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Automorphic forms, Galois representations, and L-functions Special Session B19

Antonio Cauchi
Tokyo Institute of Technology, JAPAN

Zheng Liu
University of California, Santa Barbara, USA

Matteo Longo
Universià degli studi di Padova, ITALY

Giovanni Rosso
Concordia Univeristy, CANADA

This session is scheduled on July 25-26. The focus of the proposed scientific session is to present recent developments in a wide research area of modern number theory which sits in the wide framework of the Langlands program. Automorphic forms arise naturally in many different settings of number theory; under the deep web of conjectures that form the Langlands program, they should be related to Galois representations, and discovering properties on one of these gives us information about the other. The natural tool to connect them are complex (and p-adic) L-functions and their relations with Selmer groups, conjecturally described in great generality by Bloch–Kato (in their equivariant Tamagawa number conjecture) as a wide generalization of the Birch and Swinnerton-Dyer Conjecture for elliptic curves, a Milllennium Problem. One of the tools to attack the Bloch–Kato conjecture is the theory of Euler systems and their relation with complex (and p-adic) L-functions. In recent years, there have been many important advances in this area, most notably:

- New constructions of Euler systems via algebraic cycles, which allow one to study automorphic forms and Galois representations for motives of algebraic groups possibly different from GL_2;
- Variation of automorphic forms in families, especially using higher degree coherent cohomology which provides new ways to study Galois representations and their L-functions by deforming them p-adically.

These new developments have exciting applications on many outstanding open conjectures in number theory among which the Bloch–Kato conjectures, as already mentioned, the Iwasawa main conjecture, the study of (completed) cohomology of Shimura varieties.

E–mail: giovanni.rosso@concordia.ca.