Illusie, thereby obtaining a subcomplex of overconvergent series of Witt-differentials. One shows that this complex is defined on the étal site of $\text{Spec } A$ and that it computes the Monski-Washnitzer cohomology of A . In order to globalize the result to a comparison with rigid cohomology of a smooth scheme one applies cohomological descent theory of rigid cohomology developed by Chiarellotto and Tsuzuki.

15:00 – 16:00 Daniel Caro (Paris-Sud)

“Differential overcoherence and overconvergent F -isocrystals”

Abstract : P. Berthelot's rigid cohomology whose coefficients are overconvergent F -isocrystals (" F " means endowed with a Frobenius structure) gives a p -adic cohomology theory of varieties of characteristic $p > 0$. This p -adic cohomology theory is not stable by direct image. To fill this gap, P. Berthelot introduced arithmetic D -modules. This theory is built analogously to the classical theory of D -modules (over the field of complex numbers). Moreover, he defined the notion of holonomic F - D -modules and conjectured, like the classical case, that the holonomicity is stable. In this talk, we will construct a fully faithful functor from the category of overconvergent F -isocrystals over any (fixed) smooth variety over a perfect field of characteristic p to the category of arithmetic D -modules. We will introduce the notion of "overcoherence" which conjecturally equals to holonomicity and explain how this suits for the description of the essential image of the previous functor. Finally we give some applications.

Organizers : Fumiharu Kato (Kyoto), Makoto Matsumoto (Hiroshima), Atsushi Shiho (Tokyo), Takeshi Tsuji (Tokyo), Nobuo Tsuzuki (Hiroshima)