NOAA-CESSRST

CENTER FOR EARTH SYSTEM SCIENCES & REMOTE SENSING TECHNOLOGIES (CESSRST-II)

A National Oceanic and Atmospheric Administration (NOAA) Educational Partnership Program with Minority Serving Institutions (EPP/MSI) Cooperative Science Center (CSC) since 2016 (**#NA22SEC4810016**)

CCNY Activities in Support of NOAA & NASA Atmosphere

Presented at the GeoXO ACX Meeting

Mitch Goldberg
Professor, Distinguished Research Scientist
The City College of New York, CUNY

The City College of New York · CUNY The City University of New York · UPR Recinto Universitario de Mayagüez · Hampton University The Standard of Excellence · UMBC · UTEP · SDSU San Diego State University

The City College of New York

NOAA-CESSRST

CENTER FOR EARTH SYSTEM SCIENCES AND REMOTE SENSING TECHNOLOGIES

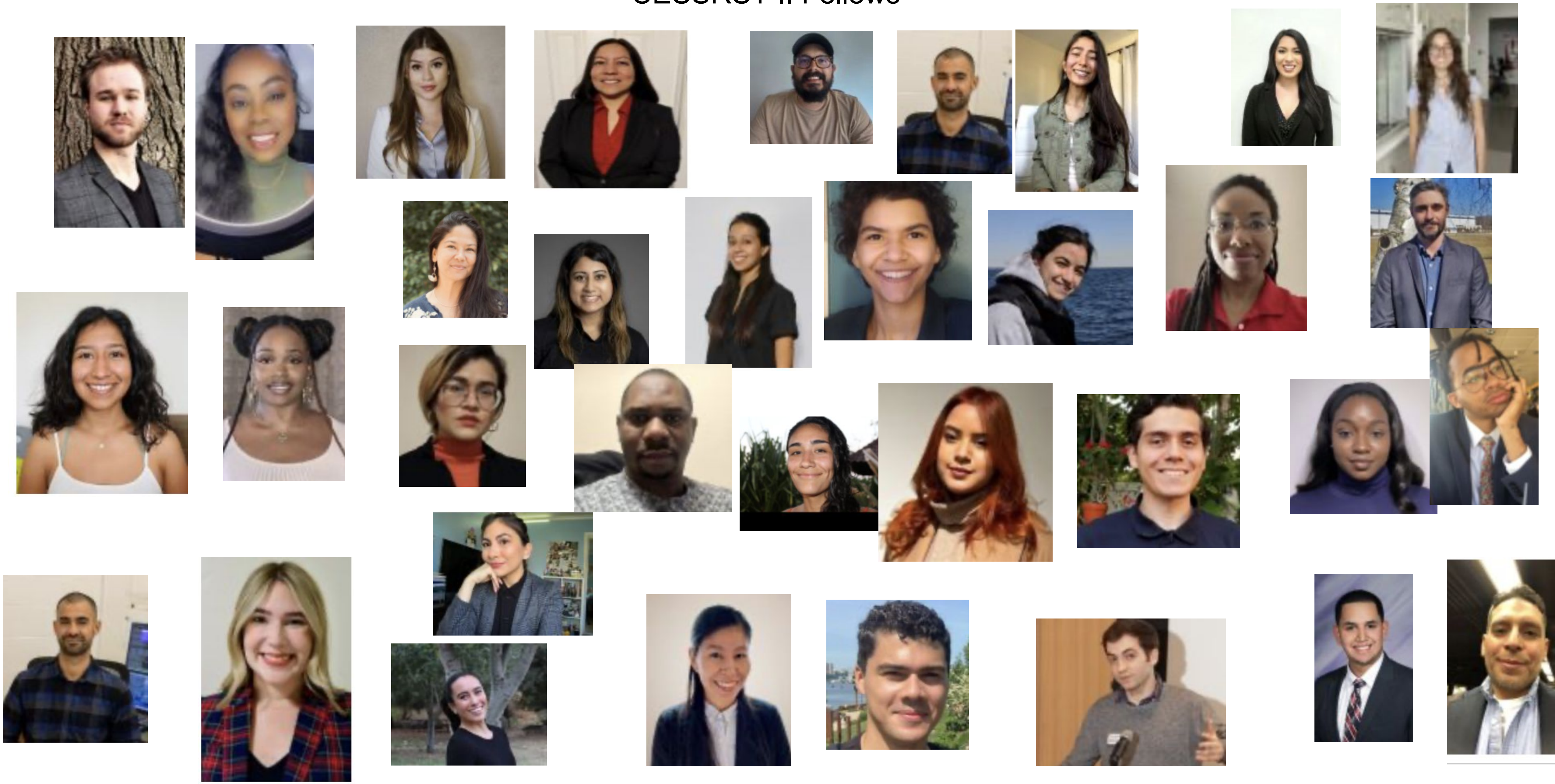
UMBC HAMPTON UNIVERSITY SAN DIEGO STATE UNIVERSITY UTEP

GOAL: *Train and graduate a diverse and highly-skilled future workforce in Earth System Sciences and Remote Sensing Technologies supporting NOAA's mission*

- ***Center Director*** –Fred Moshary
- **Deputy Director**- Nadine McCauley
- **Education Expert-** Faun Rockcliffe
- **Distinguished Research Scientist –** Mitchell Goldberg
- **Data and Information Manager-** Paul Alabi

CESSRST Staff and Faculty

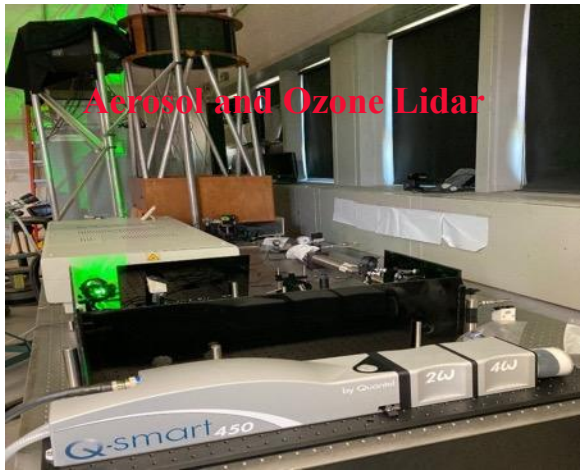
CESSRST-II Fellows



Fred Moshary- Optical Remote Sensing Lab

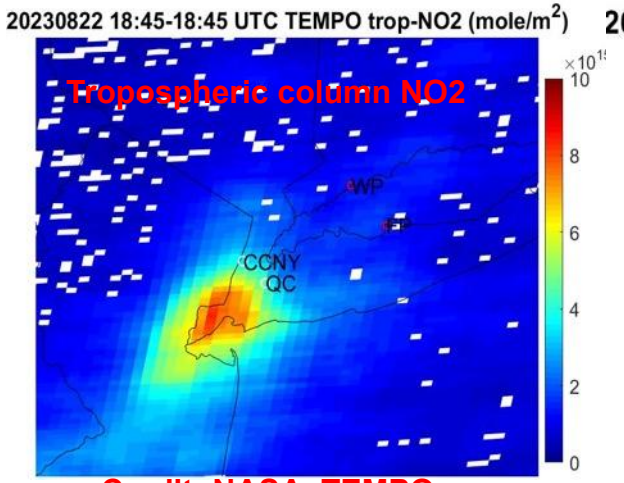
Remote Sensing of Atmospheric boundary layer, Aerosols, Ozone, Winds and water vapor (2 Graduate Students, 1 postdoc, 1 Research Scientist)

- Remote sensing of regional boundary layer dynamics, winds, mixing-layer-height and application to air quality
- Remote Sensing of atmospheric aerosols vertical distribution, optical properties, and transport
- Remote sensing of ozone vertical distribution, formation and transport in the troposphere.
- Remote sensing of atmospheric thermal structure and water vapor profiles
- Remote Sensing of continental wildfire smoke plume transport and interactions with PBL (advection to the surface)
- Surface in-situ observations (NO2, O3, CO2/H2O, PM2.5) and aerosol size distribution

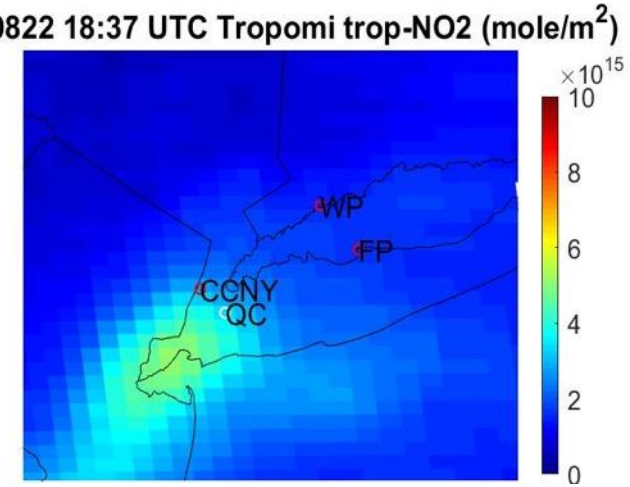


Fred Moshary- Optical Remote Sensing Lab

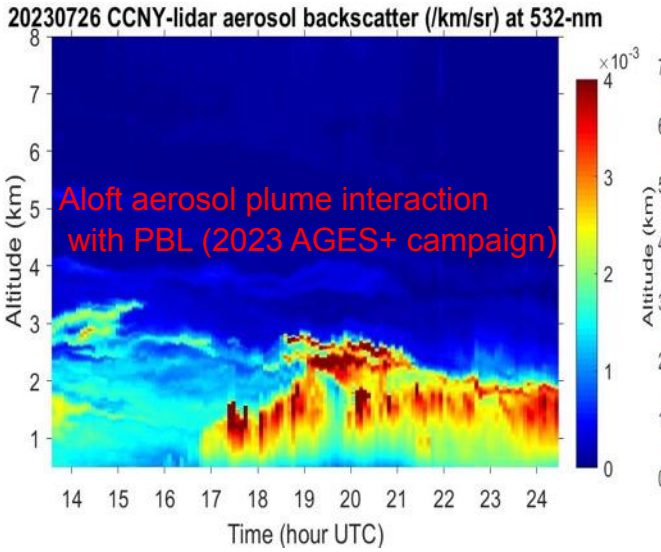
- Validation of satellite product, verification of chemical transport and air quality model forecast (NOAA-NASA satellites, NOAA-EPA GFS-CMAQ and WRF-Chem models)
- Participation in field campaigns (LISTOS 2018, TRACER 2021, NOAA CUPiDS and AEROMMA 2023, and NASA-STAQS 2023)

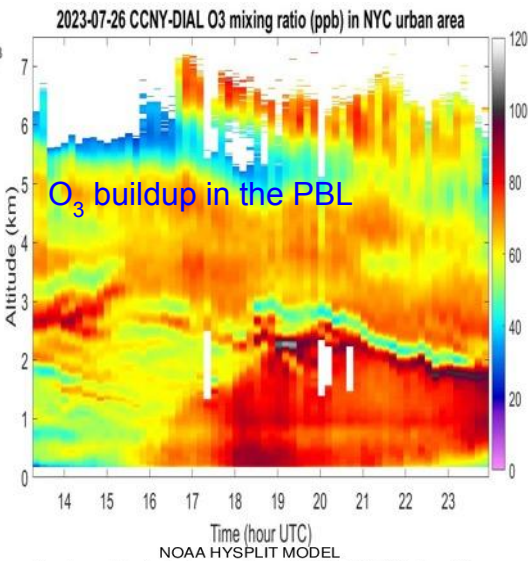


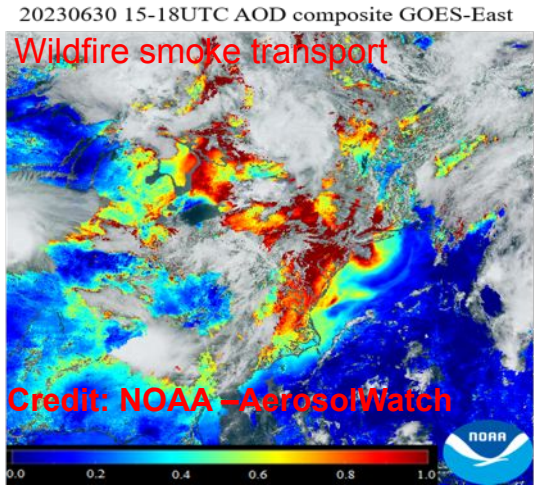
Credit: NASA–TEMPO

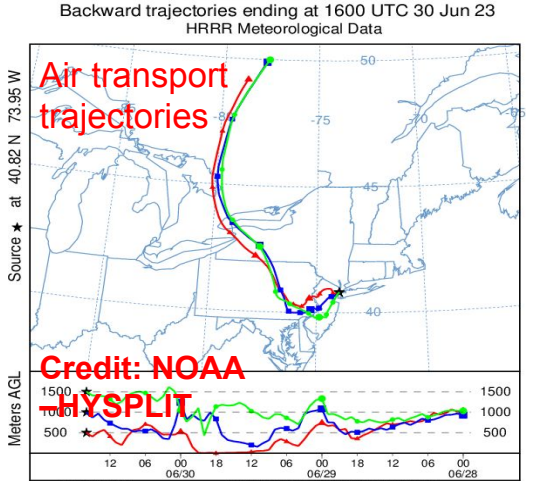


Credit: ESA–TROPOMI

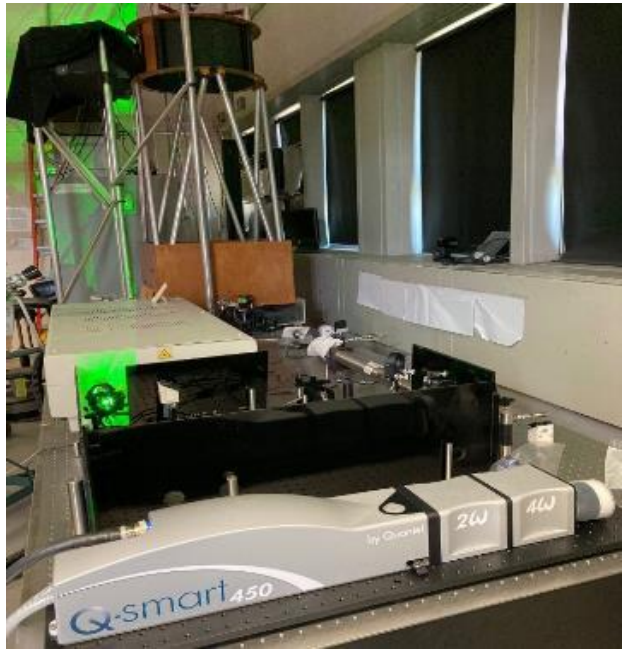




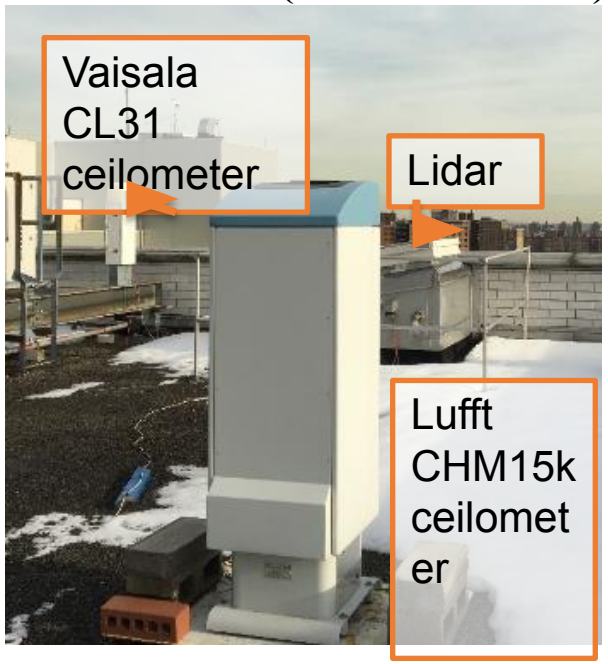




CCNY Aerosol and Ozone Lidar



Ceilometers (Lufft & Vaisala)



Wind Lidar (Windcube 200s)

AERONET sunphotometer

Microwave radiometer: T, RH

AQ station (NYSDEC/CCNY)

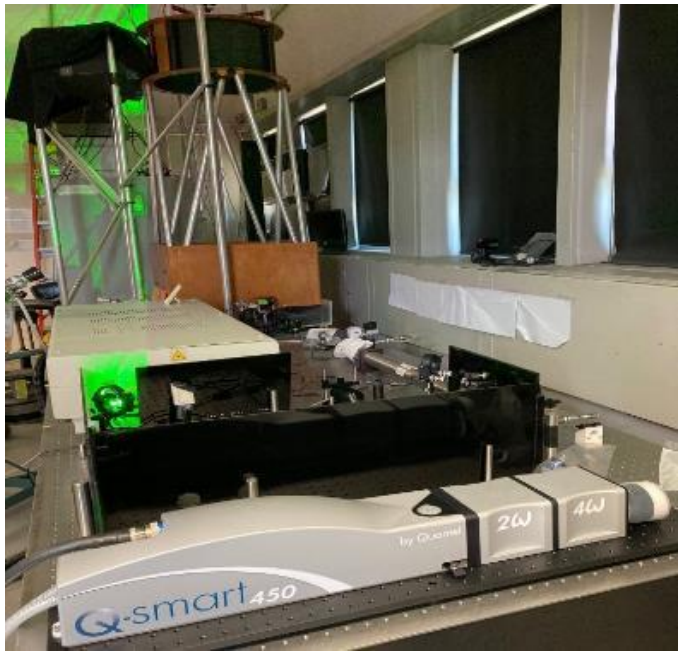
Field obs (CL51+O3)

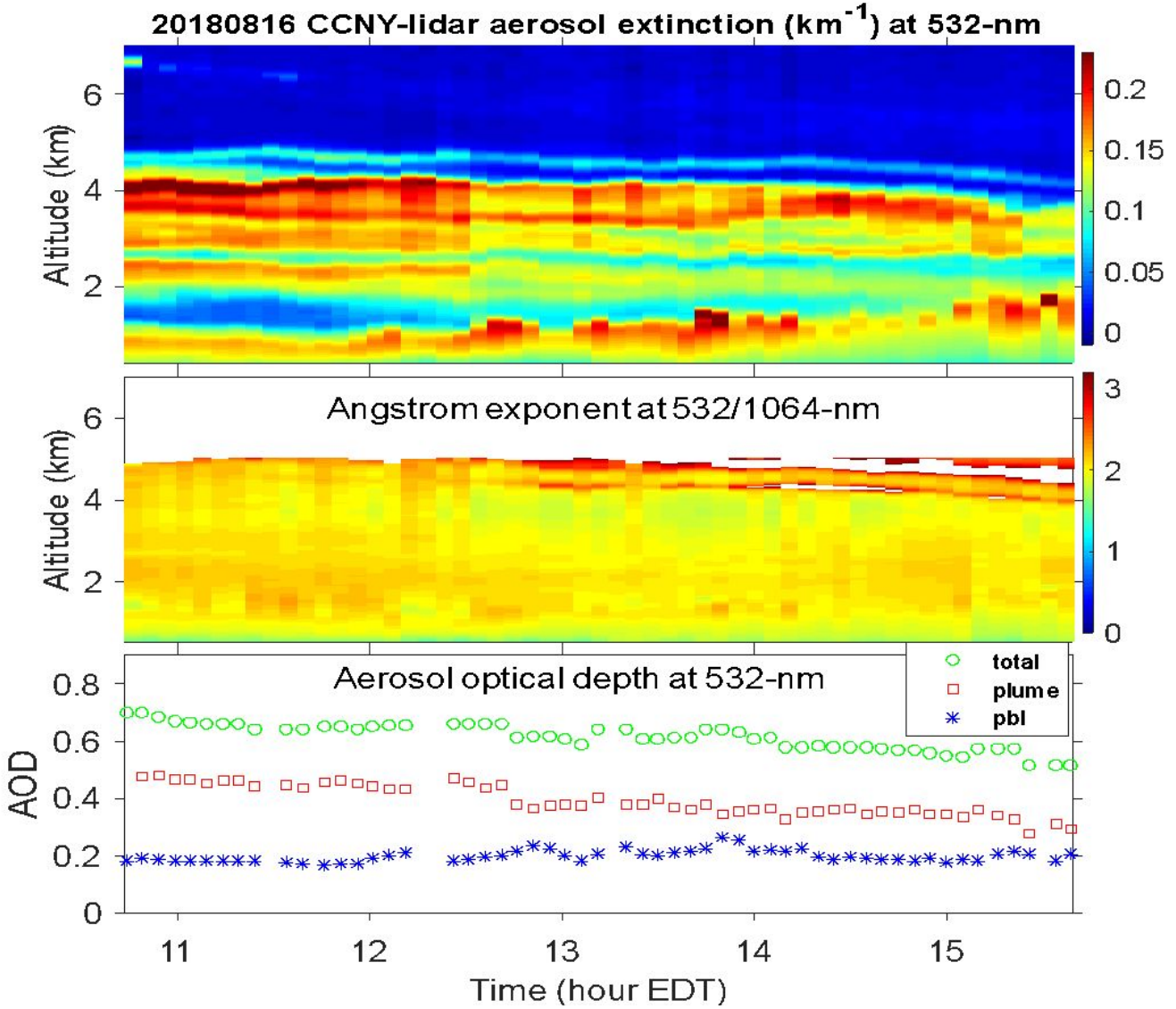
Mobile O3-lidar

CCNY multi-wavelength elastic-Raman lidar

Data product:

- Profiles of aerosol backscatter and extinction coefficients at 1064, 532, 355-nm;
- Angstrom exponent(AE) or v: $\alpha(\lambda) \sim \lambda^{-v}$
- Aerosol layer optical depth
- Water vapor in the PBL
- PBL height
- Cloud height
- 2-3 day obs/week under clear sky (2006-now)

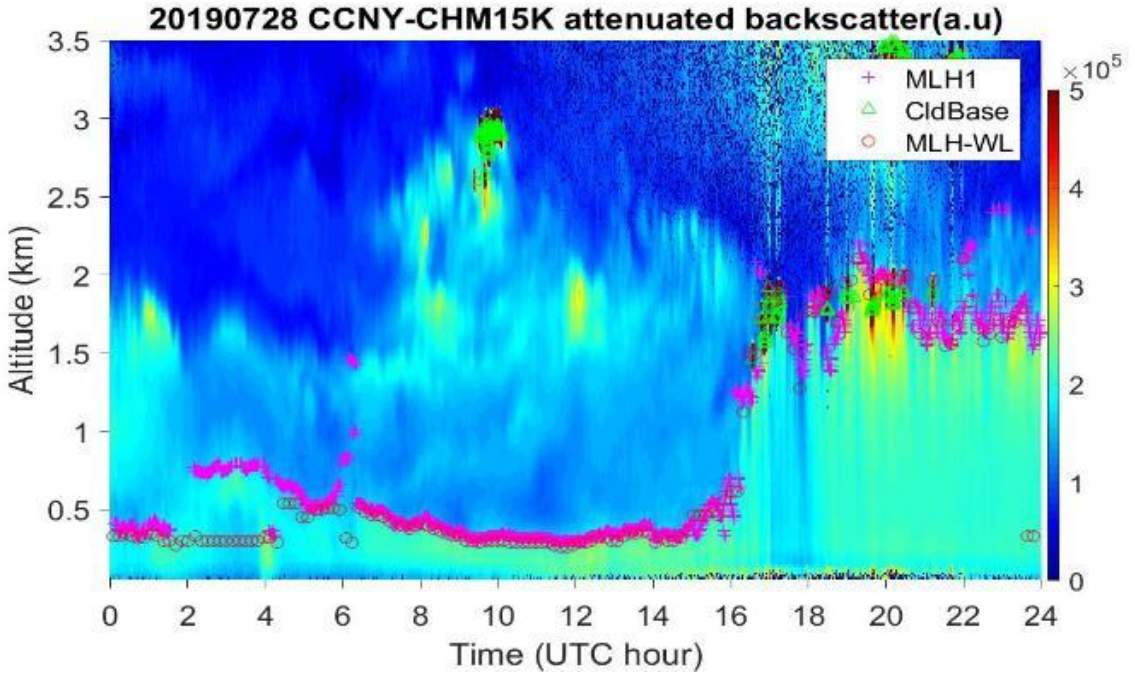


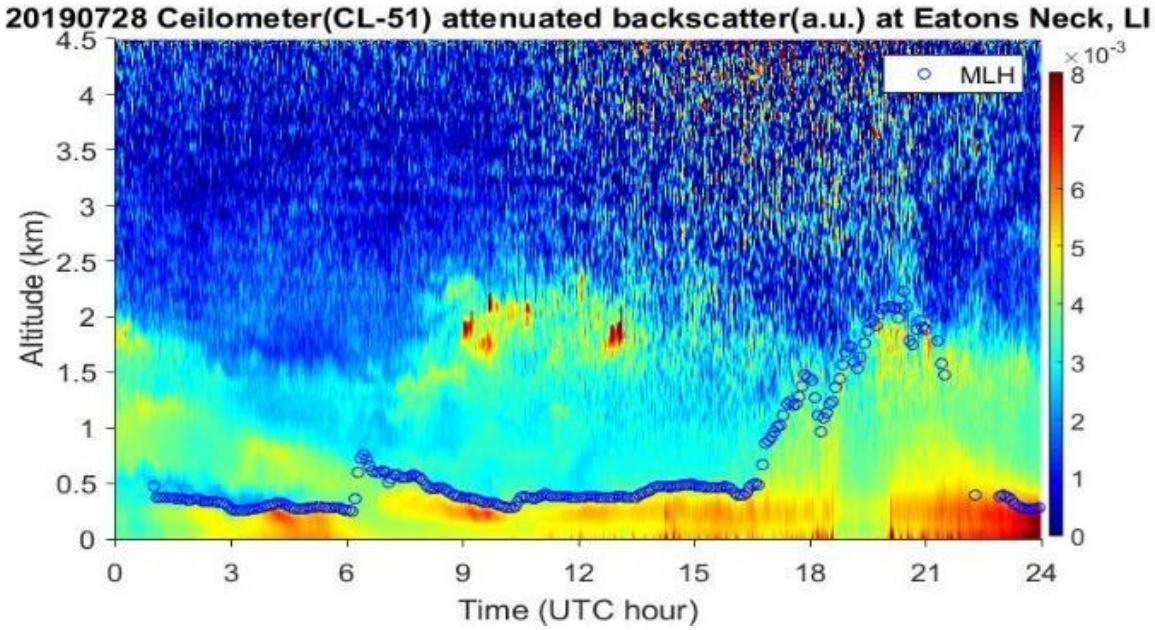


CCNY Ceilometers and Data Product: PBL-height, cloud/Aerosol height

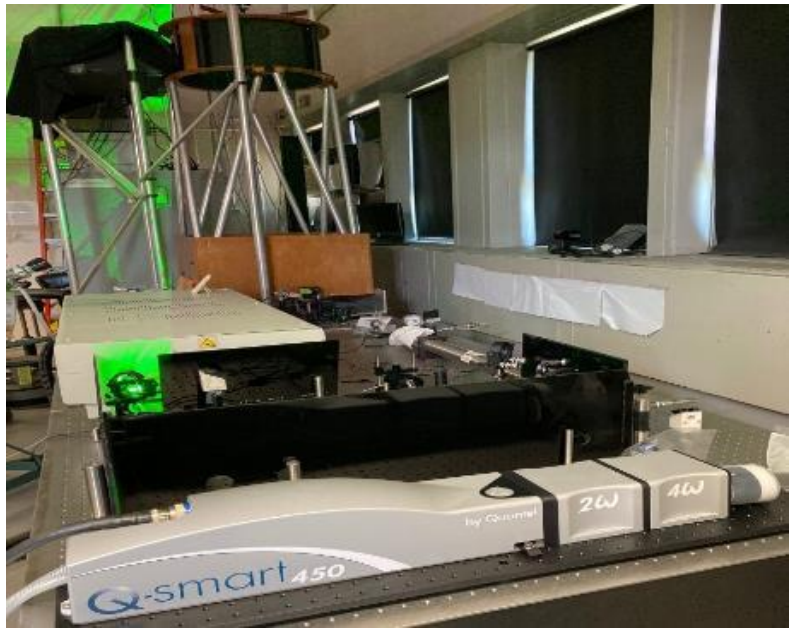
Lufft-CHM15K (top) at CCNY-site

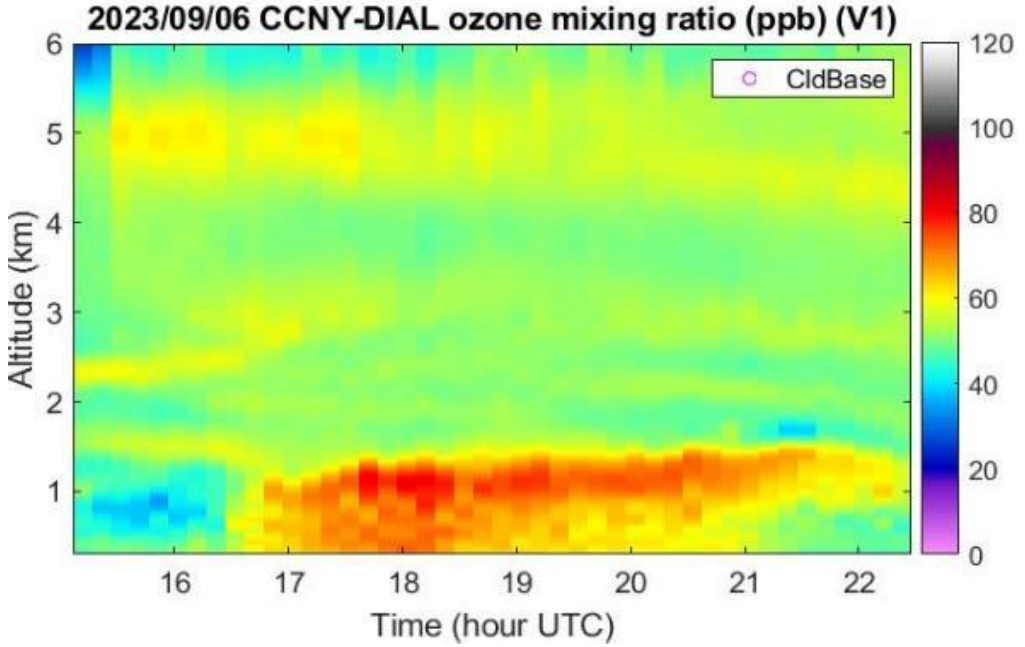
Vaisala CL5 at Eatons Neck (Long Island North-shore)

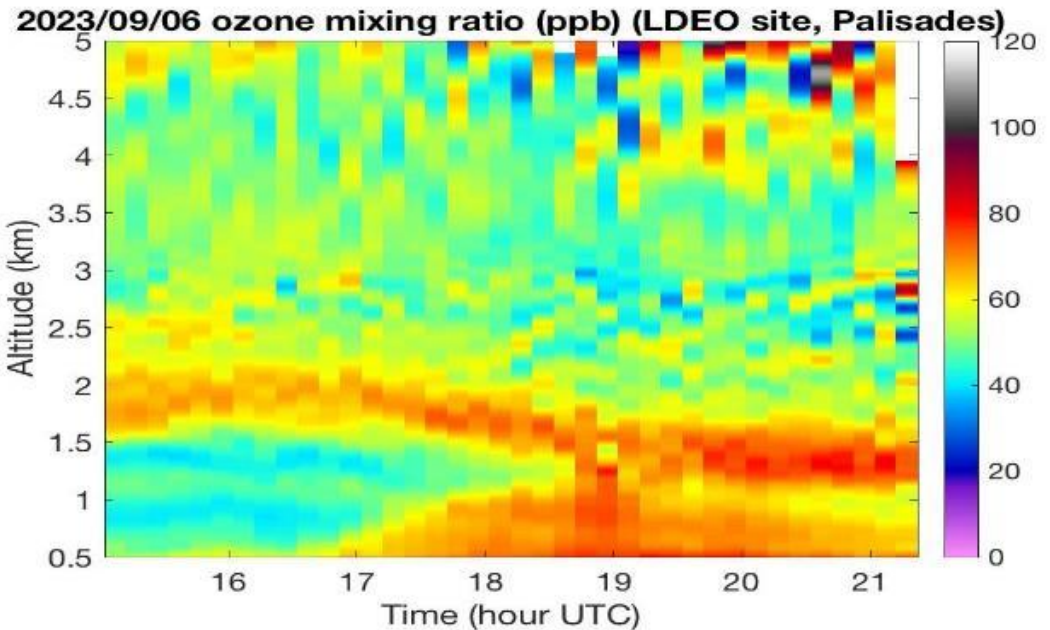




CCNY Ozone lidar (lab and mobile): Ozone vertical distributipn



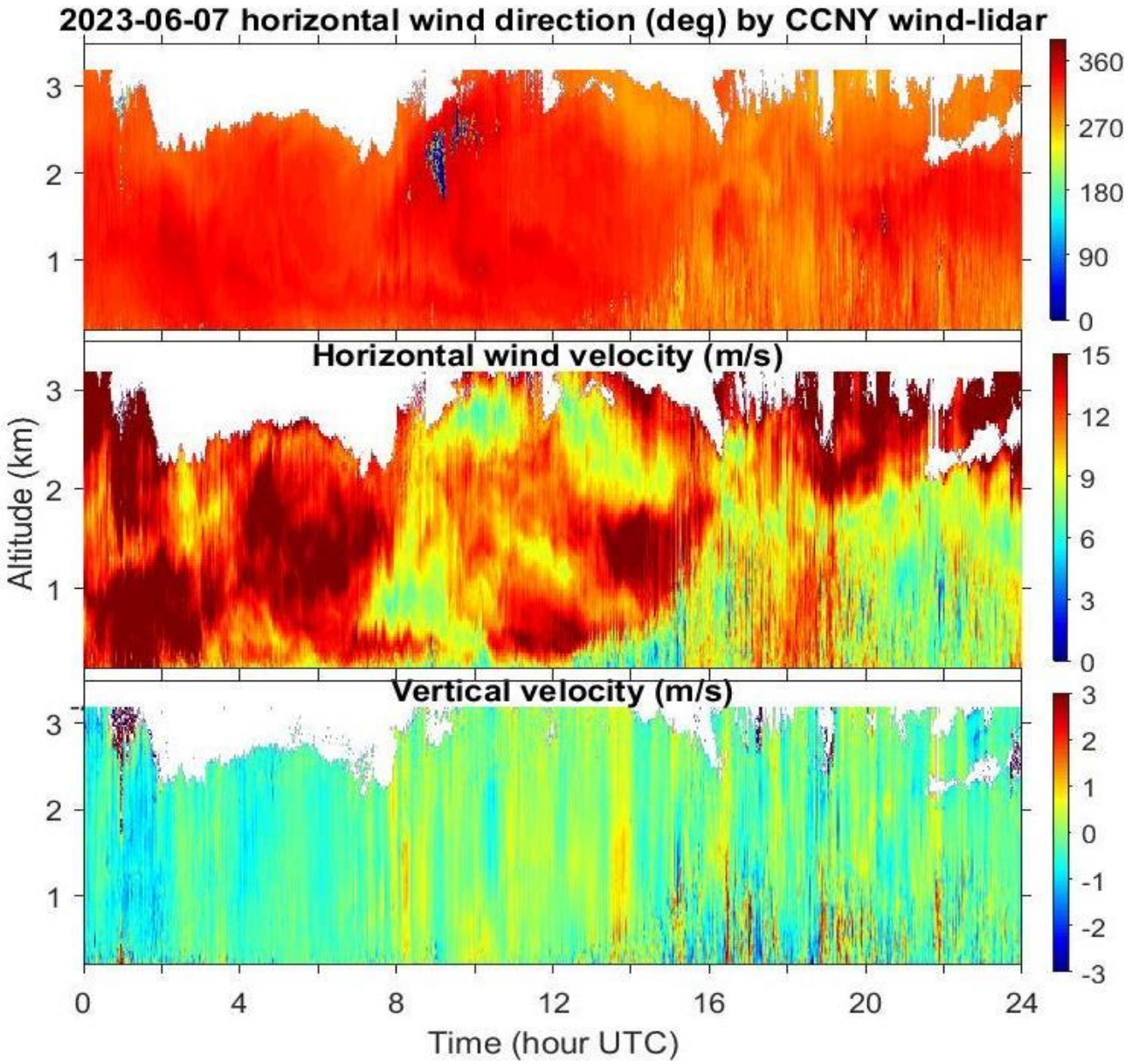




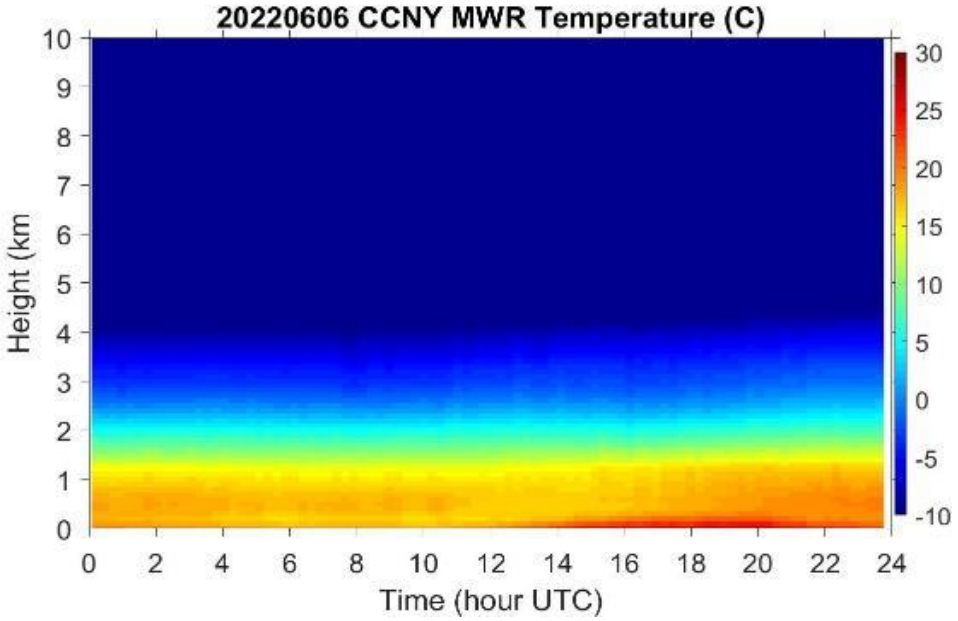
CCNY Coherent Doppler Wind Lidar (Windcube 200s):

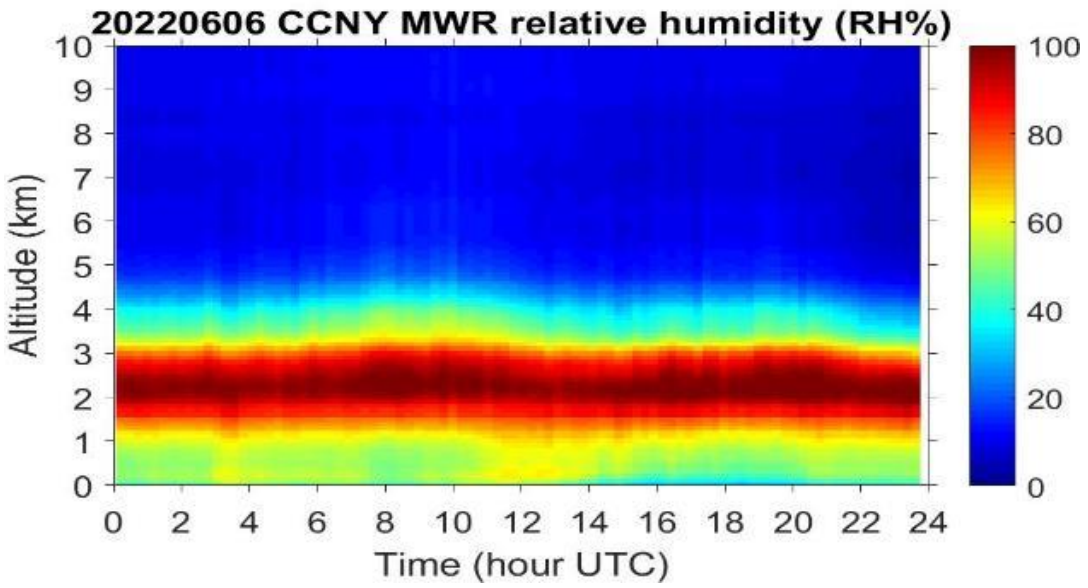
Data product:

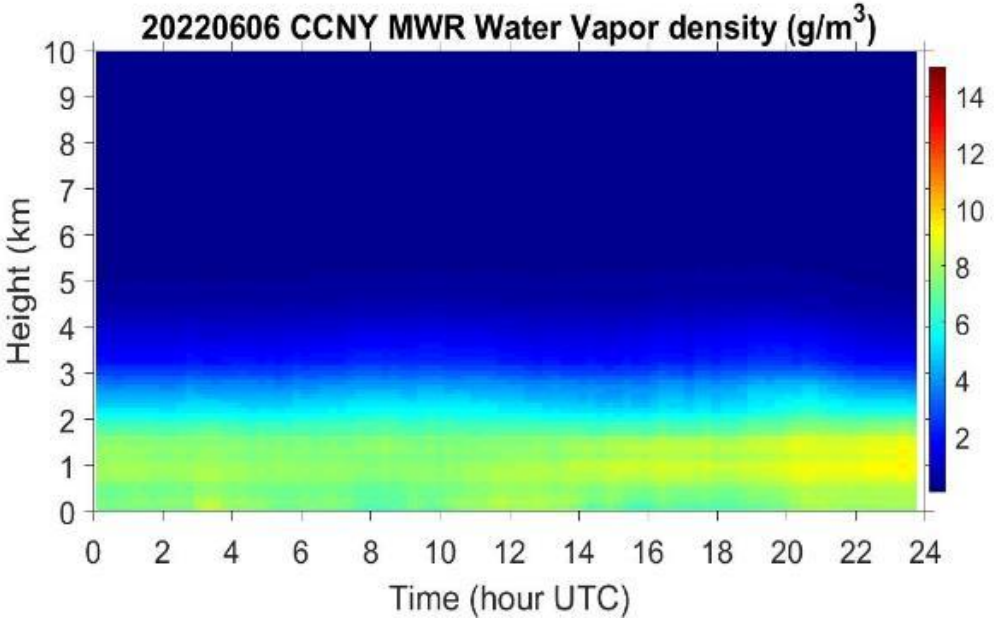
- Horizontal and Vertical Winds
- 24-hr/7day observations



Microwave Radiometer: T, RH and liquid water profiles (24-hr/7day)

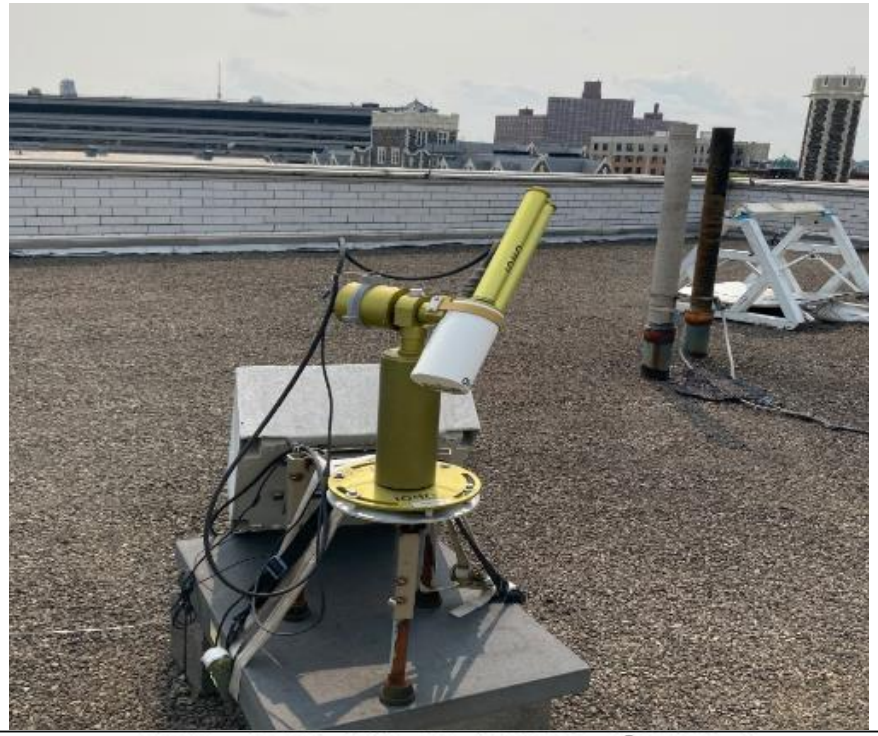


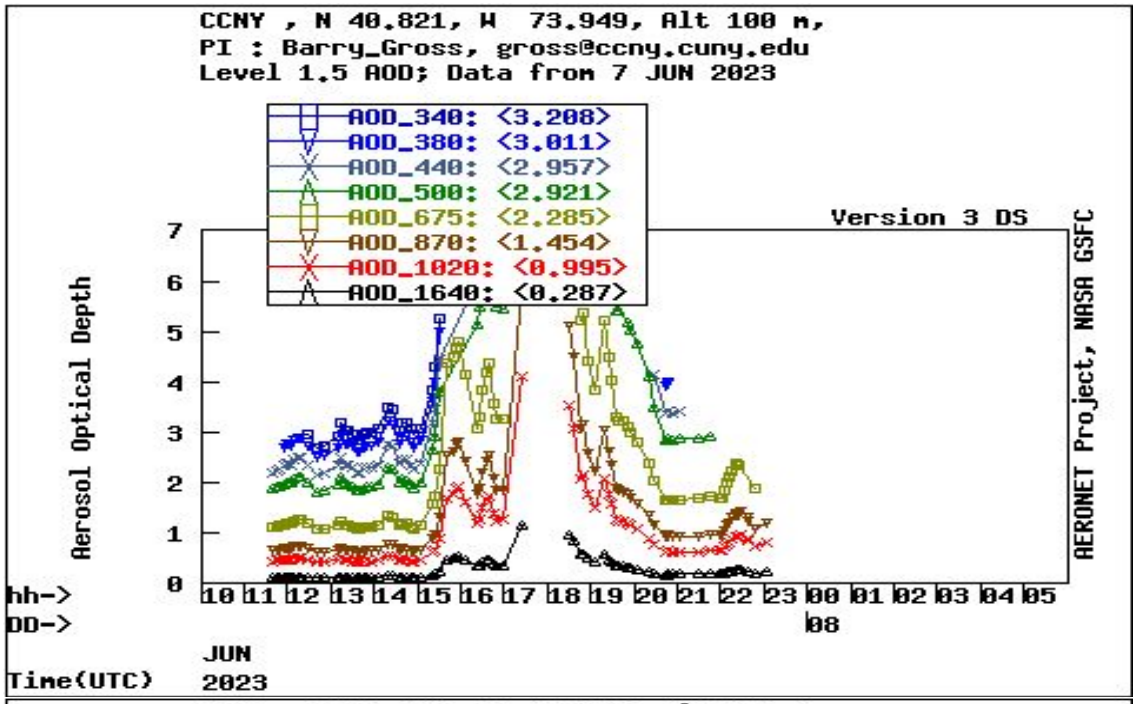


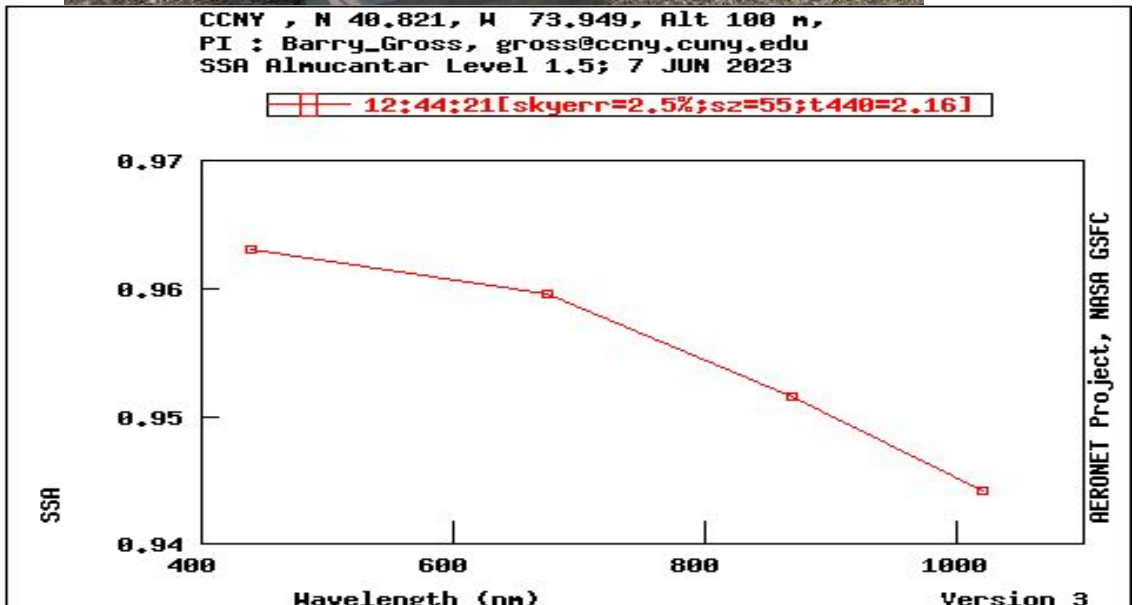


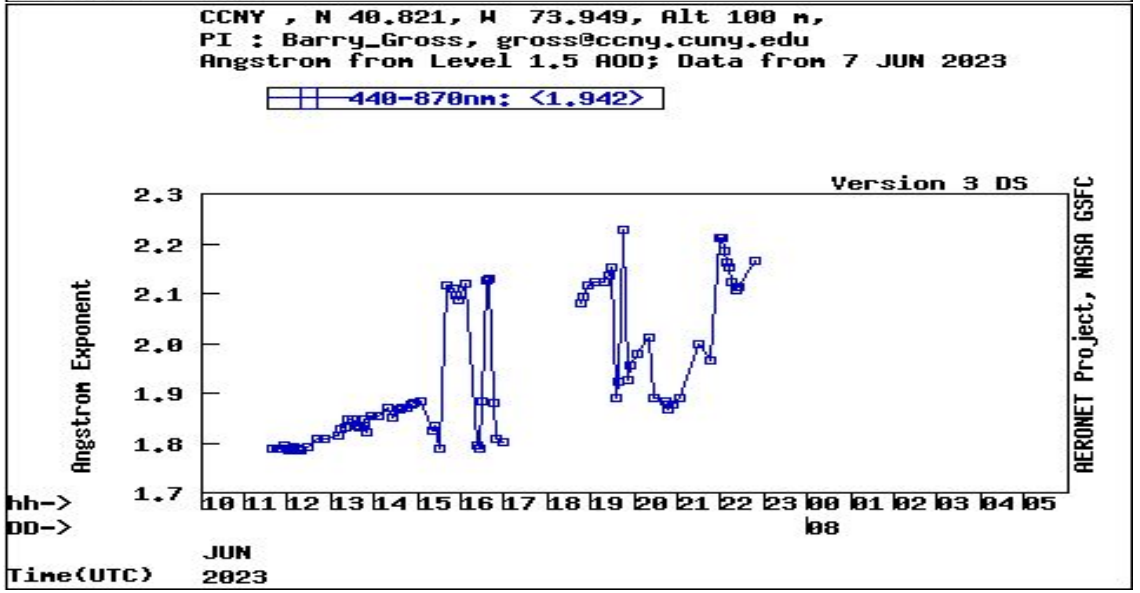
AERONET Sunphotometer at CCNY-site

Data product: AOD, AE, dV/dR, SSA, H_2O

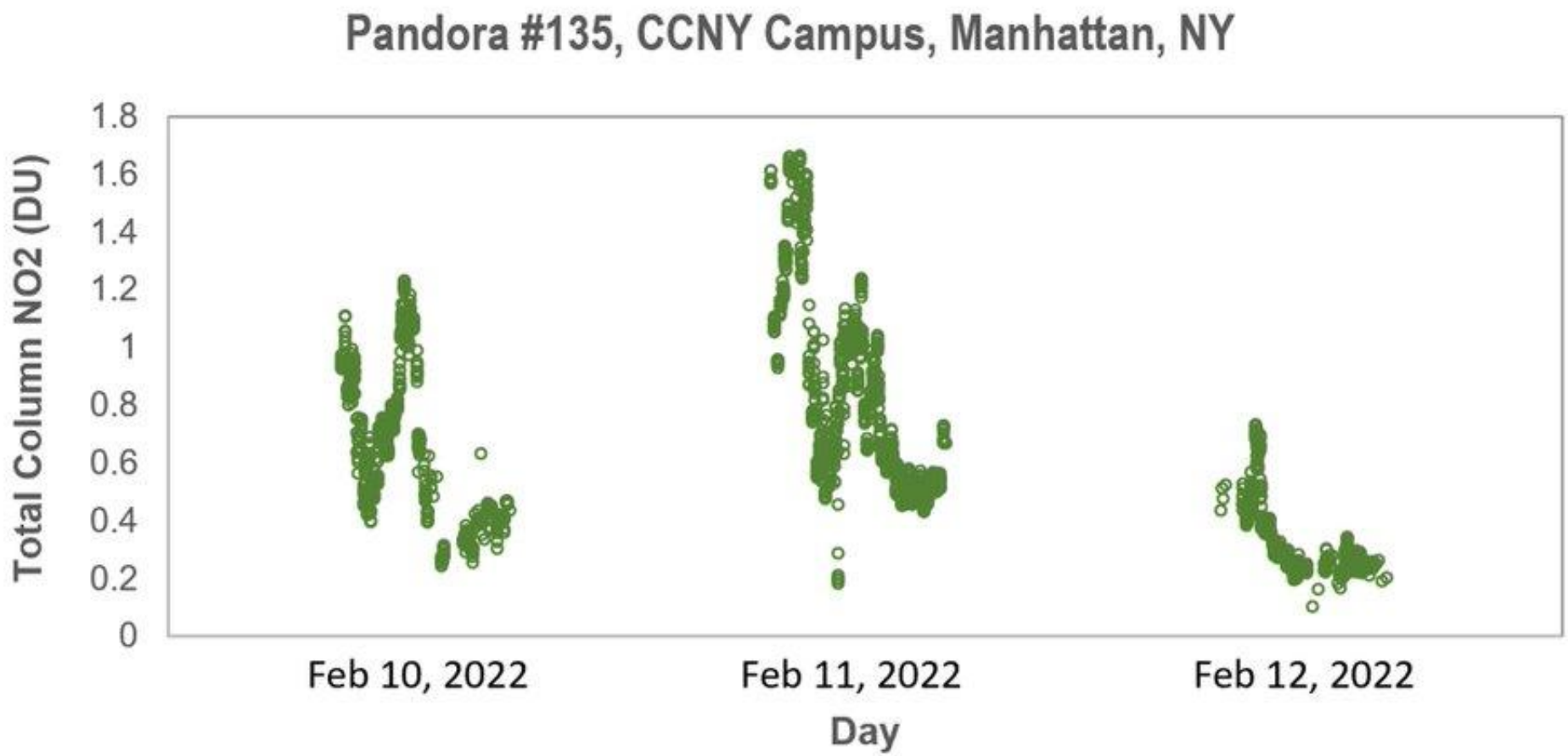









NASA


Pandora #135, CCNY Campus, Manhattan, NY
Total Column NO2 (DU)
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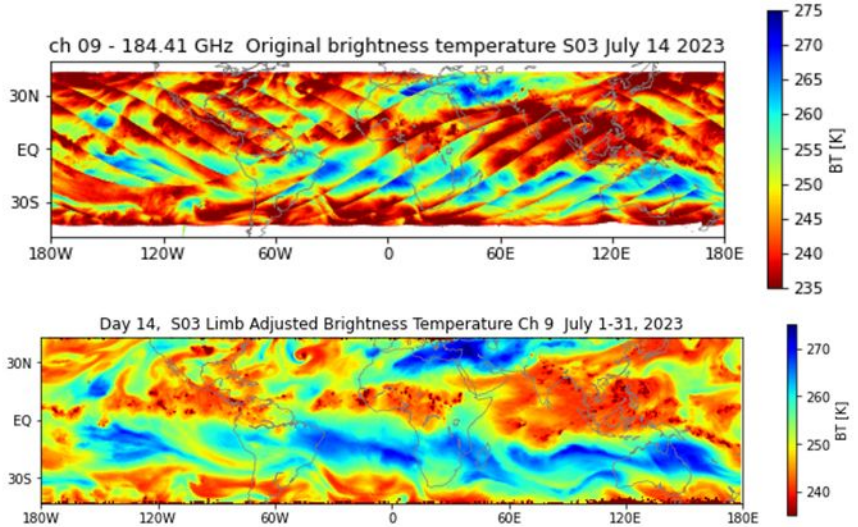
1.6
1.4
1.2
1
0.8
0.6
0.4
0.2
0
Feb 10, 2022
Feb 11, 2022
Feb 12, 2022
Day

Satellite Remote Sensing and Applications Lab - Goldberg

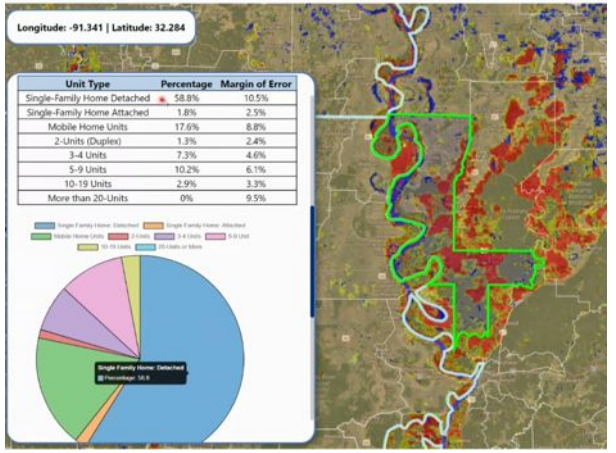
- **Direct Satellite Readout Capabilities (at CCNY)**
  - Access to real-time satellite observations for local applications.

- **Microwave and Infrared Soundings. (2 Postdocs, 1 Graduate Student)**
  - Limb adjustments of new higher temporal refresh microwave smallsats for nowcasting applications, including atmospheric rivers, and tropical storms, also developing retrieval algorithms. Rapid bias adjustments of smallsat constellations.
  - Satellite data assimilation, and verification of climate models.
  - Chair of new GeoXO Sounder (GXS) science team, developing sounding algorithms.
  - Collaborating with Tomorrow.IO commercial provider of MW sounders.



Original (top) and limb adjusted upper tropospheric humidity sensitive channel, useful for monitoring atmospheric rivers

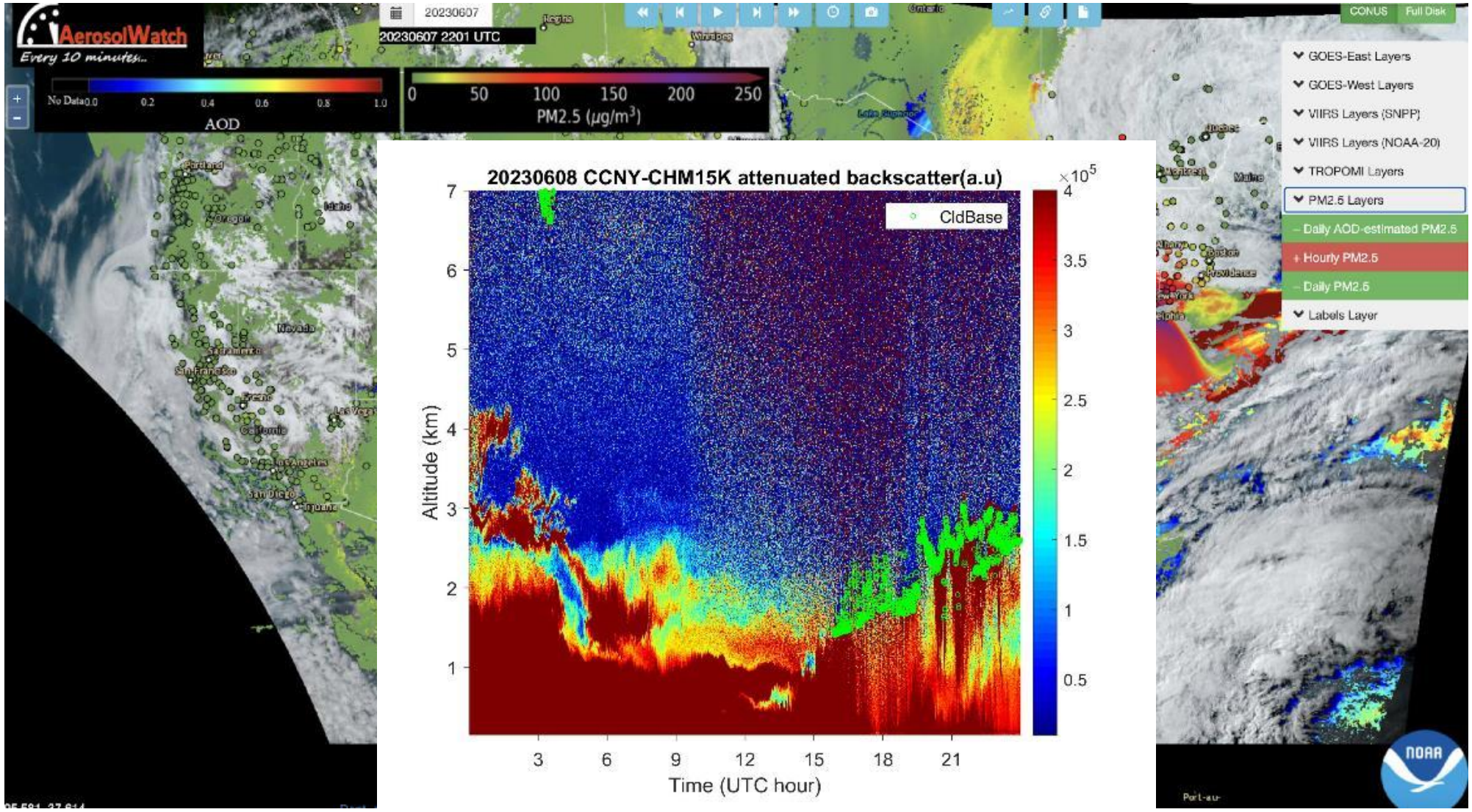
- **Atmospheric Composition (AC) Satellite Missions. (1 Postdoc)**
  - Validating products from new missions such as TEMPO using ground-based measurements.
  - Developing new applications focused on societal impacts.
  - Working on data fusion of IR soundings with AC measurements.



JPSS VIIRS Flood maps fused with socioeconomic data at the county lev

- **Climate Hub for Analytical Research & Monitoring (CHARM). (1 Postdoc, 2**

Approach – build upon existing NESDIS capabilities: It will add new functionality to AerosolWatch



NOAA-CESSRST

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AND REMOTE SENSING TECHNOLOGIES

Transform the Future of Earth Science using Cutting-Edge Technologies

NOAA CESSRST-II, a Cooperative Science Center funded by NOAA Educational Partnership Program with Minority Serving Institutions (EPP/MSI)

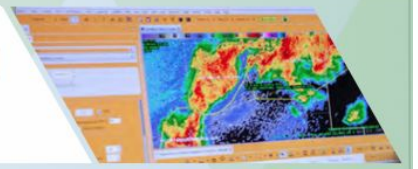
FELLOWSHIP

- Targeted Projects on Earth Sciences
- Guidance from Industry Experts
- Advanced Research Facilities
- Diverse Career Paths
- Full support for new Master's and Ph.D. students in Engineering

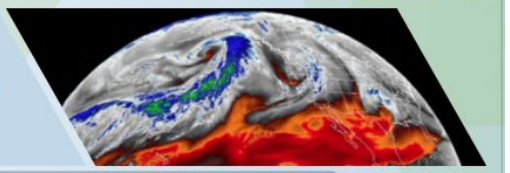
Complex multiscale modeling of the Earth System from Local to Global

Data Science, Artificial Intelligence, Machine Leaning Applications in Climate, Weather, and Earth Sciences

Observations and Surveillance with Uncrewed and Cyber Physical Systems



Remote Sensing and Satellite Technologies, Systems, Observations, and Applications in Earth Surveillance



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