

# Using DN-PMF As A Sensitivity Test for Conventional PMF Analysis At Three Towns in South Africa, 2017 -2018

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## Abstract

### BACKGROUND

During receptor source apportionment, factor analysis utilizes the covariance of compositional variables to separate sources of ambient pollutants. One of the main assumptions is that although the factors are distinct, the mixture is homogenous near the receptor point. Meteorology variations cause concentration variations in addition to emission rate changes in the atmosphere. Conventional positive matrix factorization (PMF) thus loses information. By incorporating the ventilation coefficient, dispersion normalized PMF (DN-PMF) reduces the dilution effects.

### RESULTS AND CONCLUSION

#### *Pretoria*

Six factors were identified by the PCA model (SPSS). The six sources assigned to the PMF model include resuspended dust (12.6%), biomass burning (24%), Secondary S (29%), vehicular emissions (11%), coarse particulate matter (15.7%) and industrial emissions (7.8). DN-PMF isolates biomass burning (3.7%) and vehicular emissions (41%). As in the C-PMF, there is a strong Cl-Pb correlation in the DN-PMF biomass factor.

#### *Thoyohandou*

Six factors were identified by the PCA model (SPSS). The six sources assigned to the PMF model include biomass burning (13.4%), vehicular emissions (2.1%), Vegetative burning (1.7%), coal burning (35.6%), industrial/mining (26%) and coarse dust (21.4%). DN-PMF isolates Resuspended Dust (16%), Industry (26.4%), Vehicular emissions (1.9%) and reduces biomass burning (5%). Cl is dominant tracer in the vegetative burning factor for the conventional PMF and is dominant in the biomass factor in the DN-PMF.

#### *Cape Town (Kraaifontein)*

Seven factors were identified by the PCA model (SPSS). The seven sources assigned to the PMF model include Secondary S (15%), coarse particulates (9.7%), industry emissions (29%), zinc smelter emissions (6%), exhaust emissions (14%), sea air (9.3%), biomass burning (17%). DN-PMF included heavy industry (15%), exhaust (23%) increasing zinc smelter emissions (18%). In the conventional PMF model, Cl is a

dominant tracer for sea spray, for the DN-PMF, the Cl is in combination with Cu and Zn – which implies vehicular emissions.

### **Early Career Scientist**

YES, I am an early career scientist.

### **IGAC Activities**

GEIA: Global Emissions Initiative, MAP-AQ: Monitoring, Analysis and Prediction of Air Quality

### **IGAC Regional Working Groups**

Southern Hemisphere Working Group, ANGA: African Group on Atmospheric Sciences