1112-65-331 **Guannan Zhang*** (zhangg@ornl.gov), One Bethel Valley Road, P.O. box 2008 MS-6211, Oak Ridge, TN 37831, and **Weidong Zhao**, **Clayton Webster** and **Max Gunzburger**. *Numerical Methods for a Class of Nonlocal Diffusion Problems with the Use of Backward SDEs.*

We propose a novel numerical approach for a class of nonlocal diffusion equations with integrable kernels, based on the relationship between the nonlinear backward Kolmogorov equation and backward stochastic differential equations (BSDEs) driven by Levy processes with jumps. The nonlocal diffusion problem under consideration is converted to a BSDE, for which numerical schemes are developed and applied directly. As a stochastic approach, the proposed method does not require the solution of linear systems, which allows for embarrassingly parallel implementations and also enables adaptive approximation techniques to be incorporated in a straightforward fashion. Moreover, our method is more accurate than classic stochastic approaches due to the use of high- order temporal and spatial discretization schemes. In addition, our approach can handle a broad class of problems with general nonlinear forcing terms as long as they are globally Lipchitz continuous. Rigorous error analysis of the new method is provided as several numerical examples that illustrate the effectiveness and efficiency of the proposed approach. (Received August 07, 2015)