**URBAN AEROSOL CONCENTRATIONS FROM MERIS/AATSR SYNERGY: A PREPARATORY STUDY FOR SENTINEL 3**

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**ABSTRACT**

Particulate Matter (PM) concentration is used as an air quality indicator in urban areas; it is highly important for urban planning and epidemiological studies. This reason has prompted an ongoing effort for PM estimation using satellite observations. The present study evaluates alternative spatio-temporal approaches for quantitative estimation of Daily Mean PM concentrations. Both fine (PM2.5) and coarse (PM10) concentrations were estimated over the area of London (UK) for the 2002-2012 time period, using Aerosol Optical Thickness (AOT) derived from MERIS (Medium Resolution Imaging Spectrometer) / AATSR (Advanced Along-Track Scanning Radiometer) synergy at 1 km x 1 km spatial resolution. Local scale (100 m) urban surface cover and morphology datasets were incorporated in the analysis in order to capture the effects of fine-scale emissions and sequestration. The statistical models produced in this study are expected to contribute to the development of an operational tool capable of producing high-resolution PM concentration maps using Sentinel-3 observations. The synergistic use of the Sea and Land Surface Temperature Radiometer (SLSTR) and the Ocean and Land Color Instrument (OLCI), onboard Sentinel-3, will be exploited by the developed models to support local scale studies on urban planning and public health.

**STUDY AREA AND DATA**

![Urban Atlas Land Use/Cover (LUC)](image1)

![Sky View Factor (SVF)](image2)

**METHODOLOGY**

- Pair-wise comparison of PM concentration means for distinct LUC classes
- Adjusted to PM spatial variability post-classification of LUC product
- 2D and 3D residual kriging at 100m incorporating LUC and SVF data:
  \[
  \log(\text{PM}_{ij}) = \beta_x + \beta_y + \beta_z + \sum_{k} \gamma_k \text{LUC}_{ijk} + \epsilon
  \]
- Leave-one-station-out cross-validation
- Block kriging to address the Change of Support Problem
- Upscaling to 1x1 km by computing averages

**RESULTS**

![Cross-validation metrics (3D kriging)](image3)

**Satellite Data Products**

- MERIS/AATSR AOT — 1x1 km (MERIS/AATSR Synergy Algorithm)
- Surface Temperature (STMP)
- Surface Relative Humidity (RHUM)
- K-Index (KIND) — estimator of atmospheric instability

**REFERENCES**


**CONCLUSIONS**

- The methodology developed for London can be transferred to any urban area of interest.
- The simultaneous operation of Sentinel 3A and Sentinel 3B in the near future is expected to lead to daily PM concentration maps of high spatial resolution, which are necessary in urban air quality studies.