Volker Pluschke, Frank Weber The local solution of a parabolic-elliptic equation with a nonlinear Neumann boundary condition

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Abstract: We investigate a parabolic-elliptic problem, where the time derivative is multiplied by a coefficient which may vanish on time-dependent spatial subdomains. The linear equation is supplemented by a nonlinear Neumann boundary condition $-\partial u/\partial \nu_A = g(\cdot, \cdot, u)$ with a locally defined, L_r -bounded function $g(t, \cdot, \xi)$. We prove the existence of a local weak solution to the problem by means of the Rothe method. A uniform a priori estimate for the Rothe approximations in L_{∞} , which is required by the local assumptions on g, is derived by a technique due to J. Moser.

Keywords: parabolic-elliptic problem, nonlinear Neumann boundary condition, Rothe method AMS Subject Classification: 35K65, 65N40, 35M10