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# On the vanishing-viscosity limit in parabolic systems with rate-independent dissipation terms

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**Abstract.** We consider semilinear and quasilinear parabolic systems with a non-smooth rate-independent and a viscous dissipation term in the limit of very slow loading rates, or equivalently with fixed loading and vanishing viscosity $\varepsilon > 0$. Because for nonconvex energies the solutions will develop jumps, we consider the vanishing-viscosity limit for the graphs of the solutions in the extended state space in arclength parametrization. Here the choice of the viscosity norm for parametrization is crucial to keep the subdifferential structure of the problem. A crucial point in the analysis are new a priori estimates that are rate independent and that allow us to show that the total length of the graph remains bounded in the vanishing-viscosity limit. To derive these estimates we combine parabolic regularity estimates with ideas from rate-independent systems.

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