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Asymptotic behavior for p-Laplacian type equations

The long-time asymptotics for the doubly nonlinear diffusion equations $\rho_t = \mathrm{div}(|\nabla \rho^m|^{p-2} \nabla \rho^m)$ in R^n, is studied for $p > 1$ and $m > \frac{n-p}{n(p-1)}$. The non-negative solutions of the equation are shown to behave asymptotically, as $t \to \infty$, like Barenblatt-type solutions, and a polynomial decay is established for the convergence with respect to the L^1-norm. The rate of decay is proved to be optimal when $m \geq \frac{n-p+1}{n(p-1)}$. The method used is based on optimal transportation arguments when $m \geq \frac{n-p+1}{n(p-1)}$, and on a linear analysis when $\frac{n-p}{n(p-1)} < m < \frac{n-p+1}{n(p-1)}$.