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Ugur Abdulla, Lamees Alzaki and Robert Balkin*, rbalkin@mymail.mines.edu, and **Jian Du and Elizabeth Schloss**. *Evolution of Free Boundaries for the Nonlinear Fokker-Planck Equation with Reaction*.

We investigate the problem on short-time behavior of free boundaries and local solutions near it in the following Cauchy problem for the nonlinear Fokker-Planck equation with reaction:

$$u_t = (u^m)_{xx} + a(u^\gamma)_x + bu^\beta, x \in R, t > 0; u|_{t=0} = C(-x)_+^\alpha$$

where $m > 1, \gamma > 0, \beta > 0$. The problem of determining the short-time behavior of the free boundaries, or interfaces, is the Barenblatt problem. The full solution of this problem for the reaction-diffusion equation was given in [Abdulla and King, SIAM J. Math. Anal., 32, 2(2000), 235-260] and [Abdulla, Nonlinear Analysis, 50, 4(2002), 541-560]. The goal of this project is to apply the methods of these papers to solve the open problem for the above equation.

By applying scaling method, we identify seven regions of the parameter space that correspond to different short-time behavior, and prove explicit asymptotic formula for the local solution near the interface in all cases. Based on these asymptotic results, and with further application of the method of super- and subsolutions, we prove the asymptotic formula for the short-time behavior of the interfaces. A WENO numerical scheme was applied to the problem and numerical results support our proved estimations. (Received July 20, 2016)