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**Z Dai\*** (dai@alma.edu) and **P K Lamm**. *On the Nonpositive Solution of the Nonlinear Inverse Autoconvolution Problem.*

Local regularization methods preserve the causal nature of Volterra problems, allowing for fast sequential numerical solution techniques. Stability and convergence of these methods were shown to hold not only on a large class of linear Volterra problems, but also on nonlinear Volterra problems of Hammerstein type and the nonlinear autoconvolution problems. Local regularization methods compare favorably to the existing methods in the literature for the autoconvolution problem (such as Tikhonov regularization and Lavrent'ev regularization), especially in recovering sharp features of the unknown solution. It is also worth noting that local regularization methods do not require an initial guess of the unknown solution. A local regularization theory was developed by the authors in solving positive unknown solutions of the autoconvolution problem, in the case of  $L_2$  or continuous data. Numerical results demonstrated the effectiveness of the local regularization methods even when the unknown solutions failed to be strictly positive, while the theory was limited to positive solutions only. In this presentation, we will establish the local regularization theory to solve for nonpositive solutions of the autoconvolution problem, allowing for  $L_P$  data, where  $1 \leq P \leq \infty$ . (Received September 19, 2009)