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**Treena Basu\*** (sircar@mailbox.sc.edu), 1523 Greene Street, LeConte College, Columbia, SC 29208, and **Dr. Hong Wang**. *A fast finite difference method for fractional diffusion equations*. Preliminary report.

Fractional diffusion equations model phenomena exhibiting anomalous diffusion that can not be modeled accurately by the second-order diffusion equations. Because of the nonlocal property of fractional differential operators, the numerical methods have full coefficient matrices which require storage of  $O(N^2)$  and computational cost of  $O(N^3)$  where  $N$  is the number of grid points.

In this paper we develop a fast finite difference method for fractional diffusion equations, which only requires storage of  $O(N)$  and computational cost of  $O(N \log^2 N)$  for a one dimensional fractional diffusion equation or  $O(N \log N)$  for a two dimensional fractional diffusion equation while retaining the same accuracy and approximation property as the regular finite difference method. Numerical experiments are presented to show the utility of the method. (Received September 06, 2011)