【Science and Engineering（Mathematical and physical science）】

Comprehensive studies on Shimura varieties, arithmetic geometry, Galois representations, and automorphic representations

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【Outline of survey】

Shimura varieties are algebraic varieties (geometric objects defined by equations), which are generalizations of modular curves. Previously, several mathematical objects in arithmetic geometry, Galois representations, automorphic representations were studied from individual perspectives. However, these days, these are being studied from a unified viewpoint related to Shimura varieties, and many important applications are being obtained; examples are Fermat's last theorem proved by A. Wiles and the Sato-Tate conjecture proved in many cases by R. Taylor and his collaborators. In recent years, higher dimensional Shimura varieties are being studied extensively than before, and many essential applications of recently developed theories, such as rigid geometry, theory of p-adic uniformization, theory of (ϕ, Γ)-modules, are being obtained. In this project, we study Shimura varieties comprehensively with active young researchers including foreign ones, and we try to obtain new knowledge on arithmetic geometry, Galois representations, and automorphic representations.

【Expected results】

By studying integral models of Shimura varieties, we expect to understand the relation between p-adic uniformization of Shimura varieties and the etale cohomology of Rapoport-Zink spaces. We also expect to understand the geometric structures behind p-adic period maps, to understand the relation between the theory of (ϕ, Γ)-modules and the Langlands functoriality, to clarify the geometry behind the deformation theory of Galois representations, to obtain a new perspective on Shimura varieties, to obtain a new knowledge on the arithmetic geometry, Galois representations, and automorphic representations.

【References by the principal investigator】

・T. Ito, Weight-monodromy conjecture for p-adically uniformized varieties, Invent. Math. 159 (2005), no. 3, 607--656.

・T. Ito, Stringy Hodge numbers and p-adic Hodge theory, Compositio Math. 140 (2004), no. 6, 1499--1517.

【Term of project】 FY2008－2012	【Budget allocation】 29,400,000 yen (direct cost)

【Homepage address】 None