GENERALIZED MORREY REGULARITY FOR PARABOLIC EQUATIONS WITH DISCONTINUOUS DATA

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ABSTRACT

We study the global regularity of the solution of the regular oblique derivative problem in a cylinder $Q = \Omega \times (0, T)$

$$
\begin{cases}
u_t - a^{ij}(x,t)D_{ij}u = f(x,t) & \text{a.e. in} \quad Q, \\
u(x,0) = 0 & \text{on} \quad \Omega, \\
\partial u/\partial \ell = \ell^i(x,t)D_i u = 0 & \text{on} \quad S.
\end{cases}
$$

for linear uniformly parabolic operators with VMO coefficients. We show that if the right-hand side f belongs to the generalized Morrey space $M_{p,\varphi}(Q)$, $p > 1$ then the solution belongs to the generalized Sobolev-Morrey space $W_{p,\varphi}^{2,1}(Q)$ where the weight $\varphi : \mathbb{R}^{n+1} \times \mathbb{R}_+ \to \mathbb{R}_+$ satisfies the following condition

$$
\int_r^\infty \left(1 + \ln \frac{s}{r}\right) \frac{\underset{s<\zeta<\infty}{\operatorname{essinf}} \varphi(x,t;\zeta)\zeta^{\frac{n+2}{p}}}{s^{\frac{n+2}{p}+1}} \, ds \leq C, \quad r > 0 \,.
$$

Similar result is obtained also for the Cauchy-Dirichlet problem.

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