

THE L^p REGULARITY PROBLEM FOR PARABOLIC OPERATORS

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Abstract: In this talk, I will present a full resolution of the question of whether the Regularity problem for the parabolic PDE $-\partial_t u + \operatorname{div}(A\nabla u) = 0$ on a Lipschitz cylinder $\mathcal{O} \times \mathbb{R}$ is solvable for some $p \in (1, \infty)$ under the assumption that the matrix A is elliptic, has bounded and measurable coefficients and its coefficients satisfy a very natural Carleson condition (a parabolic analog of the so-called DKP-condition).

We prove that for some $p_0 > 1$ the Regularity problem is solvable in the range $(1, p_0)$. We note that answer to this question was not known previously even in the "small Carleson case", that is, when the Carleson norm of coefficients is sufficiently small.

In the elliptic case the analogous question was only fully resolved recently (2022) independently by two groups using two very different methods; one involving S. Hofmann, J. Pipher and the presenter, the second by M. Mouroglou, B. Poggi and X. Tolsa. Our approach in the parabolic case is motivated by that of the first group, but in the parabolic setting there are significant new challenges. The result is a joint work with L. Li and J. Pipher.