Doubly nonlinear parabolic equations: from DeGiorgi type Lemmas to local regularity

In the past years progresses were made in understanding the behaviour of the solutions to the doubly nonlinear evolutionary equations given by

$$u_t - \operatorname{div}\big(|u|^{m-1}|Du|^{p-2}Du\big) = 0, \qquad p > 1, \tag{1}$$

or considered written in the form

$$\partial_t(u^q) - \operatorname{div}\big(|Du|^{p-2}Du\big) = 0, \quad p > 1 \ \text{ and } \quad q > 0. \tag{2}$$

In this talk we'll focus on the second doubly nonlinear pde (2) and we'll present the *Expansion of Positivity* for its nonnegative bounded weak solutions: the information on the measure of the *positivity set* of u, at a certain time level s over a cuber $K_\rho(y)$, is expanded both in space (say from $K_\rho(y)$ to $K_{2\rho}(y)$) and in time (from the time level s to all further time levels $s+\theta\rho^p$). We'll briefly comment on the possibilities of this *Expansion of Positivity* procedure.

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