

Public Abstract

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Title: Fluorescence Spectroscopy and Parallel Factor Analysis of Waters from Municipal Waste Sources

Excitation-emission matrix (EEM) fluorescence spectroscopy is becoming a valuable tool for studying the complex nature of dissolved organic matter (DOM). EEMs can identify fluorescence emitting organic substances (fluorophores) based on fluorescence peak location. Parallel Factor Analysis (PARAFAC) has recently been used to effectively model EEM data sets. This thesis continues the study of the EEM/PARAFAC technique by applying it to waters of municipal waste sources.

Bi-weekly samples were collected over a one-year period from the Columbia Sanitary Landfill, Columbia Regional Wastewater Treatment Plant Constructed Wetlands and the Missouri River at Eagle Bluffs Conservation Area. EEMs were created for each sample and modeled using PARAFAC.

Humic-like, protein-like and xenobiotic-like fluorophores identified from EEMs were consistent with recent studies. The three sample sources were clearly differentiated based on their organic composition represented by PARAFAC components. Landfill leachate samples were dominated by a xenobiotic-like fluorescence, wastewater samples were dominated by protein-like fluorescence, and river water was dominated by humic-like fluorescence. Seasonal development of PARAFAC results indicated a gradual increase in humification within the landfill and elevated levels of humic-like fluorescence from the constructed wetlands during summer. Protein-like fluorescence was consistently reduced by constructed wetlands treatment (25% average reduction). Correlation of PARAFAC results with water quality parameters was weak, but consistent with previous studies. Results support the continued study of EEM/PARAFAC towards practical monitoring applications in the future.