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Rigid Cocycles and the p-adic Kudla Program

Rigid cocycles, introduced by Darmon and Vonk in 2017, offer a promising framework to extend complex multiplication theory to real quadratic fields, suggesting a theory of "real multiplication." They exhibit striking parallels with modular forms and are central to the emerging p-adic Kudla program. While the classical Kudla program studies the theta correspondence between automorphic forms on different groups, the p-adic version appears to replace automorphic forms with rigid cocycles. Although a theory for a p-adic theta correspondence has yet to be developed, recent results suggest its existence. In this talk, I present some of these p-adic results, draw comparisons to the classical setting, and discuss the evidence for an underlying p-adic theta correspondence.