1084-35-207 **Emmanuele DiBenedetto** (em.diben@vanderbilt.edu), **Ugo Gianazza** (gianazza@imati.cnr.it) and **Naian Liao*** (naian.liao@vanderbilt.edu), 3209 West End Circle, Apt. 5, Nashville, TN 37203. *A Logarithmic Diffusion Equation as the Limit of Porous Medium Equations.*

Consider the logarithmic diffusion equation $u_t = \Delta \ln u$ which can be seen as a formal limit of the porous medium equations $u_t = \Delta \frac{u^m}{m}$ as $m \to 0$. Recently some authors made such a limit rigorous by prescribing initial or/and boundary data. However our approach is entirely local (joint work with E. DiBenedetto and U. Gianazza). Under the assumption that

$$\frac{u_m^m - 1}{m} \in L^p_{loc}, u_m \in L^r_{loc}$$

for some $p > N + 2$ and $r > \frac{1}{2}N$ where u_m is the solution to $u_t = \frac{u^m}{m}$ and N is the space dimension, we establish a $C^{\alpha, \frac{\alpha}{2}}_{loc}$ limit process by finding the uniform upper bound and lower bound of solutions to the porous medium equations. The uniform lower bound is realized by a Harnack-type inequality. (Received September 01, 2012)