

Meeting: 1003, Atlanta, Georgia, MAA CP M1, MAA Session on Environmental Mathematics and the Interdisciplinary

1003-M1-1377 **Umesh P Nagarkatte*** (unagarkatte@hotmail.com), Department of Mathematics, Medgar Evers College (CUNY), 1650 Bedford Avenue, Brooklyn, NY 11225, and **Wilbert Hope** (wilbert@mec.cuny.edu), Physical, Environmental and Computer Sciences, Medgar Evers College (CUNY), 1650 Bedford Avenue, Brooklyn, NY 11225. *Use of Principal Component Analysis in Fingerprinting Ambient Air — Research with Undergraduate Students.* Preliminary report.

The environmental research was designed by implementing a new technique for analyzing air samples, in our case, for air over neighborhoods of Brooklyn, NY. The data was collected and analyzed by undergraduate environmental science, biology, and mathematics majors using Gas Chromatography/Mass Spectrometry (GC/MS) to find Volatile Organic Compounds(VOCs) extracted from ambient air. Principal Component Analysis (PCA) using MATLAB and PLS Toolbox was performed on the chromatographic data. In the preliminary analysis the goal was to find a VOC fingerprint for urban air in terms of clustering, source identification and location differentiation.

We will first discuss a simple example of a matrix containing actual data, its four fundamental subspaces, and how it naturally evolves into an application of the Singular Value Decomposition Theorem in Linear Algebra, giving practical interpretation of terms such as eigenvalue, eigenvector, and principal components. Various detailed calculations will be shown. Even here clustering occurs and samples from different locations can be identified.

Then we discuss the findings from PCA using MATLAB and PLS Toolbox involving various graphs that lead to a VOC fingerprint of ambient air over Brooklyn on a summer day. (Received October 05, 2004)