$PM_{2.5}$ Characterization in Pretoria, South Africa

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FULBRIGHT

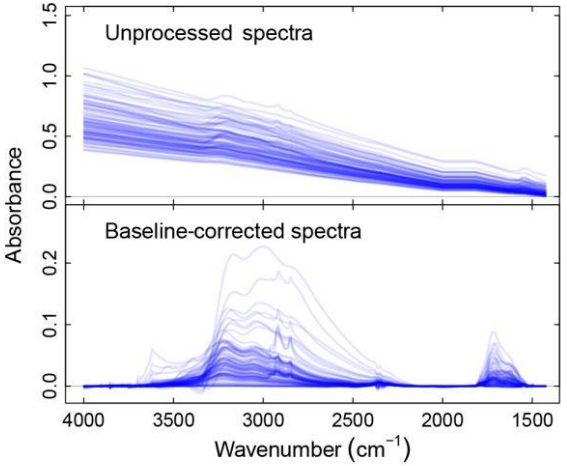
SPARTAN Global Particulate Matter Network

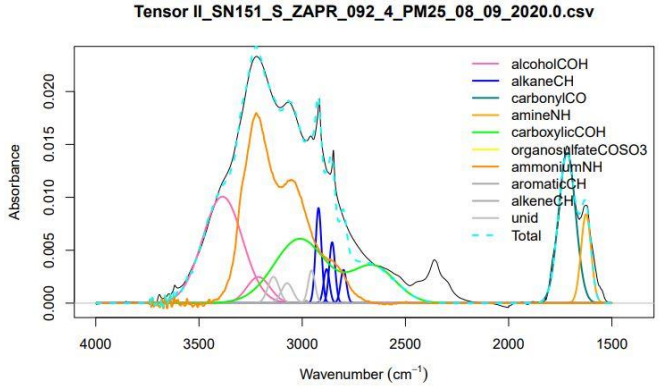
$PM_{2.5}$ Pollution at Pretoria

- Pretoria, South Africa, SPARTAN site
- Research Goals
  - Organic and inorganic composition's variation
  - Source apportionment of $PM_{2.5}$
  - Exploration of possible policy-based solutions

OM Quantification – Approach 1

- Baseline correction
- Multi-peak fitting
- Functional groups
  - aliphatic C-H, carbonyl (C=O), carboxylic acid O-H, and alcoholic O-H, and aNH2
- OM Quantification

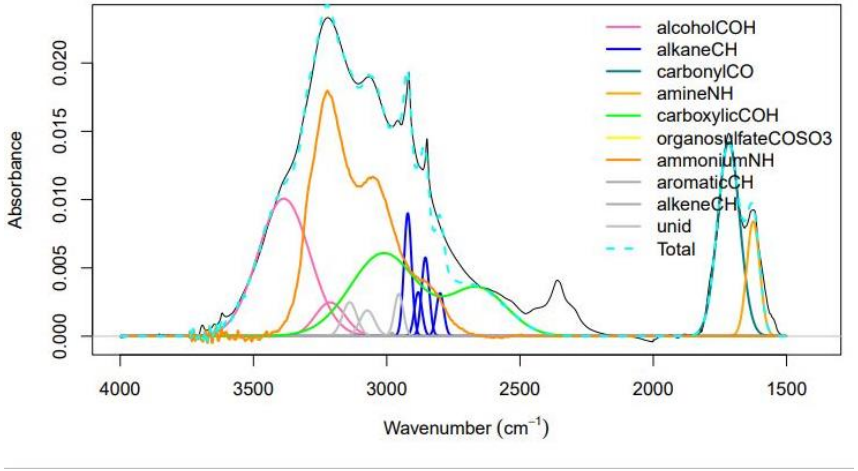


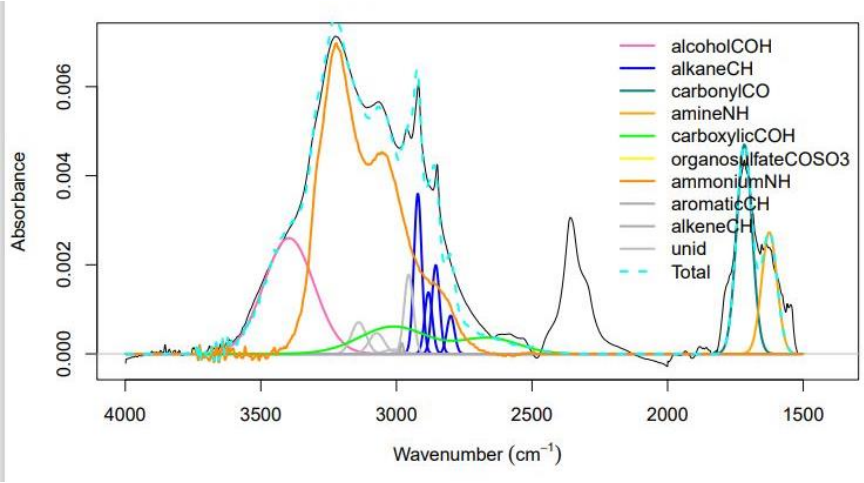


OM Quantification – Approach 2

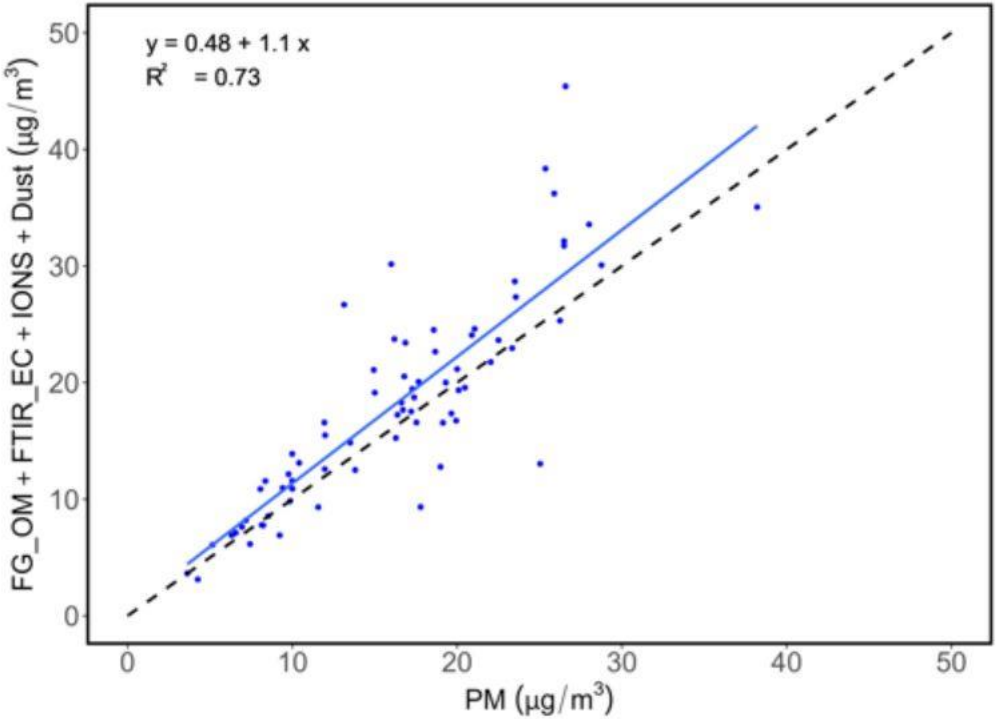
- FGs prediction: multivariate PLS calibration
- Laboratory standards: atmospherically relevant compounds containing
  - Alkane CH, alcohol OH, carboxylic acid OH, and carbonyl C=O.
- Regression coefficients for different FGs and future FGs' prediction
- OM/OC Quantification
- Elemental carbon (EC) quantification

Multi-peak fitting results – AIRSpec





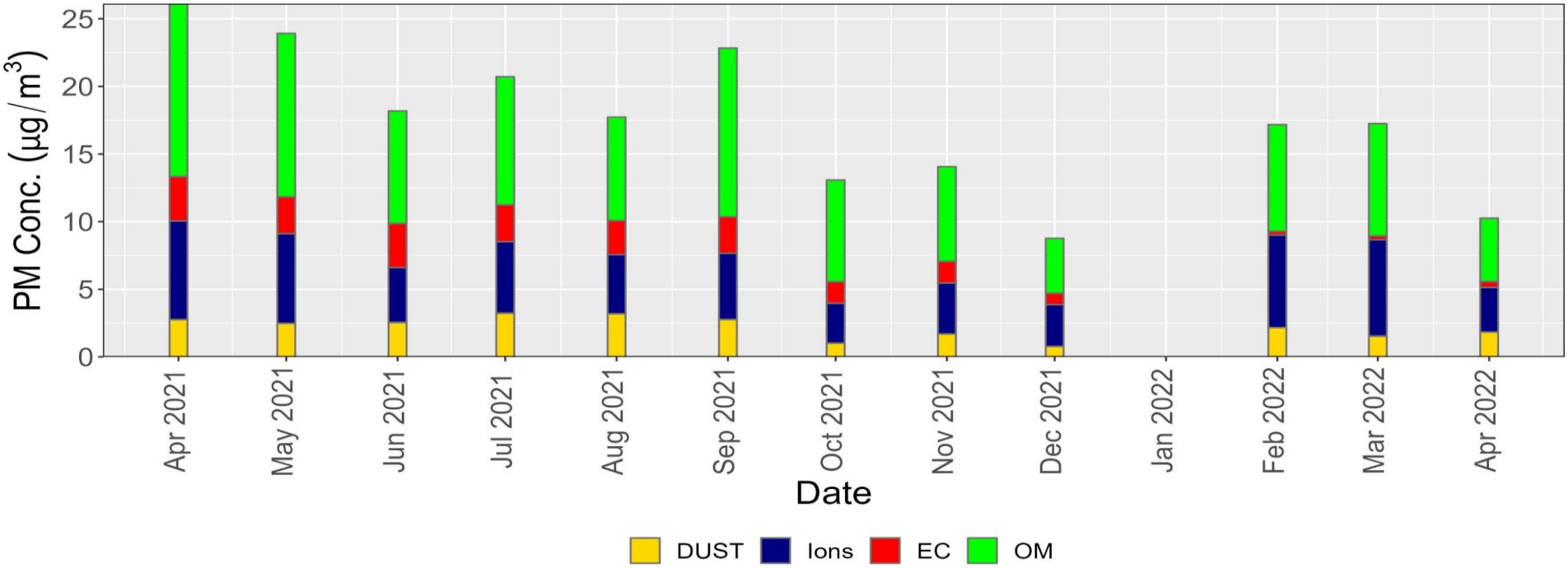
Data Quality Assurance and Validation Plots



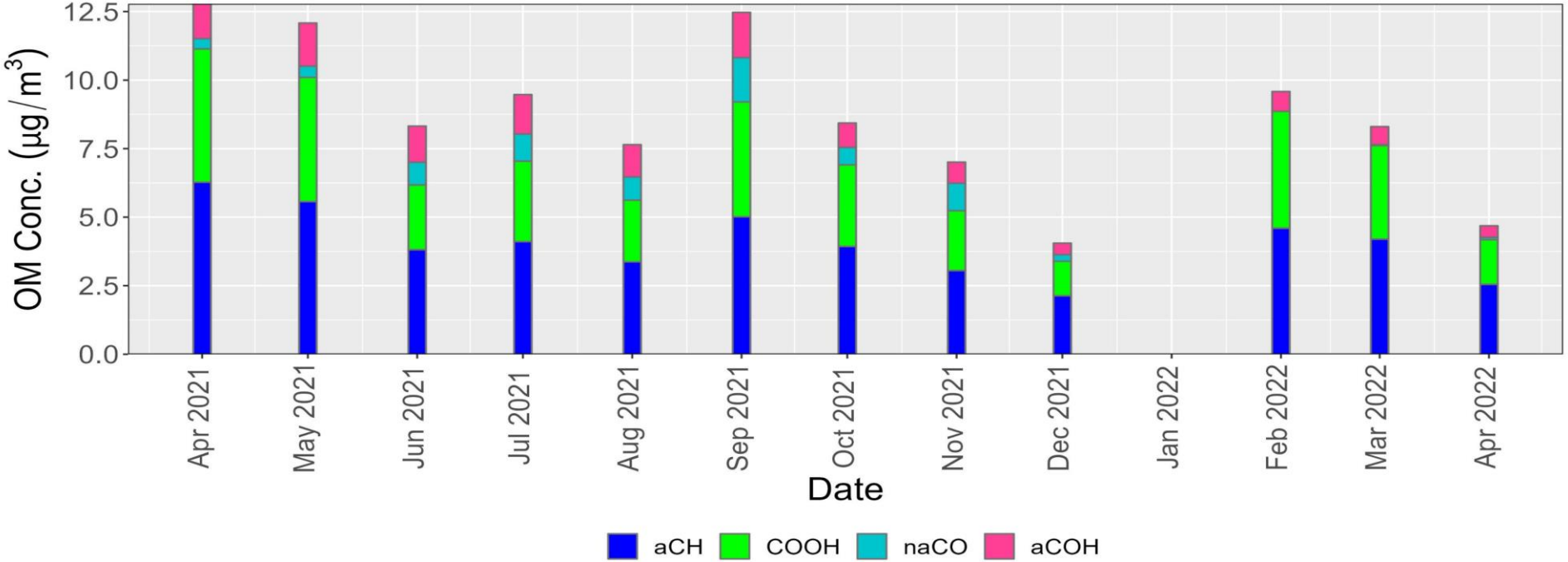
Dust = [1.89Al × (1 + MAL) + 2.14Si + 1.40Ca + 1.36Fe +] 1.67Ti

MAL = (1.20K/Al + 1.66 Mg/Al + 1.35 Na/Al)/1.89

$PM_{2.5}$ components' stacked bar plots for monthly averages (April 2021 - April 2022)



OM components' stacked bar plots for monthly averages (April 2021 - April 2022)



Next Steps

- Reduction of the OM over-prediction
  - OM Quantification through PLS Calibration approach
  - Improving the multi-peak fitting approach
- Source apportionment of $PM_{2.5}$ at Pretoria through
  - Positive Matrix Factorization (PMF) Model
    - Using organic and inorganic speciation
    - Using FT-IR Spectra
  - Back trajectories analysis