1125-35-91 **Ugur Abdulla**, **Montie Avery**, **Jian Du**, **Naba Mukhtar*** (nhm005@bucknell.edu) and **Adam Prinkey**. *Qualitative Properties of Solutions to the Nonlinear Parabolic PDEs with Double-Degenerate Fast Diffusion.*

We consider the Cauchy problem for the double degenerate parabolic equation $u_t = ((|(u^m)_x|^{p-1}(u^m)_x))_x - bu^\beta, x \in \mathbb{R}, t > 0, u(x,0) = C(-x)_+^\alpha$, where $C, \alpha, m, p > 0, b \in \mathbb{R}$. We prove the existence/non-existence of an interface for this problem and the explicit asymptotics of the solution near the interface or at infinity. Our research focuses on the open case of fast diffusion range: $0 < mp < 1$. The properties of the case when $p = 1$ were fully classified in [U.G.Abdulla, Nonlinear Analysis, 50, 4(2002), 541-560]. Through scaling analysis we prove the interface behavior is determined by the competition between diffusion and reaction. For $\beta < mp$, the interface propagates with finite speed and expands or shrinks depending on the value of α. We prove explicit bounds for the interface and the solution u. If $\beta \geq mp$, we prove that the interface expands with infinite speed and we derive explicit asymptotic formulas for the solution at infinity. The rigorous methods we apply include scaling, construction of super- and sub- solutions to the problem, and special comparison theorems in general domains. We also confirmed our results numerically with a WENO scheme and developed test problems for a new numerical interface tracking method. (Received July 20, 2016)