Aerosol Spatial and Temporal Variations in a Coastal Area: Implications for GEO-CAPE Measurements

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1. MOTIVATION & OBJECTIVES

♦ Complex coastal meteorology (e.g., land-sea breeze circulations) can cause adverse effects on air quality; while radiatively active pollutants (e.g., aerosols) could feedback on meteorology and air quality.

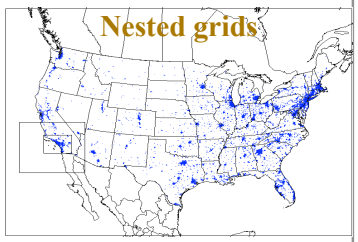
♦ **OBJECTIVES:** By using both high-resolution modeling and observations, we will

- analyze spatial & temporal (diurnal and day-to-day) variations of aerosols
- examine the role of coastal meteorology
- discuss implications for GEO-CAPE measurements

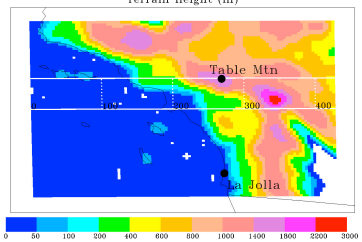
2. AEROSOL MODELING & OBSERVATIONS

MODELING

◆ CMAQ driven by WRF (offline, no feedbacks)
◆ Nested grids 36km -12km - 4km
◆ Modeling period: June 28 - July 4, 2007
  ◆ ramp-up: June 28-30;
  ◆ analysis: July 1 – 4
◆ sulfate, ammonium, nitrate, OM, BC, dust, sea-salt
◆ Mass to AOD (500nm) conversion: following GOCART



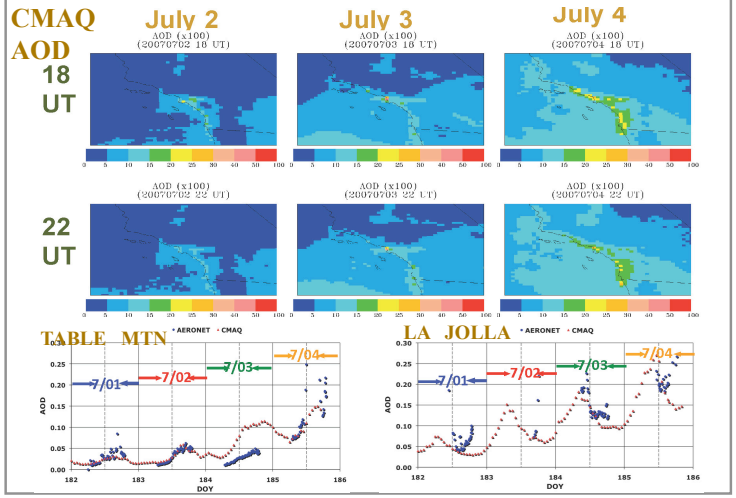
Focused Area (4km res. Domain)

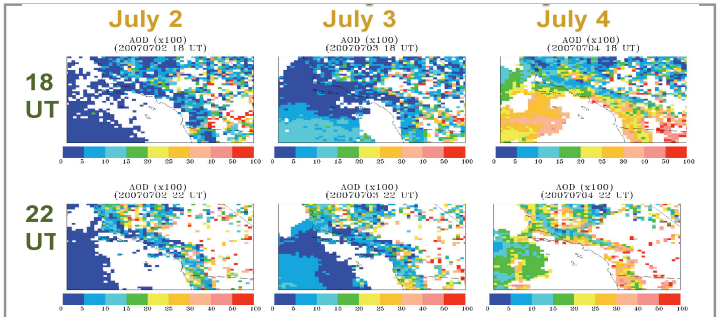


OBSERVATIONS

◆ **AERONET Measurements**
  ◆ AOD at 500 nm
  ◆ Available sites: **Table Mountain, La Jolla**
◆ **GOES Operational Aerosol Retrieval**
  ◆ Geostationary – GOES-West
  ◆ AOD at 550nm: 4 km, every 30 min
  ◆ **Data screening**: scattering angle, clear-pixels, surface reflectivity, AOD std deviation, and signal strength

3. AEROSOL ACCUMULATION: MODELING & OBSERVATIONS

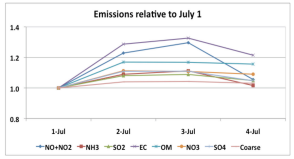




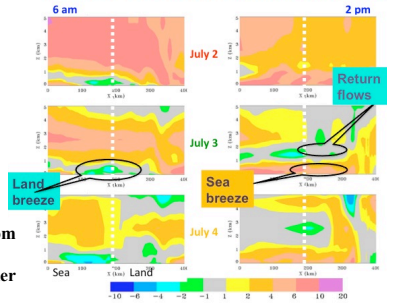
GOES AOD retrievals, though noisy and much larger in magnitude, indicate an aerosol accumulation event that is generally consistent with the CMAQ modeling.

4. ROLE OF COASTAL METEOROLOGY

Day-to-day change of emissions<30%, which can not explain the large AOD variations.

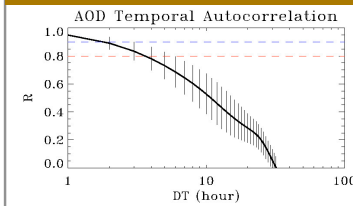


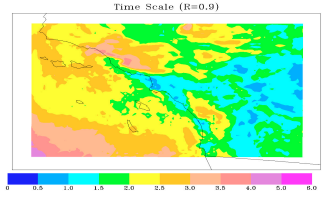
Evolution of Zonal Wind [+ westerly; - Easterly]

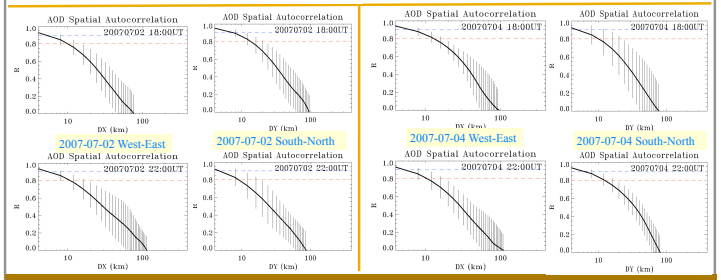


Aerosol accumulation results mainly from recirculation (occurrence of return flow of sea breeze on July 3 & 4, due to weaker background wind).

5. AEROSOL AUTO-CORRELATIONS







Large spatial and temporal variations of aerosol in coastal area can be adequately (auto-correlation R > 0.9) captured by geostationary satellite observations with time resolution of 1-2 hrs and spatial resolution of 4-7 km.