VISUALIZATION OF 3D AERPSOL DISTRIBUTION WITH SATELLITE AND GROUND OBSERVATION DATA ON GOOGLE EARTH

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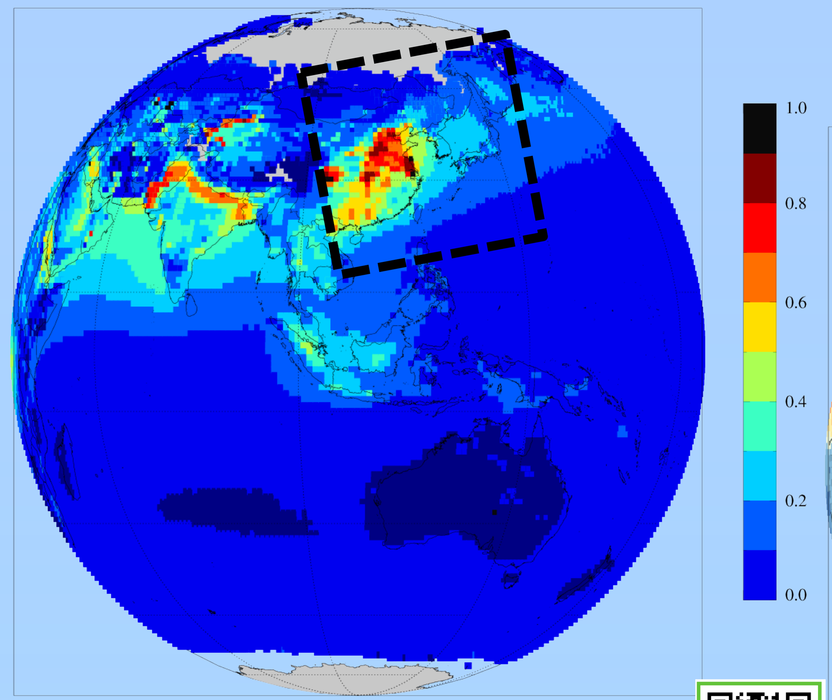
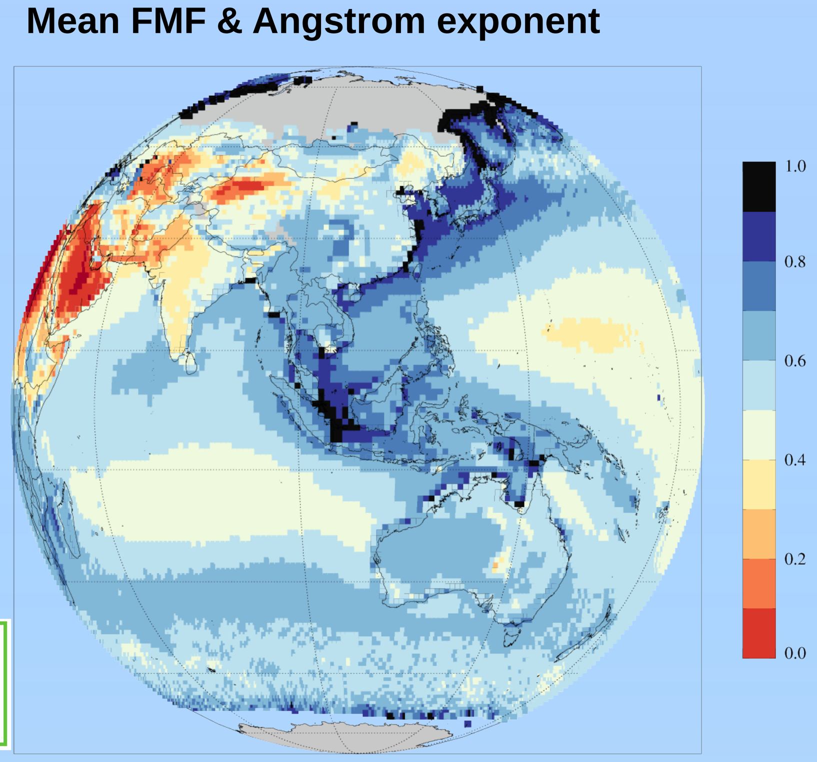
Background

Highest aerosol loading and finer aerosols over East-Asia



Terra/MODIS 16 year (2000~2015) mean AOT

Mean FMF & Angstrom exponent



Motivation

- East-Asia is
  - Major aerosol sources
  - Sparse observations

Issues

- Direct & Indirect effect
- Energy & Hydrology Cycle
- Weather pattern
  - wind, precipitation
  - monsoon

Strategy

- Extensive measurement
  - Optical, Physical, & Chemical
- Synergetic analysis

Objectives of this study

Observation
- AOT
- Extinction profiles

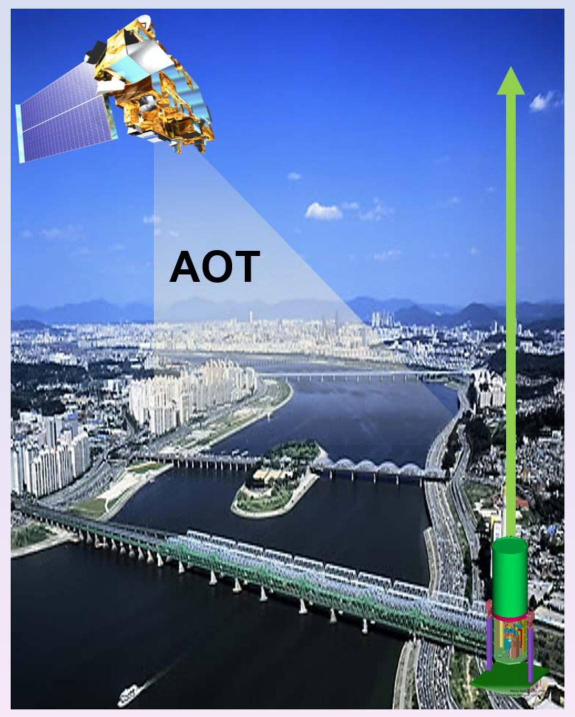
Analysis
- Extraction Flux simulation
- Model derivation

Visualization
- Volume data linkage
- Spatial variation

Aerosol Optical Properties → **New methodology** → **Interactive Aerosol Distributions**

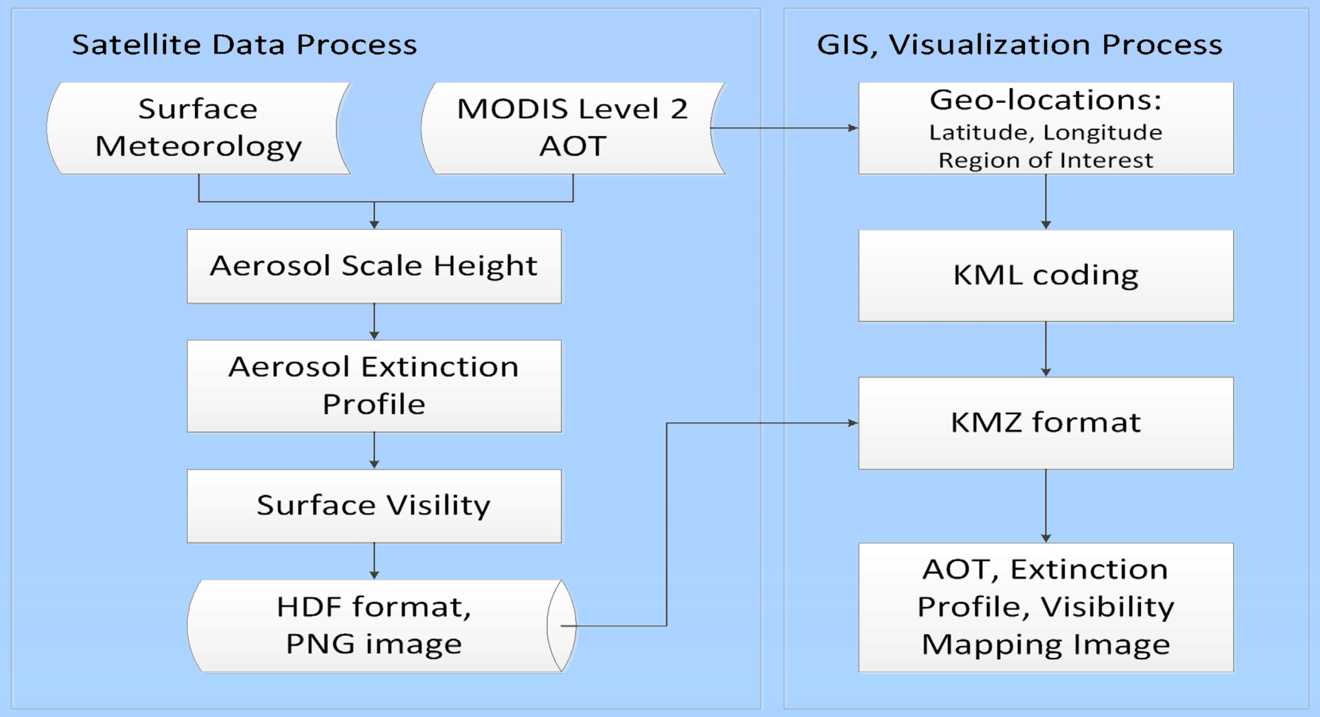
Dataset

- Satellite observations
  - MODIS (for AOT) :
    - L1 Calibrated radiance,
- Ground-based observations
  - Lidar (from AD-NET):
    - Aerosol extinction coefficient(AEC) profiles
  - Sun-sky radiometer (from AERONET):
    - AOT



Aerosol retrieval

Data Processing



Mathematical description

The rationale of the model is first estimating the aerosol scaling height (Za) by equation 1:

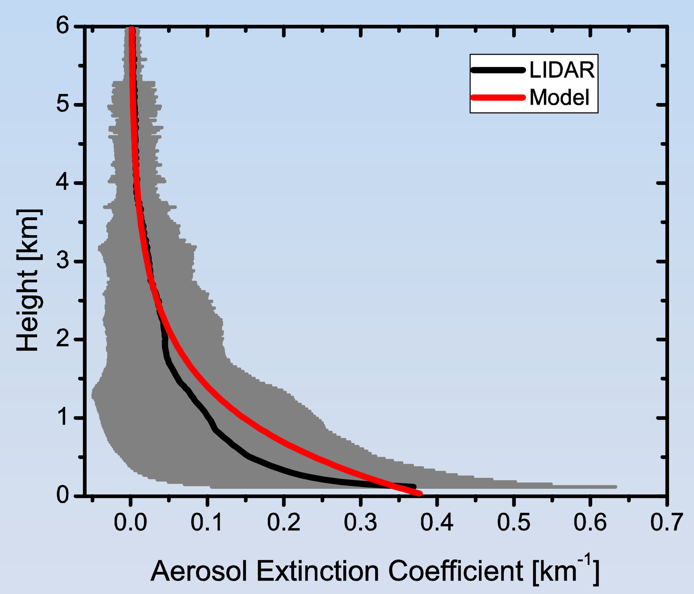
$$Z_a = \frac{\tau_a(0.55\mu m)}{3.912/V - \sigma_m(0, 0.55\mu m)} \quad (1)$$

where Z_a is the scaling height, τ_a is AOT, V is surface visibility, σ_m is the surface-level molecular extinction coefficient. The equation 1 is comprised with equation 2 and 3.

$$\tau_a, Tro(\lambda) = \sigma_a(0,\lambda) Z_a [1 - \exp(\frac{-Z_{Tro}}{Z_a})] \approx \sigma_a(0,\lambda) Z_a \quad (2)$$

$$\sigma_a(0, 0.55\mu m) = \frac{3.912}{V} - \sigma_m(0, 0.55\mu m) \quad (3)$$

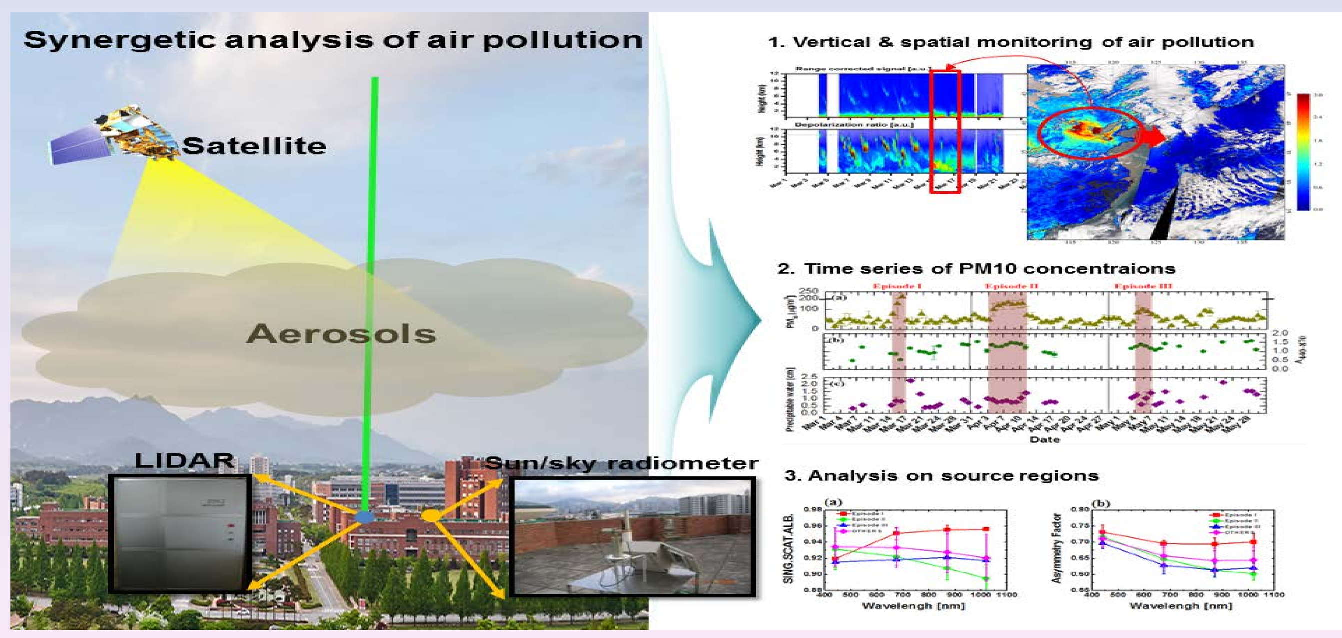
where Ztro is the height of tropospheric top, σ is the aerosol extinction coefficient at the surface level.



Comparison between LIDAR measured and model derived AEC profile (at Seoul, Korea during June 2016)

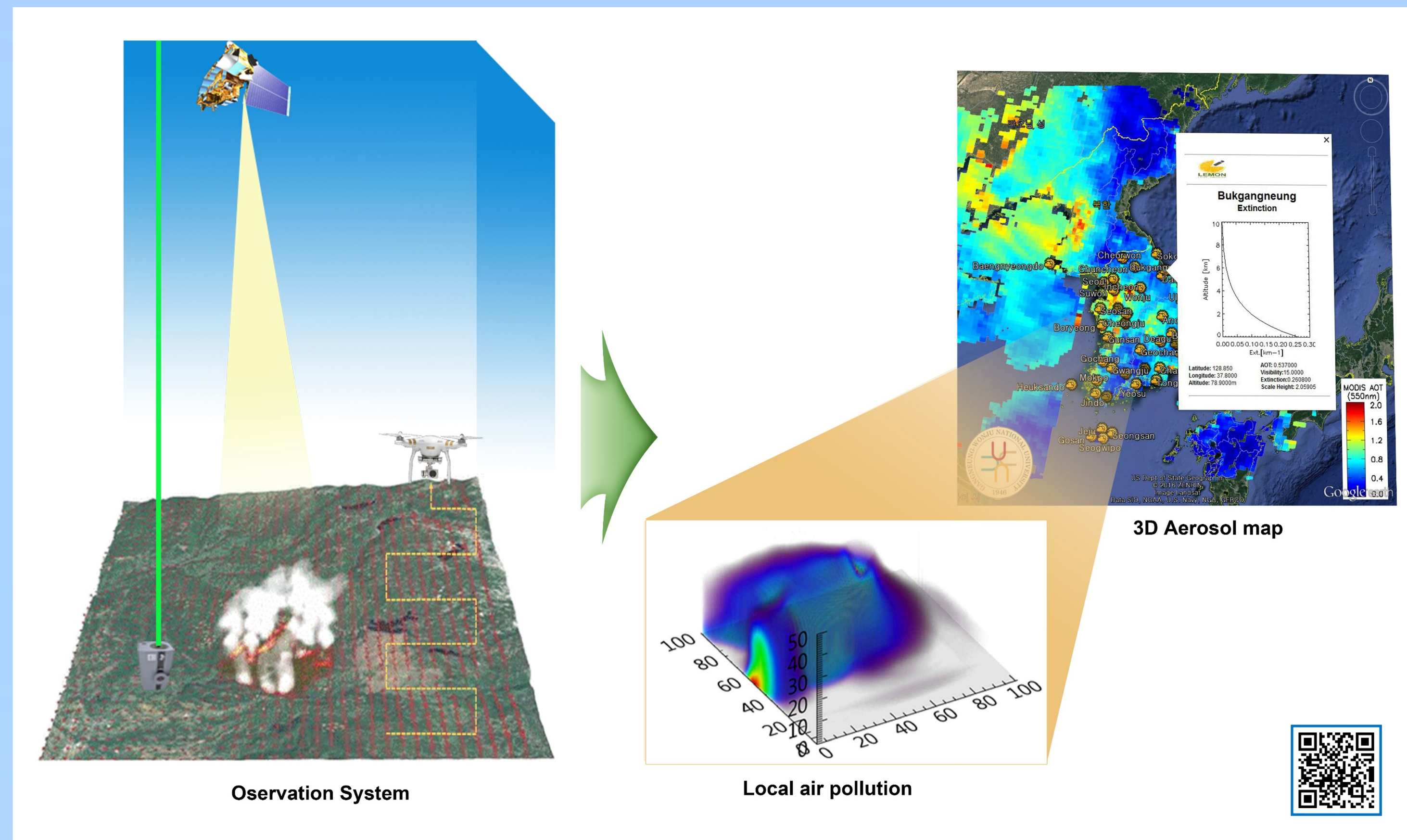
→ Under the clear sky condition, two AEC profiles shows very good conincidience

Synergetic mesurements

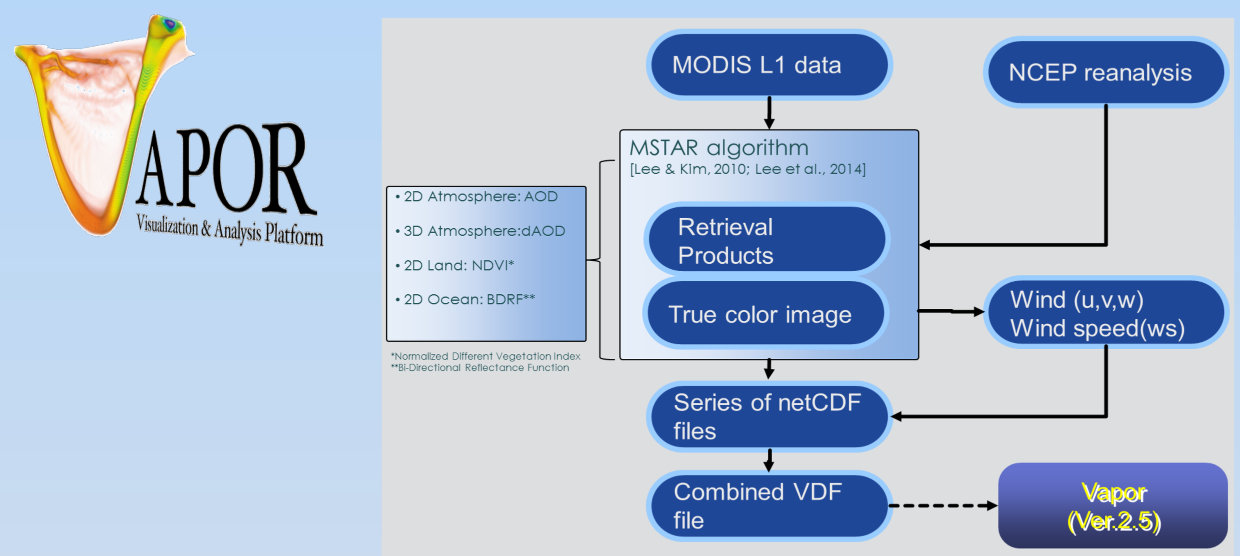


Visualization of aerosol information

Data Linkage with Google Earth (GE)



Visualization into VAPOR



Summary

- This study presented a synergetic approach to derive and visualize the horizontal AOT and vertical profile of AEC using satellite and ground-based remote sensing data.
- Combining of multi-sensor, -dimensional observation data acquired from satellite and ground-based remote sensing observations, and analytic modelling data can construct volume unit of aerosol information which are used in GE's input for the visualization.
- Limitations of the method are that the analytic model is more accurate in clear sky, non-elevated dust condition, where further improvement is needed and will be modified in the near future.

ACKNOWLEDGEMENTS

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