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Solvability to some strongly degenerate parabolic problems. (English) Zbl 07053117

Summary: Nonlinear parabolic equations of “divergence form,” $u_t = (\varphi(u)\psi(u_x))_x$, are considered under the assumption that the “material flux,” $\varphi(u)\psi(v)$, is bounded for all values of arguments, $u$ and $v$. In literature such equations have been referred to as “strongly degenerate” equations. This is due to the fact that the coefficient, $\varphi(u)\psi'(u_x)$, of the second derivative, $u_{xx}$, can be arbitrarily small for large value of the gradient, $u_x$. The “hyperbolic phenomena” (unbounded growth of space derivatives within a finite time) have been established in literature for solutions to Cauchy problem for the above-mentioned equations. Accordingly one can expect a correct statement of the initial-boundary value problem for such equations only under additional assumptions on the problem data. In this paper we describe several restrictions, under which the initial-boundary value problems for strongly degenerate parabolic equations are well-posed.

MSC:
35-XX Partial differential equations
76-XX Fluid mechanics

Keywords:
strongly degenerate parabolic equations; initial-boundary value problem; hyperbolic phenomena; global-in-time solutions; generalized distance

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