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Seasonal Climatic variations in NO2 and CO concentrations over West Africa

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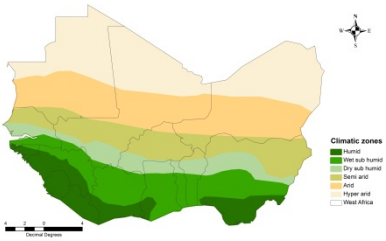
1. INTRODUCTION

NO_2 (Nitrogen dioxide) and CO (Carbon monoxide) as tracers have been used in conjunction with other parameters to identify deforestation / biomass burning episodes globally. However, urban and biomass burning signals can appear in similar emission ranges, making it harder to attribute these emissions to their actual sources. Since it has been suggested that both satellite observations of NO_2 and CO show large seasonal emissions from open fires between December and February annually (Marais et al., 2014), this research seeks to assess the viability of attributing emissions from major fires to their unique sources over West Africa using pollutant ratios.



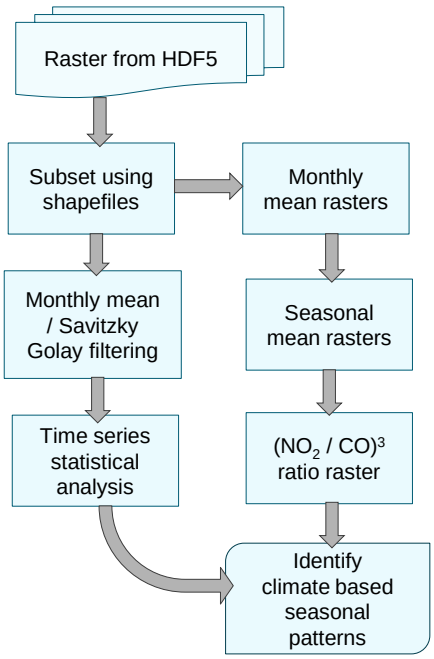
2. AIM

To improve estimation of biomass burning occurrences by distinguishing urban/ industrial pollution signals from actual fires, using freely available remotely sensed atmospheric pollution data and open source software (R).

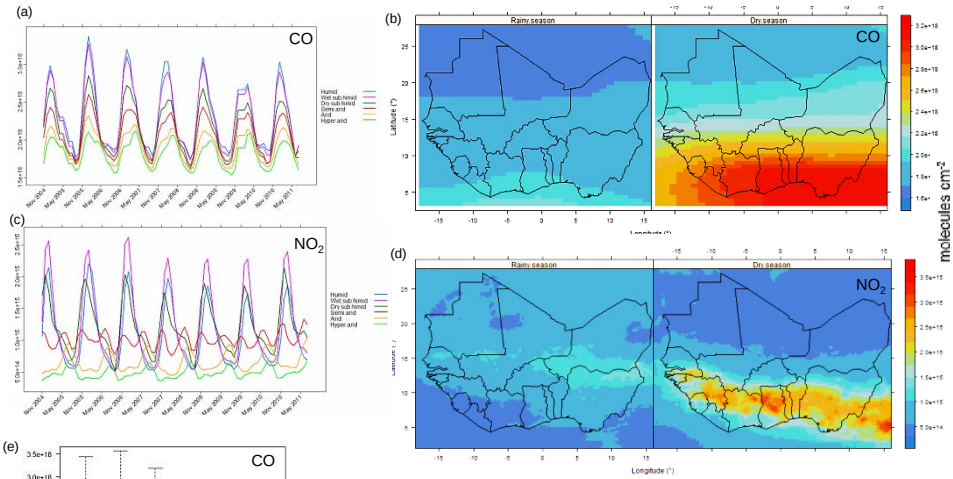
3. DATA

- OMNO2d Level-3 data gridded at 0.25 x 0.25 degrees latitude-longitude (2004 - 2011) downloaded through MIRADOR.
- TES CO data gridded at 2 x 4 degrees (2004 - 2011) downloaded through REVERB
- Vector map of the climatic zones of West Africa
- Boundary map of West Africa
- MODIS Global Land cover Climatology map (Broxton et al., 2014)

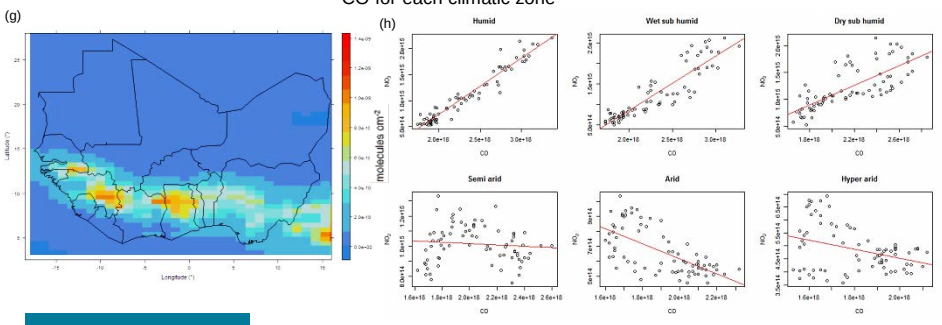
4. METHODS



5. RESULTS



Initial results show the highest seasonal variations in NO_2 densities between 2004 and 2011 where in the wet humid zone corresponding to the Savanna Landcover type, where most dry season fires occur annually. The semi arid zone showed two annual NO_2 peaks, (rainy and dry seasons). With CO, all zones had one annual peak with the highest annual densities around the humid zone and lowest annual, the hyper arid zone. A zone based t-test between the NO_2 and CO densities showed a variation of between11.8 in the Humid to 12.2 in the Hyper arid zone. The results are displayed in figures a – g with "g" being the ratio raster and "h", the regression plots between NO2 and CO for each climatic zone



6. FUTURE WORK

The pollutant ratioing method appears to flatten out signals from urban/ industrial areas in dry season. The results above have followed two unique approaches: raster based analysis and the Savitzky Golay mean filter approach. Future work would revolve around modelling these parameters to aid identification of both primary and secondary annual seasonal peaks from FRP data (SEVIRI).

REFERENCES

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MARAIS, E. A., JACOB, D. J., WECHT, K., LEROT, C., ZHANG, L., YU, K., KUROSU, T. P., CHANCE, K. & SAUVAGE, B. 2014. Anthropogenic emissions in Nigeria and implications for atmospheric ozone pollution: A view from space. Atmospheric Environment, 99, 32-40.

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