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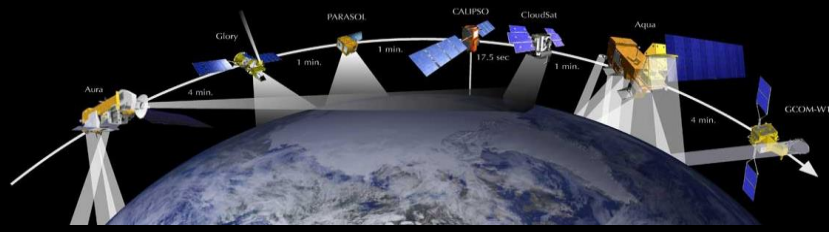
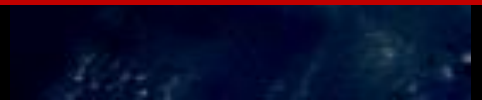
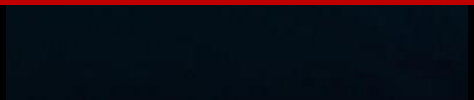
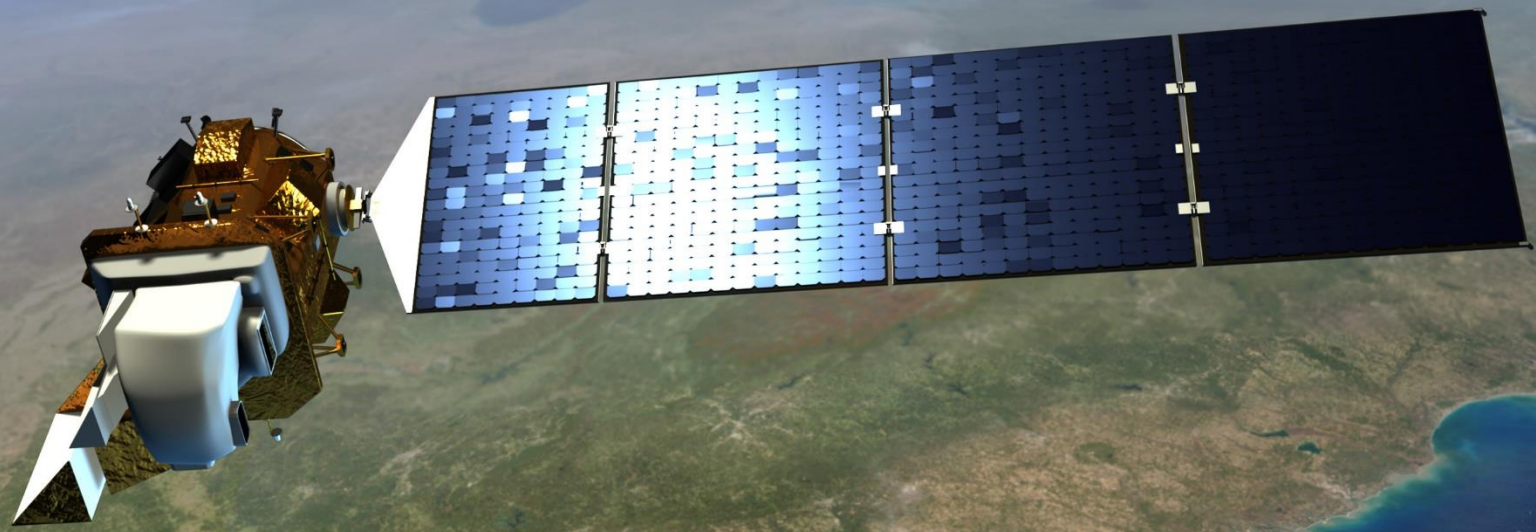






NOAA CREST

Theme I: Coastal Resilience



Theme I: Coastal Resilience

CREST Faculty: M. Tzortziou (Lead), A. Gilerson**,** S. Ahmed, J. Cherrier, K. McDonald, R. Armstrong, R.Rodriguez, J. Munoz

Improving coastal resilience depends critically on coastal intelligence and developing a deeper understanding of coastal processes, dynamics, and vulnerability to anthropogenic and natural stressors.

Theme I addresses this high research priority for NOAA through a combination of **coastal observations**, **advanced modeling**, development of **new remotes sensing tools**, and assessment of **environmental and socioeconomic** efficacy of developed approaches for mitigating these stressors.

Coastal environments are among the most vulnerable yet economically valuable ecosystems on Earth. Comprehensive **integration of social science into research** is a key priority in Theme I.

NOAA CREST

Land Ocean Atmosphere (LOA) Interactions Lab

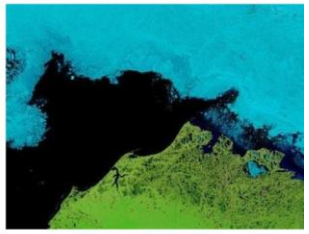
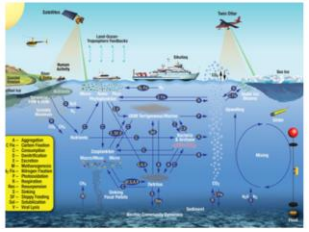
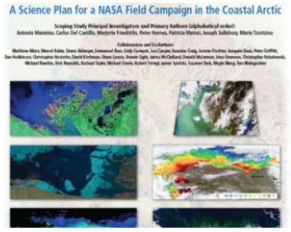
PI: Professor Maria Tzortziou

Tidal wetlands in a changing world




Research in the LOA Lab integrates field measurements with advanced remote sensing observations and new mechanistic carbon cycling modeling to assess the role of marsh soils and tidal **wetland-estuary margins** as sources, sinks, buffers, reactors, and transformers **of carbon and nitrogen.**

Land Ocean Interactions in the Arctic

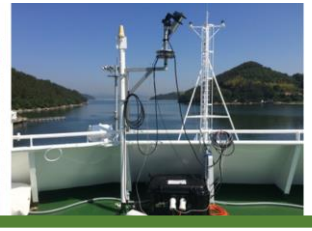





The Arctic is warming at least twice as fast as the rest of the planet. The impacts on the amount and quality of organic carbon exported to adjacent aquatic ecosystems, and subsequent effects on **nearshore biogeochemistry, ecology and biodiversity,** are unknown and drive our research in coastal Arctic ecosystems.

Atmospheric dynamics across land-sea interface

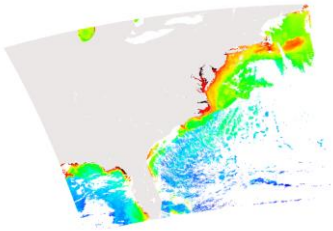
Urban nearshore regions are characterized by strong variability in **atmospheric composition**, associated with both **anthropogenic emissions and meteorological processes** that influence the circulation and accumulation of atmospheric pollutants at the land-ocean interface. A major focus in the Lab is studying these highly dynamic and complex atmospheric processes across terrestrial-aquatic interfaces.

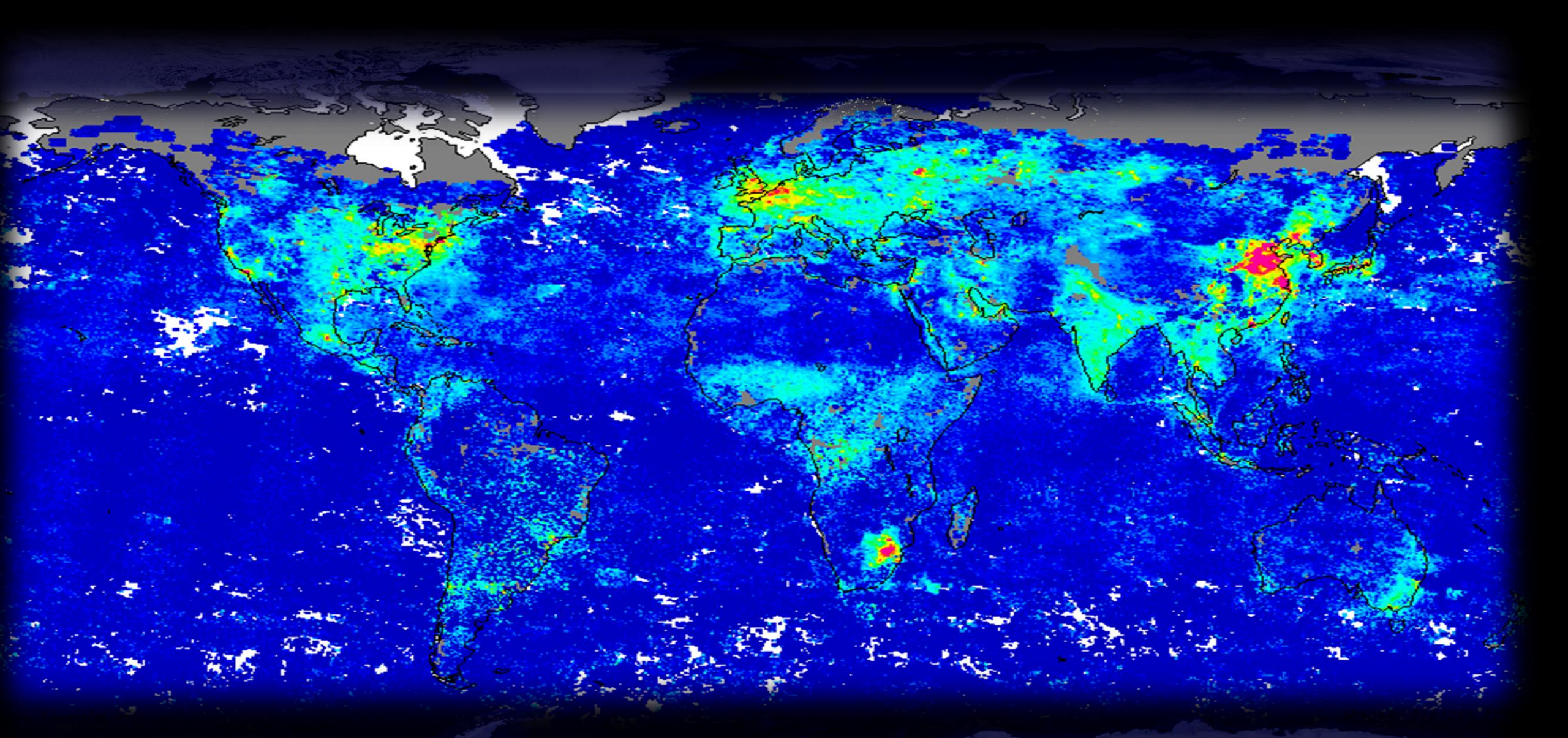




Remote Sensing of Coastal Ecosystems

Remote sensing of land-ocean interfaces in our Lab combines techniques for studying both the terrestrial and aquatic domains of **coastal margin ecosystems**, and understanding land-ocean-atmosphere interactions and exchanges. Some of this work is conducted as part of future satellite mission preparation efforts for **optimizing the design** of future ocean color sensors sensors and **maximizing the societal benefits** of future satellite missions.



1. Quantify impact of atmospheric pollution on ocean color
2. Characterize atmospheric variability at the land-water interface, and impacts of anthropogenic air pollution on coastal ecosystems

Atmospheric Nitrogen Dioxide NO2

Nitrogen Dioxide Absorption Cross sections (at 293 ^{o}K)

NO_2 absorbs in spectral regions relevant to ocean color observations, so understanding amount and variability in NO_2 is important for satellite observations of ocean processes

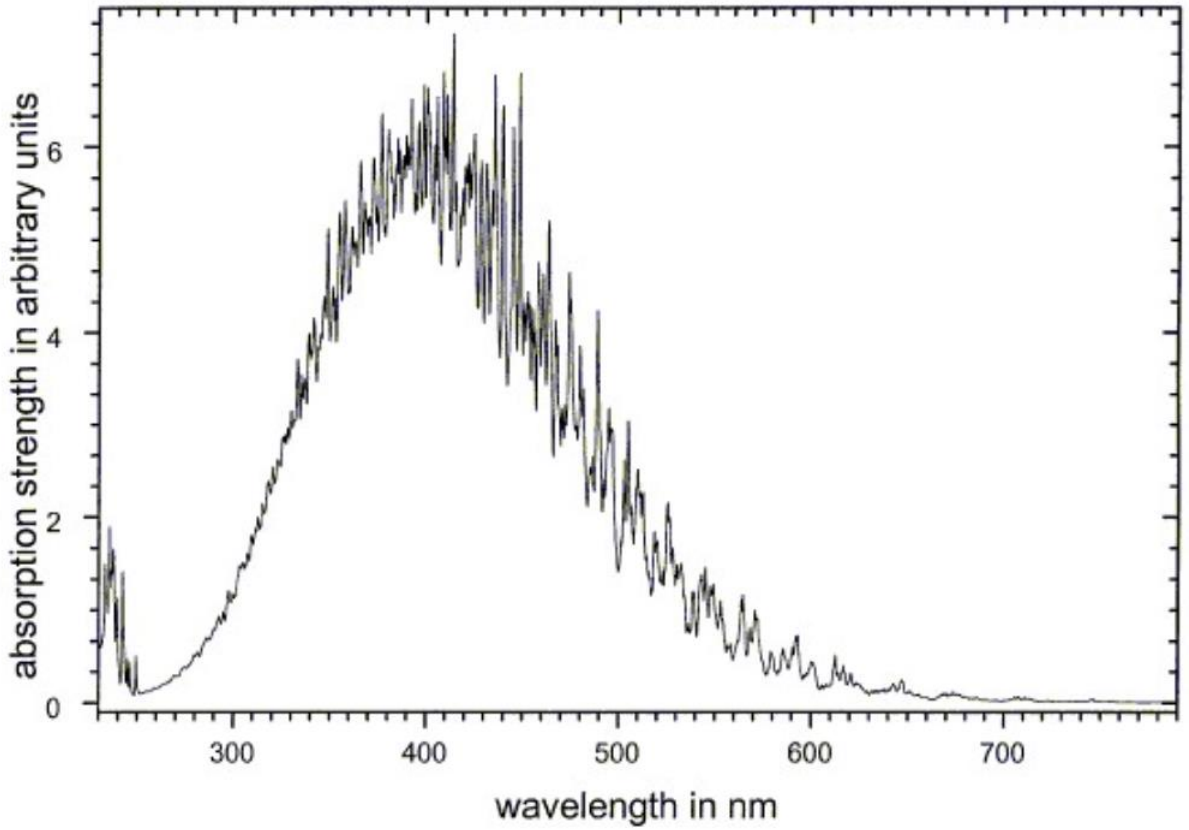
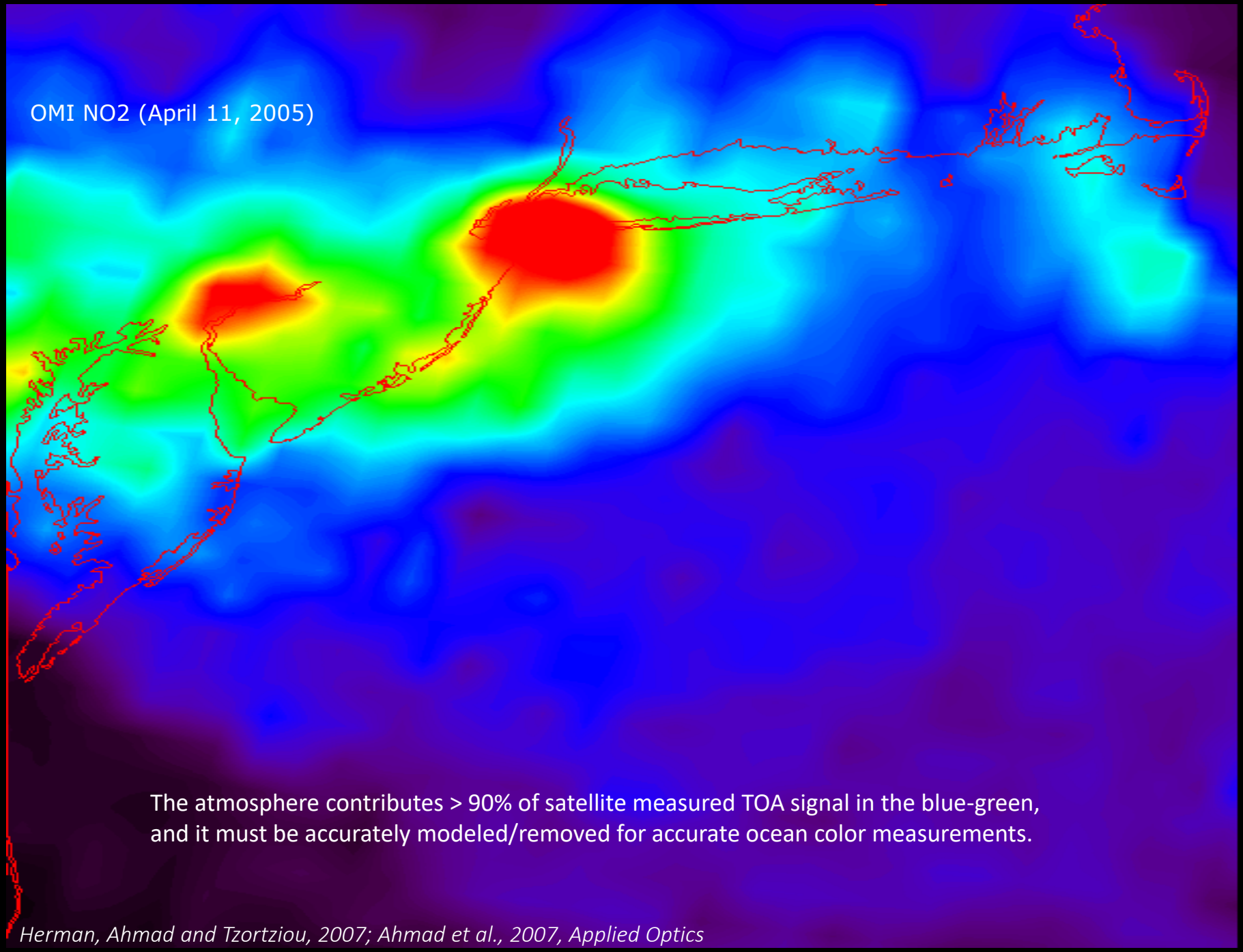


Fig. 1. Relative NO_2 spectrum at 293 K measured by GOME FM between 231–794 nm. The spectral resolution is 0.2 nm at wavelengths below and 0.3 nm above 400 nm.



The atmosphere contributes > 90% of satellite measured TOA signal in the blue-green, and it must be accurately modeled/removed for accurate ocean color measurements.

Herman, Ahmad and Tzortziou, 2007; Ahmad et al., 2007, Applied Optics

Research Objectives

- *Characterize **spatial and temporal (day-to-day and diel) variability** of total column amounts of trace gases over coastal waters*
- *Capture variability in atmospheric composition across **onshore-offshore gradients, spatiotemporal variability at the land-water interface,** and impacts of **meteorological processes(e.g., sea breezes).***
- *Compare **ground-based measurements of atmospheric trace gas variability** (using Pandora) with **satellite observations** of atmospheric composition (e.g., using the Ozone Monitoring Instrument OMI on Aura)*
- *Assess potential impacts on satellite ocean color retrievals*

NOAA-CREST

Methods: Use observations from past field campaigns in coastal waters

NOAA, EPA and NASA GEO-CAPE CBODAQ Campaign in the Chesapeake Bay (11-20 July 2011)

CBODAQ: **C**hesapeake **B**ay **O**ceanographic Campaign with **D**iscover-**AQ**

Aircraft campaign DISCOVER-AQ (**D**eriving **I**nformation on **S**urface **C**onditions from **COl**umn and **VER**tically Resolved Observations Relevant to **A**ir **Q**uality

NOAA Vessel SRVx - National Marine Sanctuary Test and Evaluation Vessel R8501

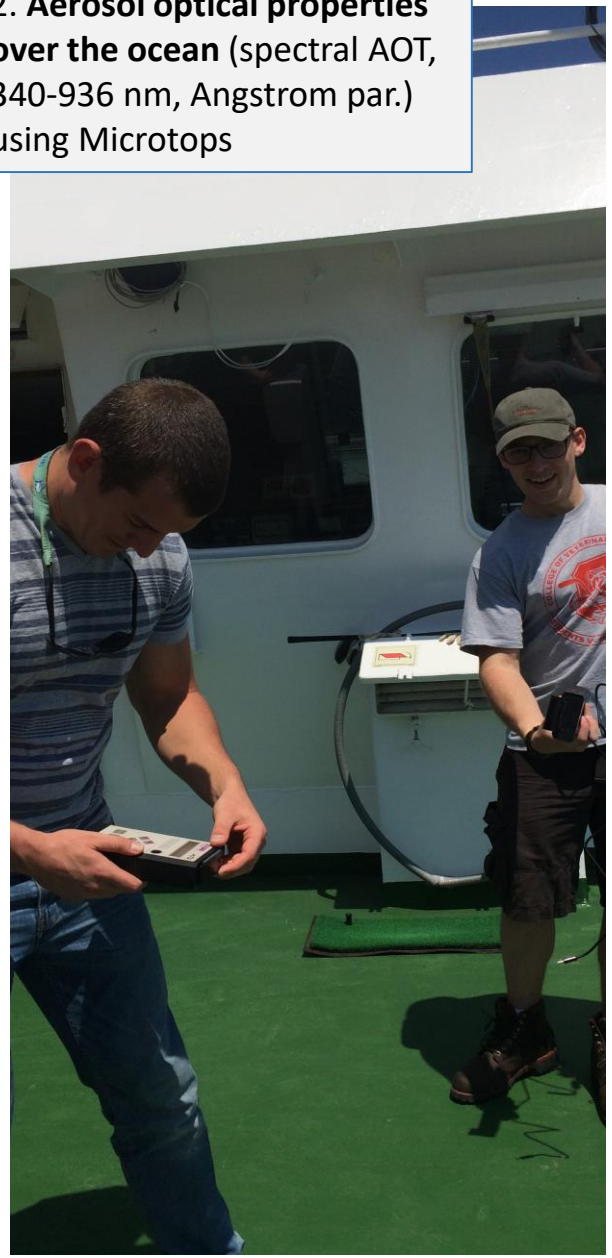
NOAA-CREST

Methods: Use observations from past field campaigns in coastal waters

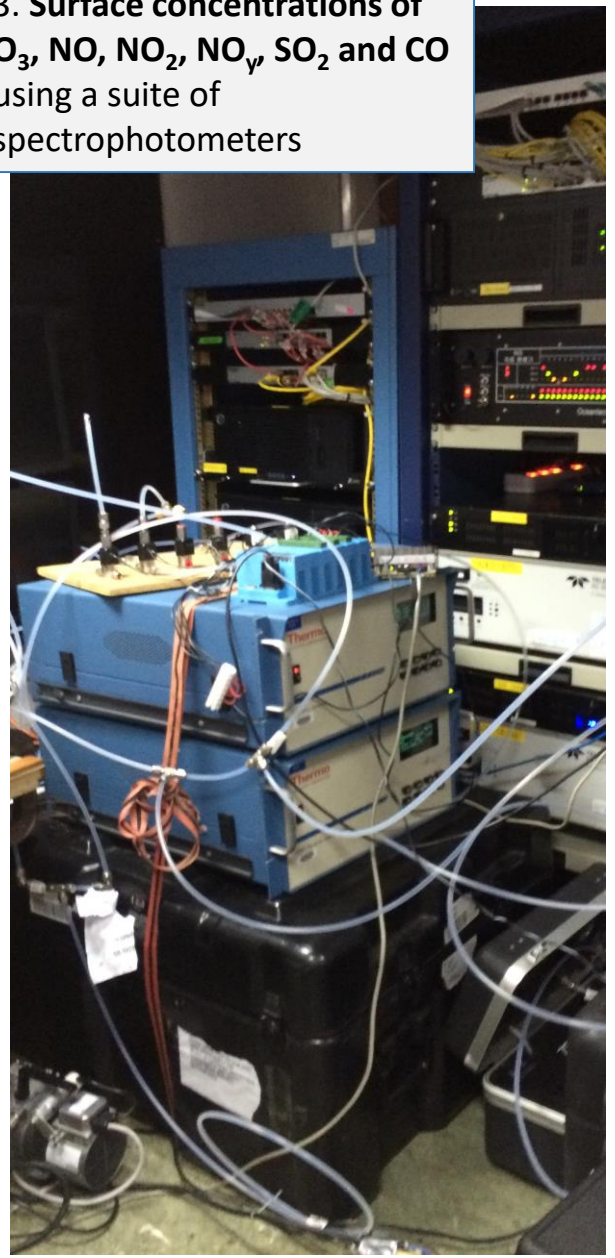
Methods: Use observations from past field campaigns in coastal waters

1. Continuous measurements of **$TCNO_2$ and TCO_3 over land and over the ocean** from the Pandora network

2. **Aerosol optical properties over the ocean** (spectral AOT, 340-936 nm, Angstrom par.) using Microtops



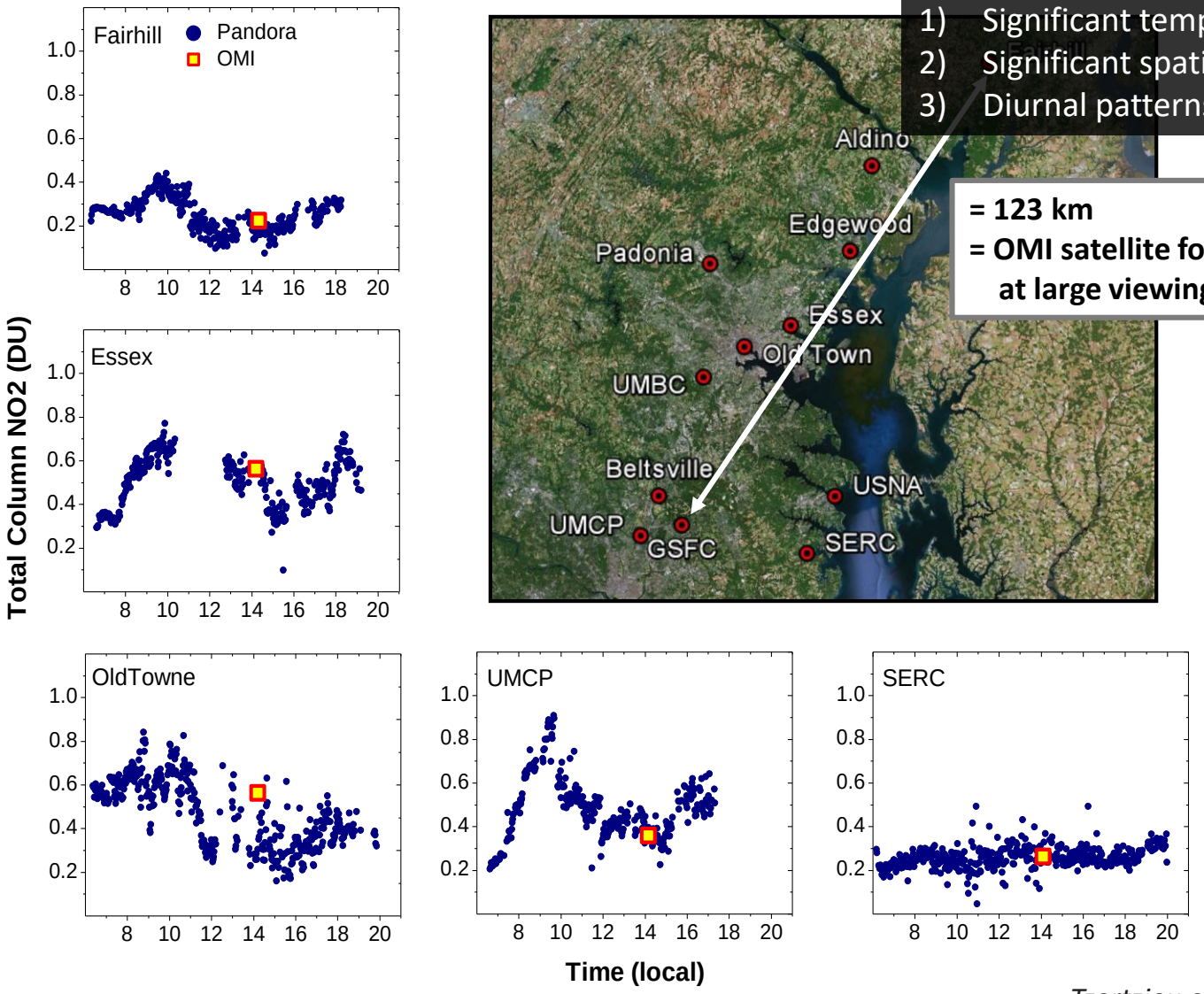
3. **Surface concentrations of O_3, NO, NO_2, NO_y, SO_2 and CO** using a suite of spectrophotometers



Methods: Use observations from past field campaigns in coastal waters

Spatial & temporal variability in $TCNO_2$ - Washington DC/Chesapeake Bay area (July 18, 2011)

Blue symbols: Pandora
Yellow square: satellite observation
Because the satellite provides ONLY 1-2 measurements per day, it cannot capture the strong diurnal variability in NO2.
Also, the satellite spatial resolution is very coarse (14x24 km for OMI).
The coarse spatial and temporal resolutions of satellite atmospheric observations create problems with satellite retrievals of ocean color, and with validation of air quality models.



1) Significant temp variability (0.7 DU)
2) Significant spatial variability (~0.7-0.8 DU)
3) Diurnal patterns are different at different sites

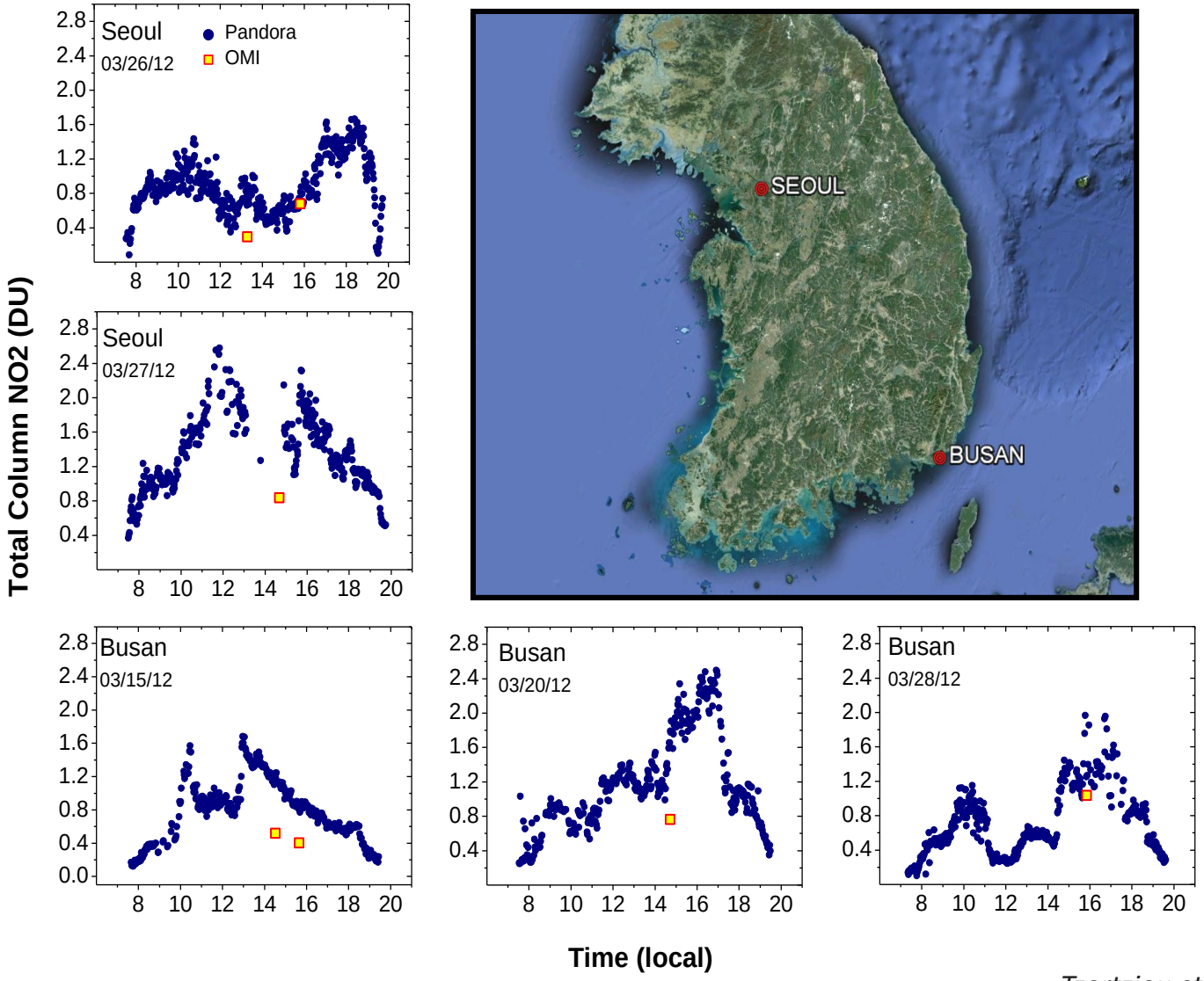
= 123 km
= OMI satellite footprint at large viewing angles

Tzortziou et al 2014, JGR-Oceans, 119, 3834–3854

Methods: Use observations from past field campaigns in coastal waters

Spatial & temporal variability in $TCNO_2$ – Seoul and Busan in Korea

Blue symbols: Pandora
Yellow square: satellite observation
Because the satellite provides ONLY 1-2 measurements per day, it cannot capture the strong diurnal variability in NO2.
Also, the satellite spatial resolution is very coarse (14x24 km for OMI).
The coarse spatial and temporal resolutions of satellite atmospheric observations create problems with satellite retrievals of ocean color, and with validation of air quality models.

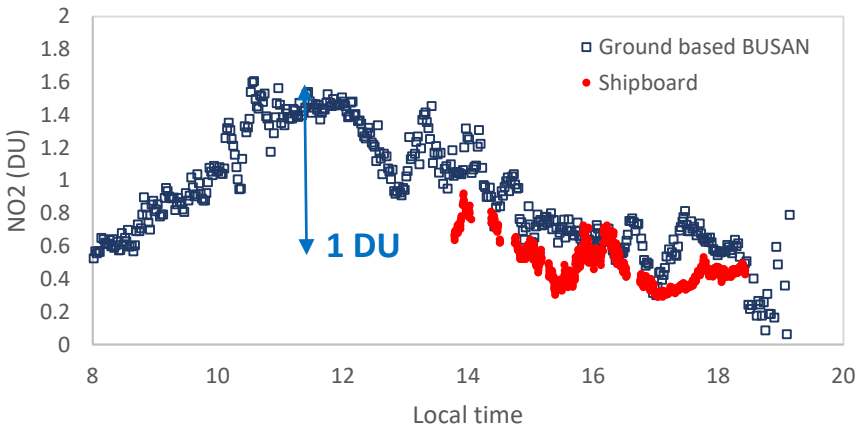


Tzortziou et al 2014, JGR-Oceans, 119, 3834–3854

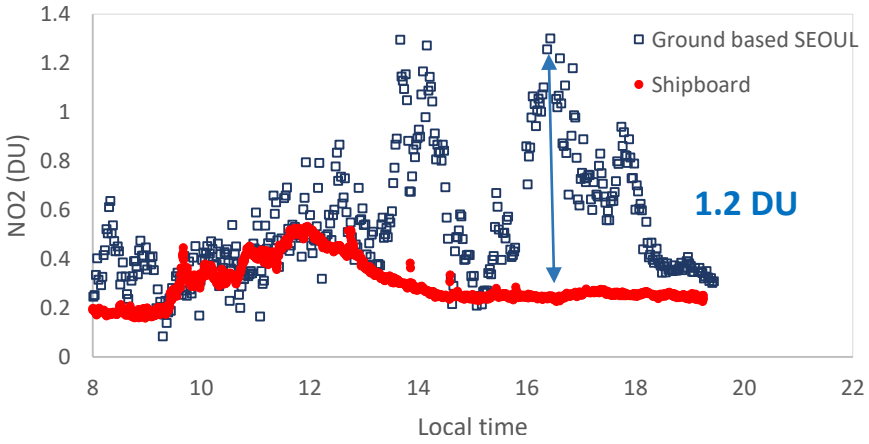
Methods: Use observations from past field campaigns in coastal waters

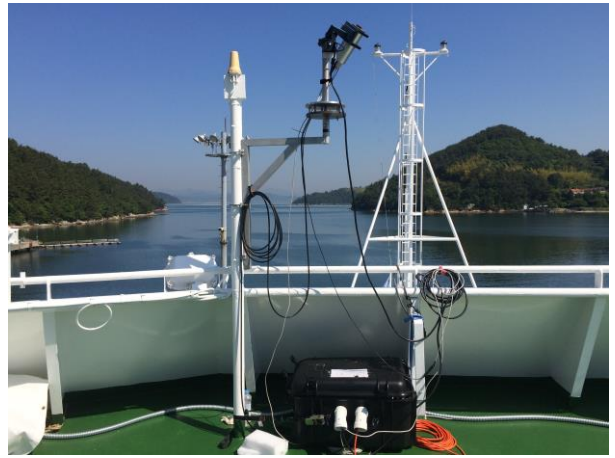
Recent field campaign in South Korea

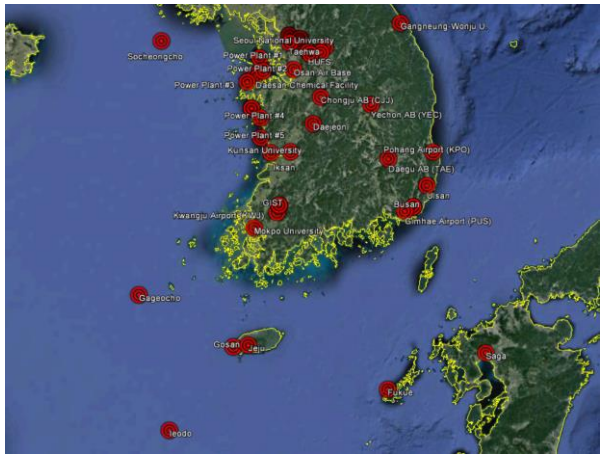
Busan, 18 May 2016

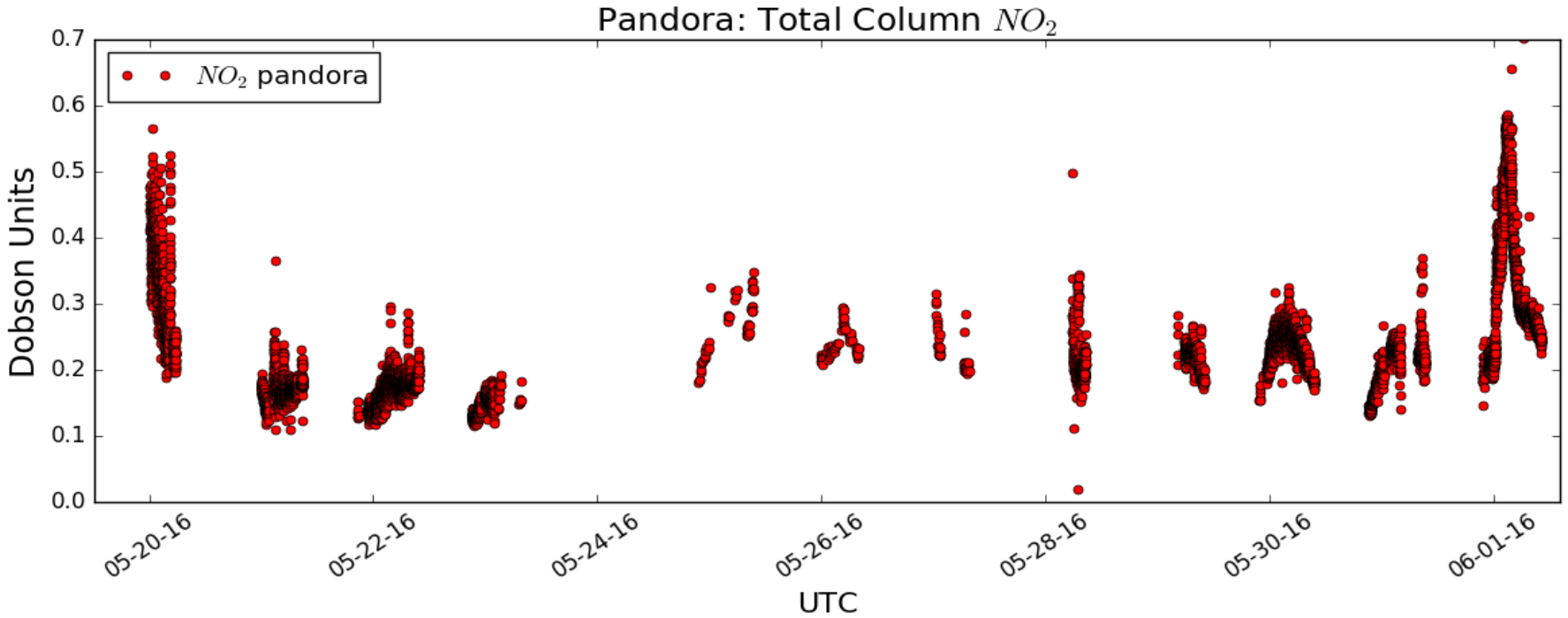


Seoul, 1 June 2016









Student Activities

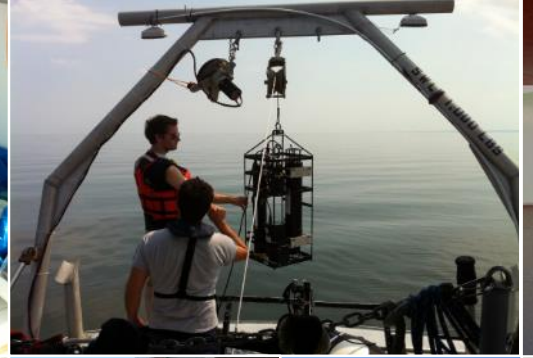
Learn about **spatial and temporal patterns** in nearshore atmospheric composition, **transport of air pollution across urban-terrestrial-aquatic interfaces**, and **impacts on coastal ecosystems and human health**.

Students will have the opportunity to **use satellite observations and measurements from past and ongoing air-quality and oceanographic field campaigns** (Pandora ground-based network and shipboard observations, Aura OMI satellite data)

Gain **experience in statistical and GIS software** to quantify and map atmospheric pollutant concentrations along heavily urbanized coastlines, and **develop new skills in satellite data analysis and remote sensing techniques** fundamental to understanding and monitoring physical and biogeochemical processes in economically and ecologically important coastal environments.





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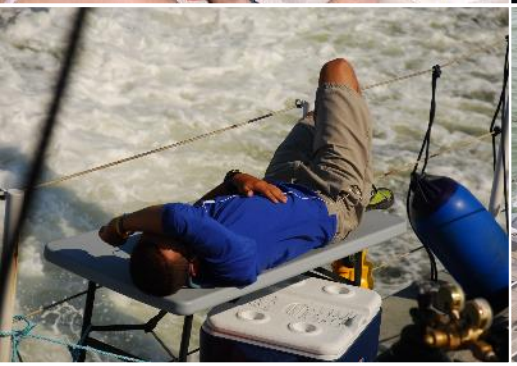








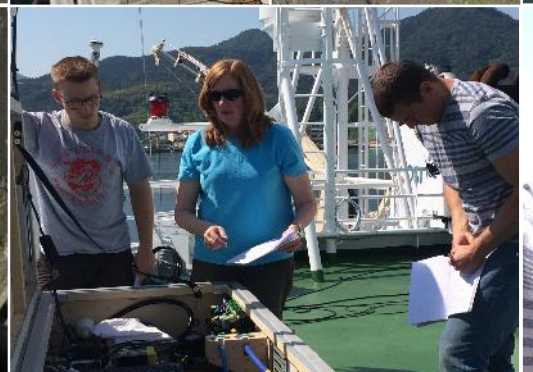


Google:

“Land Ocean Atmosphere Lab CCNY”

- Should be first result!

Or go to:

www.mariatzortziou.com