QUASILINEAR PARABOLIC EQUATIONS WITH A SINGULAR FORCING

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Our goal is to obtain a well-posedness theory for a quasilinear parabolic initial value problem with a rough forcing. In particular, we are interested in equations of the form

$$\begin{aligned} (\partial_2 - a(u)\partial_1^2 + 1)u = f \qquad &\text{on} \quad \mathbb{R}^2_+, \\ u = g \qquad &\text{on} \quad \partial\mathbb{R}^2_+, \end{aligned}$$

where $a \in C^\alpha(\mathbb{R})$, $g \in C^\alpha(\mathbb{R})$, and $f \in C^{\alpha-2}(\mathbb{R}^2)$ with $\alpha \in (\frac{2}{3}, 1)$. We work under the assumption of spatial periodicity for a, f and g and also time periodicity for the forcing f. Our well-posedness theory comes in two parts: 1) We must determine a meaning for the product $a\partial_1^2 u$, which due to a lack of regularity is not classically defined. 2) Given this notion of the product, we construct a solution operator satisfying some continuity properties. These results can be seen as a natural continuation of the recent work of Otto and Weber in which the authors treat the space-time periodic version of our problem (without a massive term). This is a joint work with Felix Otto and Jonas Sauer.