1106-65-1584 **Sergey Voronin*** (sergey.voronin@colorado.edu), 526 UCB, University of Colorado, Boulder, CO 80309-0526, and **Gunnar Martinsson** (per-gunnar.martinsson@colorado.edu), 526 UCB, University of Colorado, Boulder, CO 80309-0526. *Fast algorithms and software for low rank matrix approximation with applications to geotomographical inverse problems.*

Many fundamental problems in geoscience require the solution of linear systems with very large coefficient matrices. In geotomography, where the aim is to construct three dimensional models of wave speed velocities in the Earth's interior, the amount of rows (from earthquake – seismic station pairs) in the matrix and of coordinate system variables in the solution vector are both very large. The resulting matrices for global problems, though sparse, are often several TB in size. In addition, due to the uneven distribution of seismic receivers and the often clustered locations of earthquakes, the matrices in geotomography are inherently ill-conditioned, which makes them well suited for low rank approximation with matrices of much smaller size. In this talk, we present some randomized low rank approximation strategies which have been successfully applied in geotomographical applications. We discuss fast algorithms for low rank approximations and the results of applying these approximations to regularization algorithms. We also present the open source software packages which we have developed. These packages can be used to obtain low rank approximations to matrices of various sizes and are programmed to take advantage of modern day parallel CPU and GPU based computing architectures. (Received September 14, 2014)