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**Joshua Isralowitz** and **Kabe Moen\*** ([kabe.moen@ua.edu](mailto:kabe.moen@ua.edu)), P.O. Box 870350, Tuscaloosa, AL 35487. *Poincaré inequalities and estimates for fractional operators on matrix weighted spaces with applications to PDE.*

We will discuss fractional integral operators and fractional maximal operators acting on matrix weighted spaces. In the matrix weighted setting we prove analogous results to the work of Muckenhoupt and Wheeden in the scalar case. We will also prove Poincaré inequalities in matrix weighted spaces and use these inequalities to prove existence and regularity results for systems of degenerate elliptic equations. (Received January 20, 2016)