Quasilinear parabolic equations in the Bessel scale

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In this talk, I will discuss and analyze scalar quasilinear parabolic equations posed on nonsmooth domains with generally irregular input data. The latter refers to merely measurable and bounded coefficients, mixed boundary conditions, possibly inhomogeneous Robin- or Neumann boundary data, and also to nonlinear forcing functions which may act on the gradient of the solution. The driving force for the analysis will be maximal parabolic regularity of the differential operators in the scale of (duals of) Bessel potential spaces incorporating mixed boundary conditions, with the scale parameter depending on the smoothness of the solution within the quasilinear operator. These depend on permanence principles for the elliptic counterparts which are leveraged from bilinear interpolation. A careful analysis allows to close the loop for the quasilinear equation and thus obtain local-in-time solutions under minimal assumptions. I further mention some sufficient criteria for solutions to exist globally, and how these can be leveraged in the framework of optimal control problems to achieve a satisfying theory for nonsmooth problems with strong nonlinearities.