Science Team Telecon (3/4 June 2024)

Agenda

- Data Archive Status
- Data Intercomparisons
- Ground-Based Measurements in Chiang Mai
- Brainstorming Updates
- Organizing the Roadmap Ahead

ASIA-AQ Preliminary Data Status

DC-8	Philippines	Philippines	Philippines	Philippines	Taiwan	Korea	Korea	Korea	Korea	Korea	Taiwan	Thailand	Thailand	Thailand	Thailand	Taiwan
	6-Feb	7-Feb	11-Feb	13-Feb	15-Feb	17-Feb	26-Feb	8-Mar	10-Mar	11-Mar	13-Mar	16-Mar	18-Mar	21-Mar	25-Mar	27-Mar
TOGA																
NSERC																
WAS																
TILDAS																
CIT-CIMS																
DACOM																
DLH																
NONO2O3																
MMS																
CAFS																
GTCIMS																
CU-AMS																
K-CIMS																
LGR-AAT																
K-SP2																
K-AMS																
K-SP2D																
K-SMPS																
Smoke Flag																
CAESAR																
LARGE																
LARGE-SP2																
MIRO																
ROZE																
CANOE																
PTR-MS																
CHARON																
ISAF																
K-CCN																
OPALS																

submitted
partial submission
no data collected
not submitted

G-III	Philippines	Philippines	Philippines	Philippines	Philippines	Taiwan	Korea	Korea	Korea	Korea	Korea	Korea	Korea	Korea	Taiwan	Thailand	Thailand	Thailand	Thailand	Thailand	Thailand	Taiwan
	6-Feb	7-Feb	10-Feb	11-Feb	13-Feb	15-Feb	17-Feb	23-Feb	26-Feb	28-Feb	1-Mar	2-Mar	3-Mar	8-Mar	10-Mar	13-Mar	16-Mar	18-Mar	19-Mar	21-Mar	23-Mar	25-Mar	27-Mar
HSRL2																							
GCAS																							

Intercomparisons

The DC-8 payload has many interconnections that need to be assessed. Some were initiated during the field campaign. All should be initially explored during the QA/QC phase of converting preliminary to final data.

<u>Trace Gas comparisons:</u>

Chemilum:ROZE – O_3
Chemilum:CANOE – NO_2
DACOM:MIRO – CO, CH_4, N_2O
DLH:MIRO – H_2O
CIT-CIMS:K-CIMS – SO_2
CIT-CIMS:TOGA – HCN
LGR-AAT:OPALS – NH_3
ISAF:TOGA – CH_2O
WAS:ETILDAS – C_2H_6
WAS:TOGA:PTR-MS – Benzene, Toluene
TOGA:PTR-MS – CH_3CHO, Acetone and Propanal, MEK, CH_3OH, MVK and MAC, Furfural, CH_3CN
WAS:TOGA - CFC11, CFC113, CFC114, CH_3Cl, CH_2Cl_2, $CHCl_3$, CH_3CCl_3, C_2HCl_3, C_2Cl_4, $CHBrCl_2$, $CHBr_2Cl$, CH_3Br, CH_2Br_2, $CHBr_3$, CH_3I, DMS, Propane, iButane, nButane, iPentane, nPentane, x2MePentane, x3MePentane, nHexane, nHeptane, x224TrimePentane, nOctane, iButeneAnd1Butene, EthBenzene, mpXylene, oXylene, Styrene, $MeONO_2$, $EthONO_2$, $iPropONO_2$

<u>Aerosol comparisons:</u>

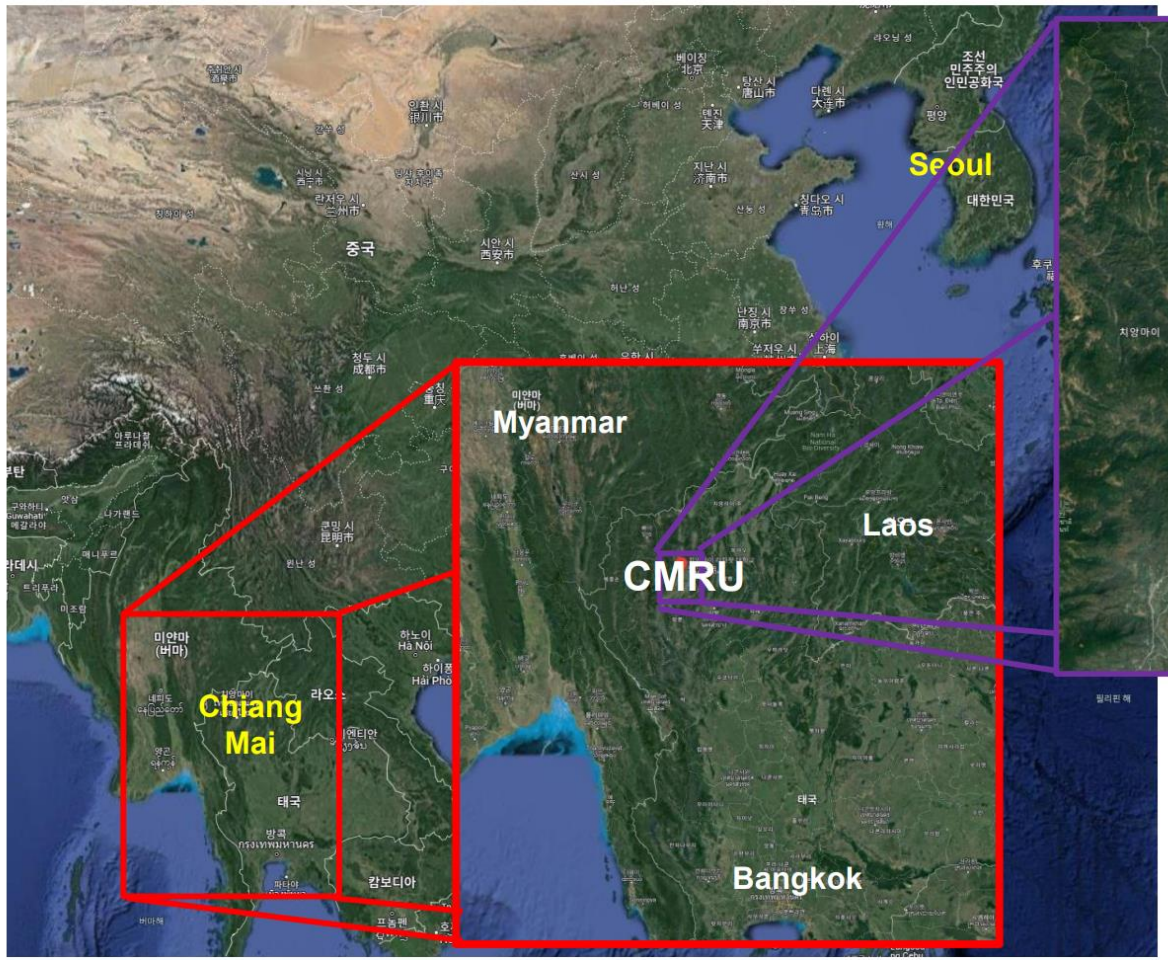
AMS:K-AMS – Aerosol Composition
LARGE:K-SP2:K-SP2D – Black Carbon
LARGE:K-CCN - CCN
LARGE:K-SMPS:K-CCN – Size Distributions

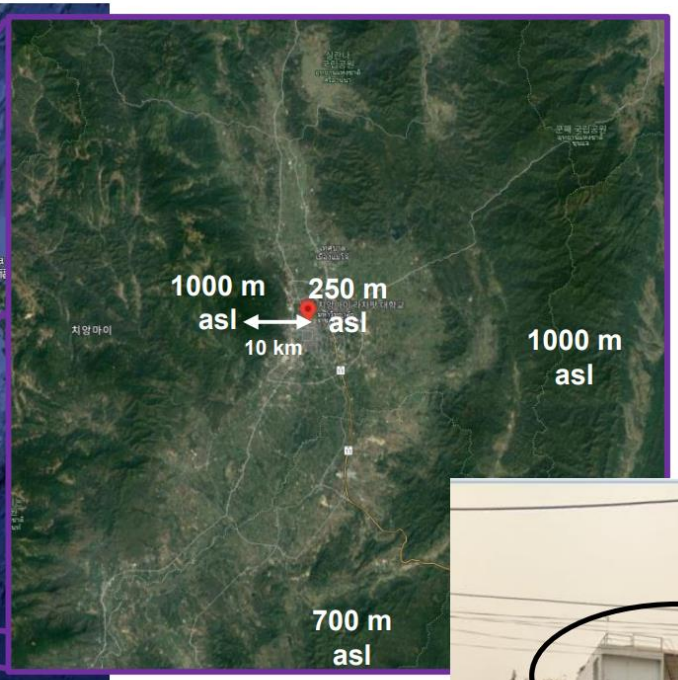
Ground measurement at Chiang-Mai, Thailand during the ASIA-AQ Campaign: Preliminary results

Junsu Gil[1], Meehye Lee[1], Jiseon Lee[2], Gangwoong Lee[2], Yebin Seo[3], Dahyun baek[3], Jo-chun Kim[3], Min-suk Bae[4], Inho Song[5], Jongseong Park[5], Hyejeong Shin[5], Sun-a Shin[5], Duangduean Thepnuan[6], Ratchaphon Samphutthanon[7], Chayanon Sawatdeenarunat[8], Worawit Suppawimut[9], Somporn Chantara[10], Sarunpron Khruengsai[11], Titapron Supasri[11], Ronald Macatangay[11]

[1]Department of Earth and Environmental Sciences, Korea University, Seoul, South Korea
[2]Department of Environment, Hankuk University of Foreign Study, Yongin, South Korea
[3]Department of Environmental Engineering, Konkuk University, Seoul, South Korea
[4]Department of Environmental Engineering, Mokpo National University, Muan, South Korea
[5]Climate and Air Quality Research Department, National Institute of Environmental Science, Incheon, South Korea
[6]Department of Chemistry, Faculty of Science and Technology, Chiang Mai Rajabhat University, Chiang Mai, Thailand
[7]AiroTEC, Chiang Mai Rajabhat University, Chiang Mai, Thailand
[8]Asian Development College for Community Economy and Technology (adiCET), Chiang Mai Rajabhat University, Chiang Mai, Thailand
[9]Department of Geopraphy, Chiang Mai Rajabhat University, Chiang Mai, Thailand
[10]Faculty of Science, Chiang Mai University, Chiang Mai, Thailand
[11]Atmospheric Research Unit, National Astronomical Research Institute of Thailand, Chiang Mai, Thailand

Ground observation site (Chiang-Mai Rajabhat University)





Measurement

Mon	Tue	Wed	Thu	Fri	Sat	Sun
March				1	2	3
4	5	6	7	8	9	10
11	12	13	14	15	16	17
18	19	20	21	22	23	24
25	26	27	28	29	30	31

ASIA-AQ-TH

Online Measurement: 8th Mar – 27th Mar (20 days)

Passive Sampling: 12th Mar – 26th Mar (15 days)

Active Sampling: 13th Mar – 27th Mar (15 days)

DC-8 Flight: (1st) 16th MAR, (2nd) 18th MAR, (3rd) 21st MAR, (4th) 25th MAR

Measurement

Data repository (google drive)

- **Limited access**: send me an email (darkuncler@korea.ac.kr) for register the google drive
- Now in preliminary stage, and will be uploaded to the NASA ASIA-AQ archive after the QC

Analysis & Data Submission Status
-Google Drive-

- Complete
- In progress
- Preparing analysis

Team	Type	Species	Method	Group	Status
KR	Online Measurement	O_3	UV absorption	Korea University	
		NO,NO_2,NO_x	Chemiluminescence	Korea University	
		CO	NDIR	Korea University	
		SO_2	UV fluorescence	Korea University	
		Particle Number Conc (1-500 nm)	SMPS	National Institute of Environmental Science	
		Particle Number Conc (500- nm)	APS	National Institute of Environmental Science	
		eBC	Aethalometer	National Institute of Environmental Science	
		PM_1, $PM_{2.5}$, PM_4, PM_{10}	Light scatter sensor	Korea University	
	Active Sampling	VOCs (PAMS)	Absorption tube (every 4hr)	Korea University	
		VOCs (BVOC)	Absorption tube (every 4hr)	Konkuk University	
		Aldehydes	DNPH cartridge (every 4 hr)	Konkuk University, Mokpo National University	
		WSIIs	High-vol quartz filter (every 1 day)	Korea University	
		Isotope (C,N)	High-vol quartz filter (every 1 day)	Korea University	
		WSOC	High-vol quartz filter (every 1 day)	Korea University	
		OC/EC	High-vol quartz filter (every 1 day)	Korea University	
	Passive Sampling	NO_2, SO_2	Absorption Tube	Korea University	
		NH_3	Absorption Tube	Korea University	
		VOCs (PAMS)	Absorption Tube	Hankuk University of Foreign Studies	
TH	Online Measurement	T, RH, P, WS, WD		Chiang Mai Rajabhat University	
		$PM_{2.5}$		Chiang Mai Rajabhat University	
		PBLH	LIDAR	National Astronomical Research Institute of Thailand	
		$PM_{2.5}$	Sensor	Chiang Mai Rajabhat University	
	Active Sampling	Sugar compounds	Hi-vol quartz filter (every 1 day)	Chiang Mai Rajabhat University, Chiang Mai University	
		Heavy metals	Hi-vol quartz filter (every 1 day)	Chiang Mai Rajabhat University, Chiang Mai University	
		$PM_{2.5}$	Sensor	Chiang Mai Rajabhat University	
		VOCs		National Astronomical Research Institute of Thailand	
		Heavy metals		National Astronomical Research Institute of Thailand	
	Model Simulation	O_3, NO_2, SO_2, $PM_{2.5}$, BC, OC	WRF-Chem	National Astronomical Research Institute of Thailand	

Measurement Overview - Gases

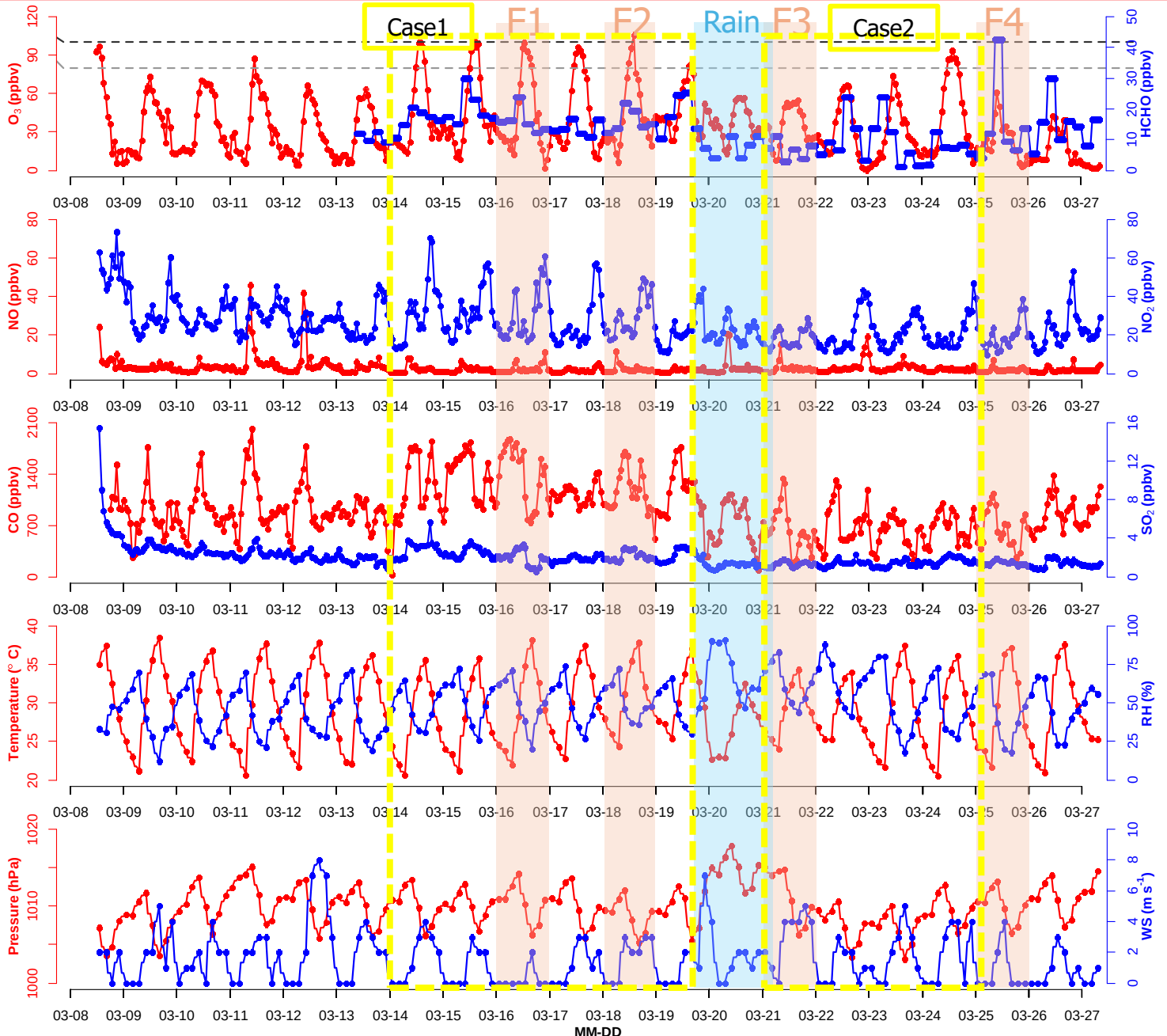
High O_3 event

[Over 100 ppbv]
: 2 days

3/15
3/18

[Over 80 ppbv]
: 9 days

3/8
3/11
3/14
3/15
3/16
3/17
3/18
3/19
3/24



O_3 (ppbv)
Avg: 35.0
Max: 105.4
HCHO (ppbv)
Avg: 13.1
Max: 42.5

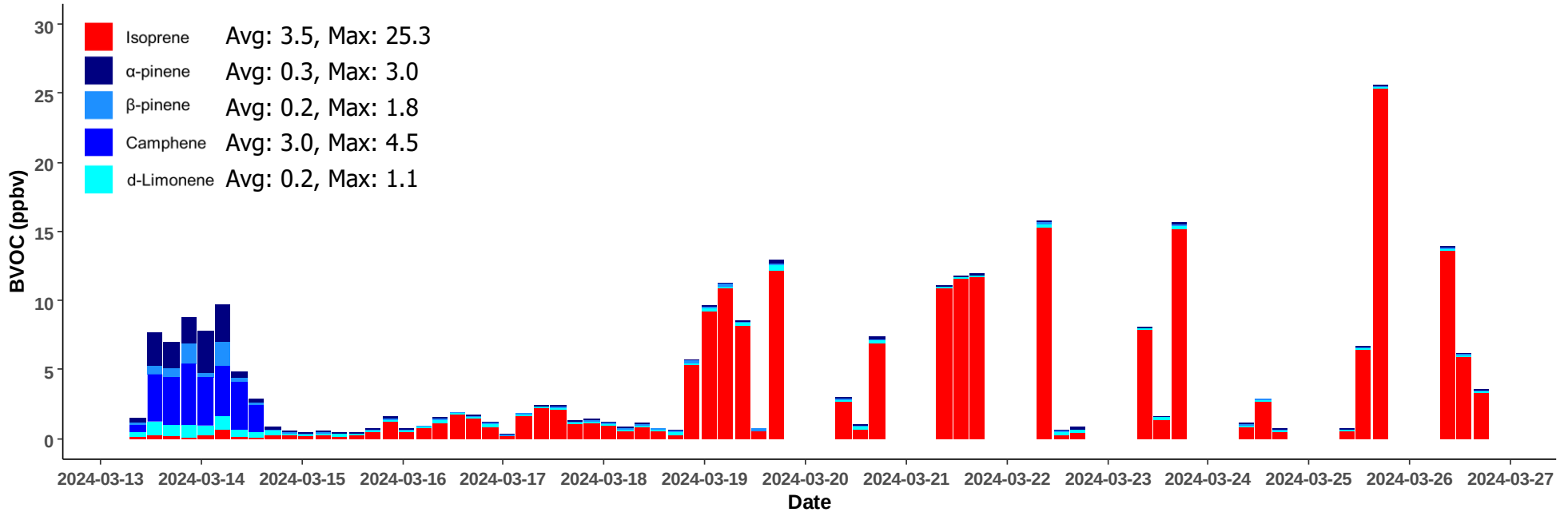
NO (ppbv)
Avg: 3.3
Max: 49.1
NO_2 (ppbv)
Avg: 26.4
Max: 73.5

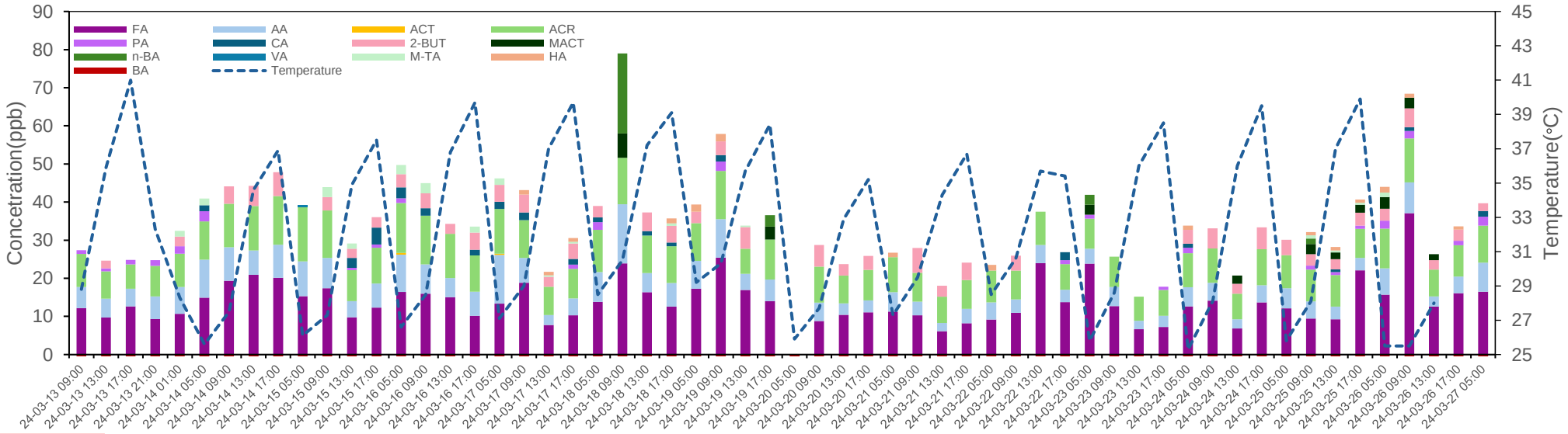
CO (ppbv)
Avg: 925
Max: 2009
SO_2 (ppbv)
Avg: 2.1
Max: 15.4

Temperature (°C)
Avg: 29.1
Max: 38.5
RH (%)
Avg: 49.7
Max: 91.0

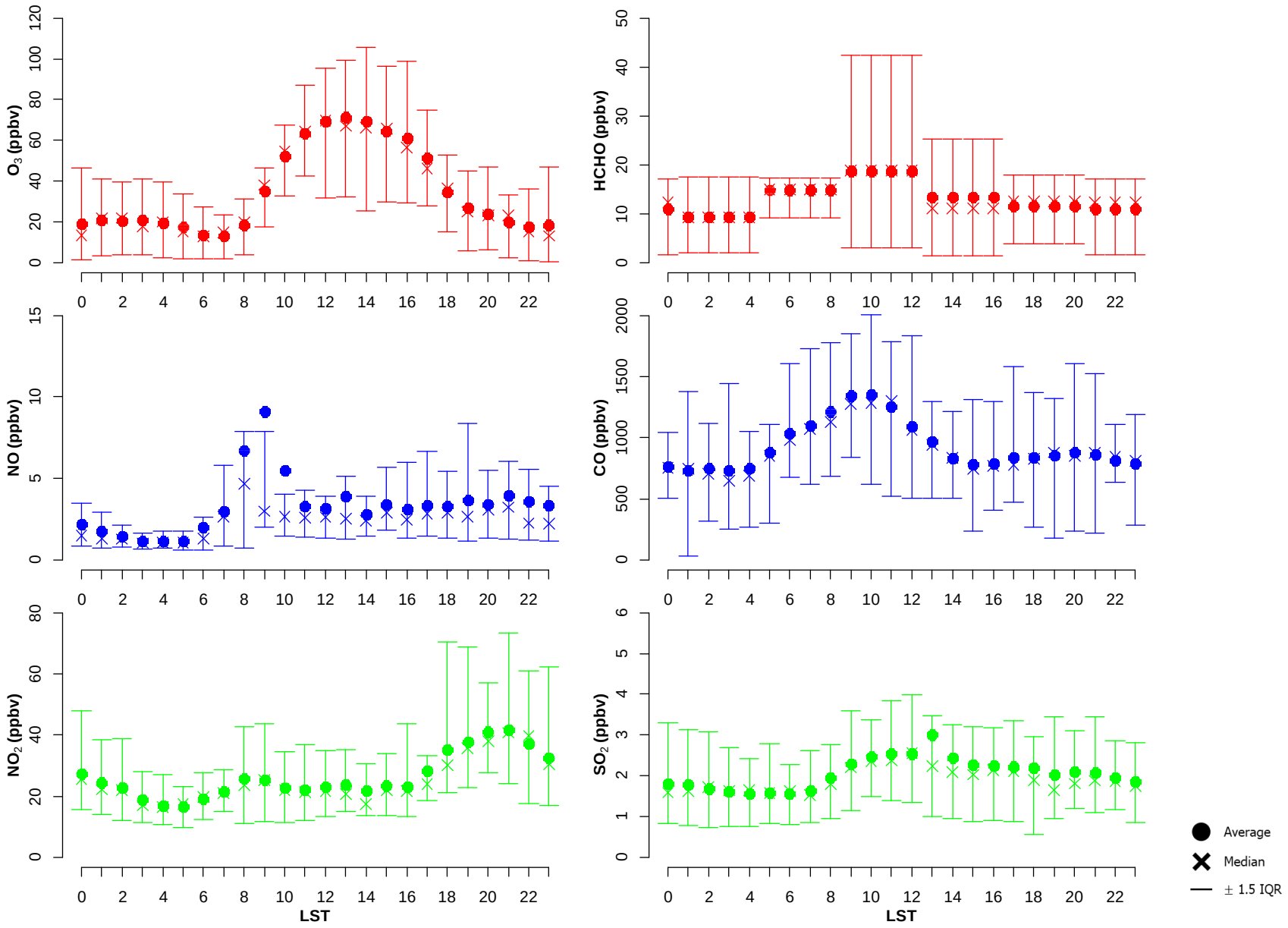
Pressure (hPa)
Avg: 1010
Max: 1018
WS (m s^{-1})
Avg: 1.5
Max: 8.0

Measurement Overview - Gases





Measurement Overview - Gases

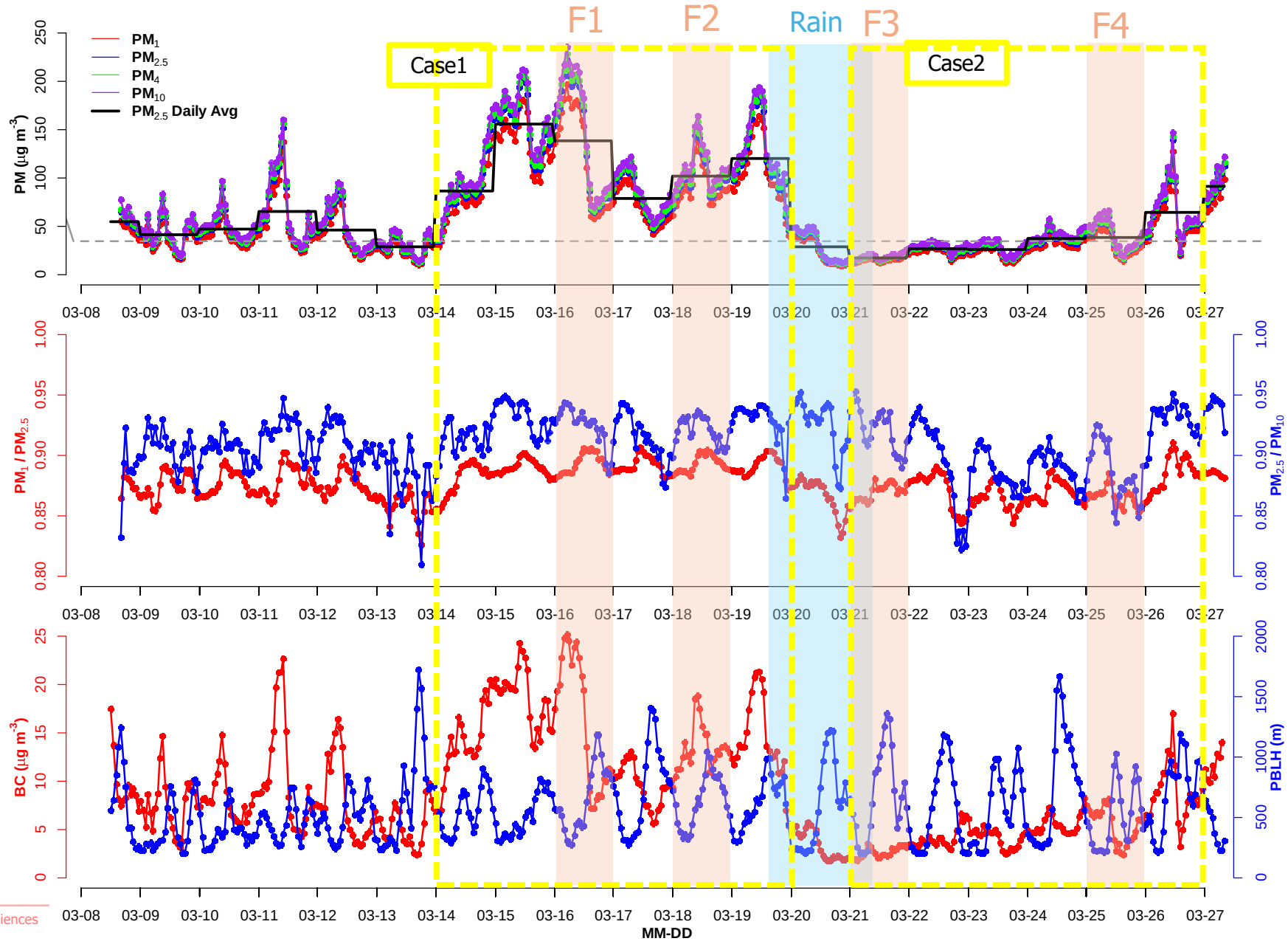


Measurement Overview – Particles & PBL

High $PM_{2.5}$ event

[Over 35 ug m^{-3}]
: 15 days

3/8
3/9
3/10
3/11
3/12
3/14
3/15
3/16
3/17
3/18
3/19
3/24
3/25
3/26
3/27



$PM_{1.0}$ (ug m^{-3})
Avg: 57.0
Max: 196.8

$PM_{2.5}$ (ug m^{-3})
Avg: 64.4
Max: 222.0

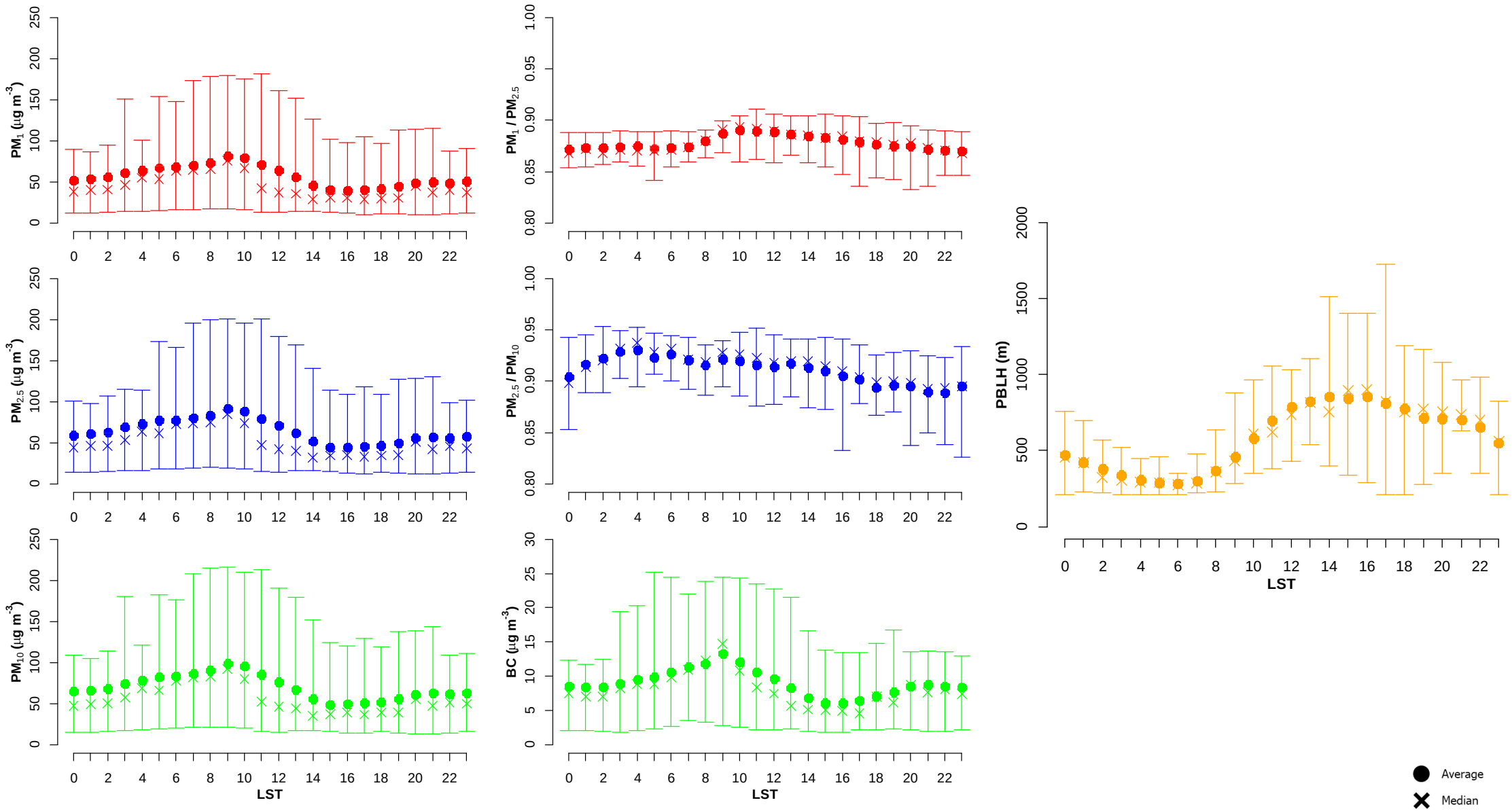
$PM_{4.0}$ (ug m^{-3})
Avg: 66.6
Max: 228.5

PM_{10} (ug m^{-3})
Avg: 70.1
Max: 235.5

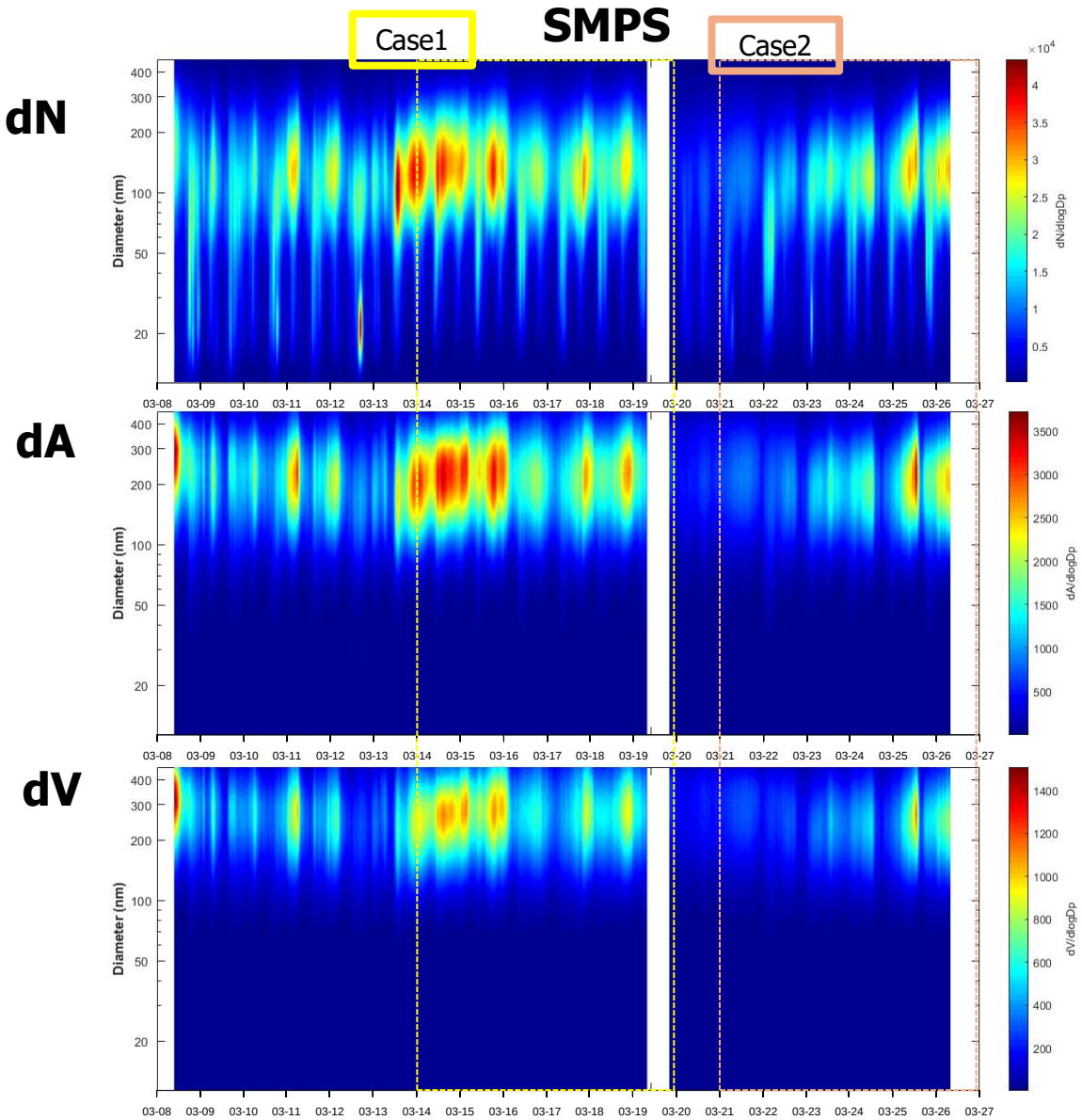
BC (ug m^{-3})
Avg: 9.0
Max: 25.2

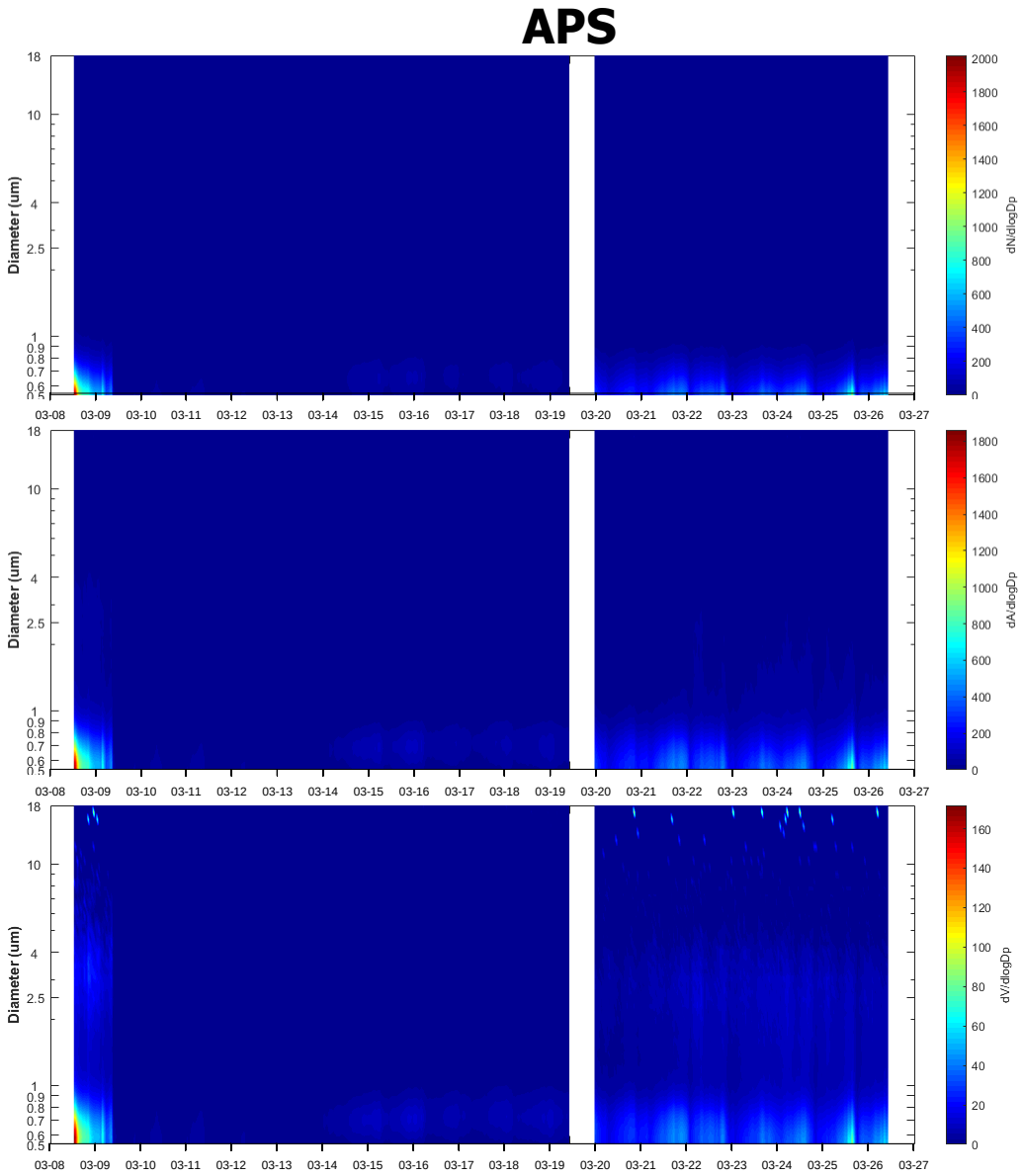
PBLH (m)
Avg: 583.2
Max: 1725.8

Measurement Overview - Particles & PBL

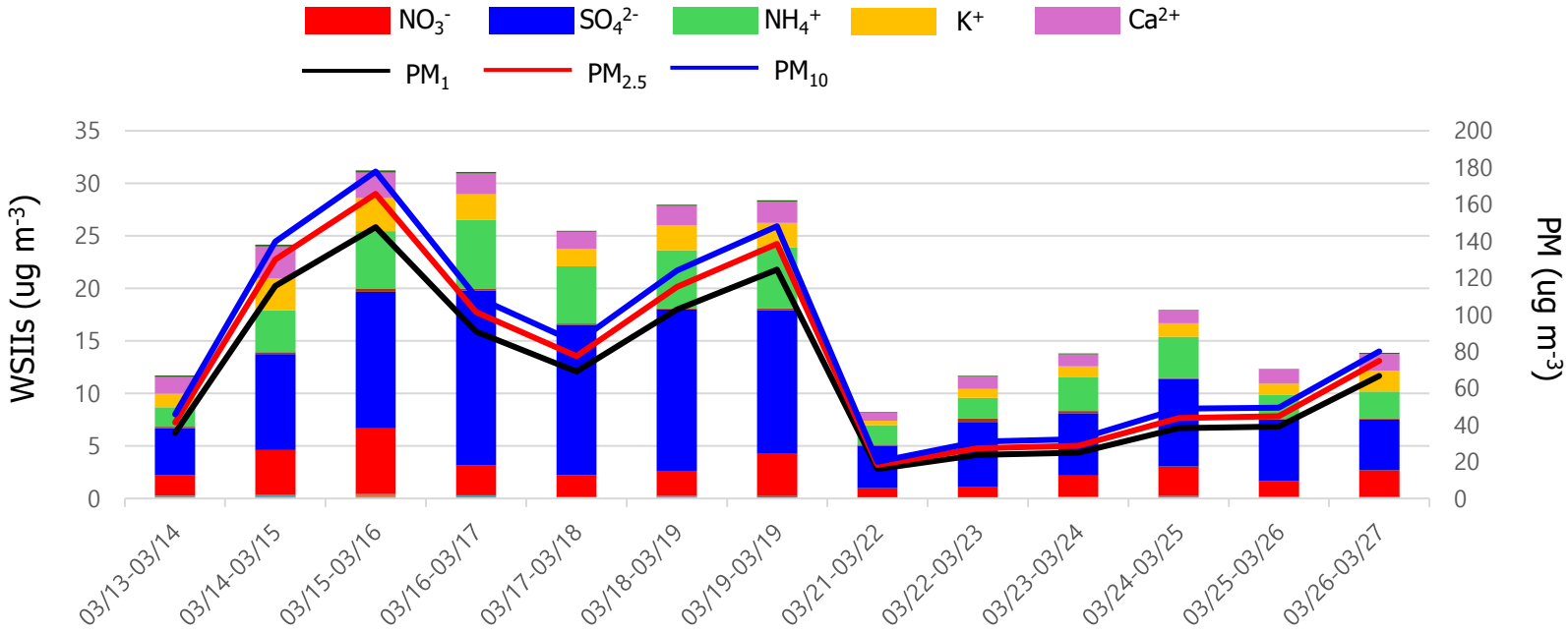


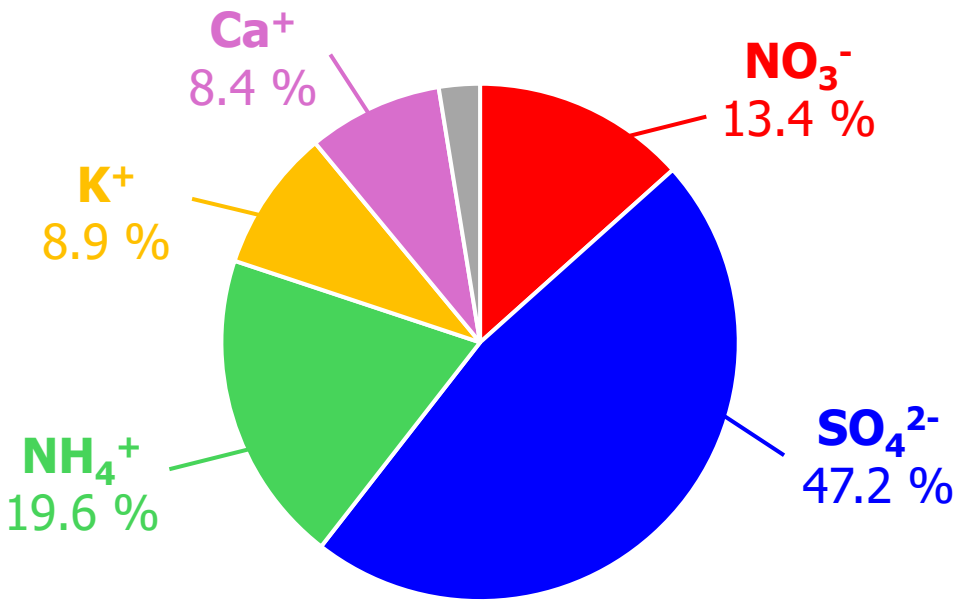
Measurement Overview - Particles & PBL



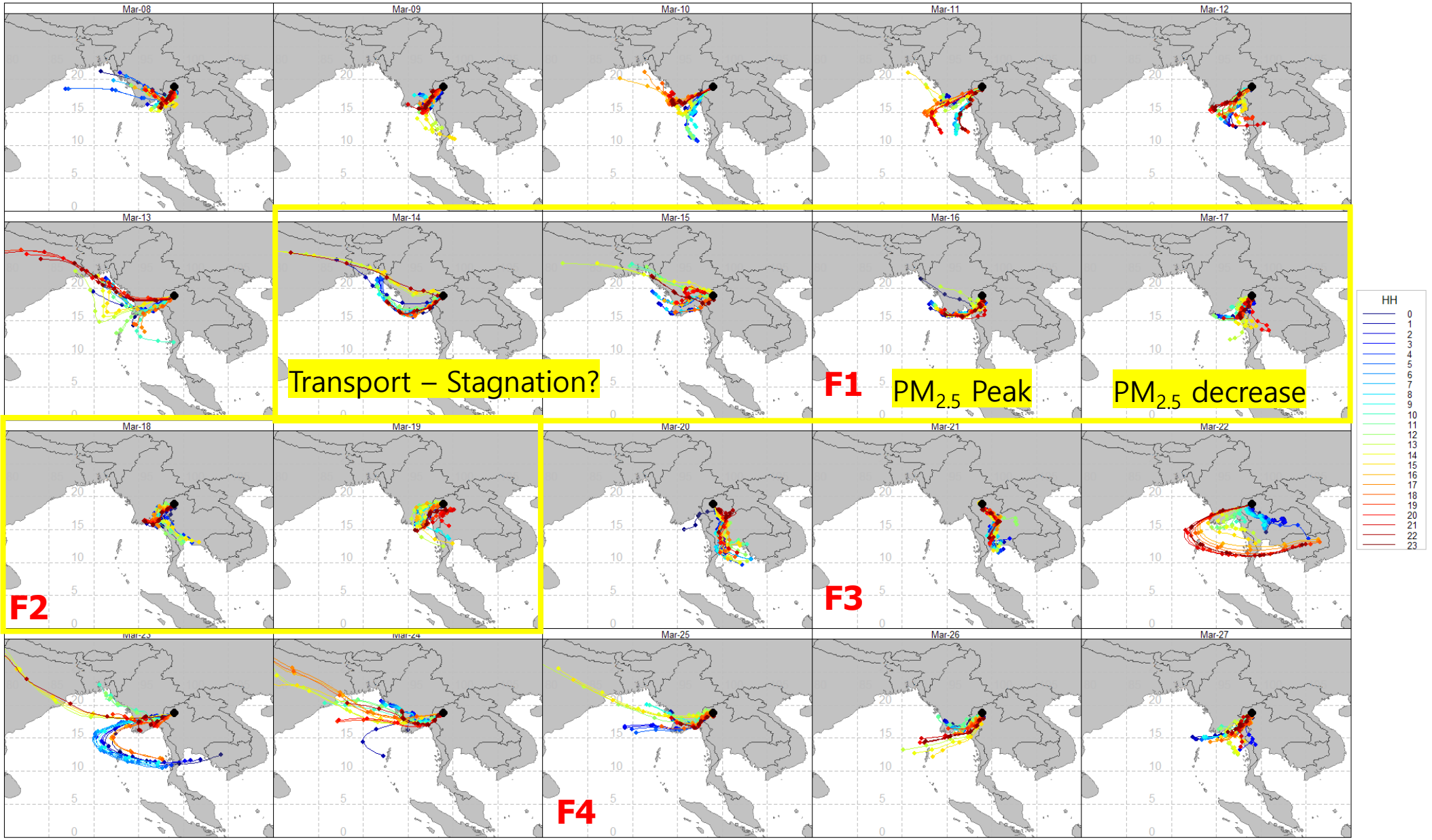


Measurement Overview - Particles & PBL



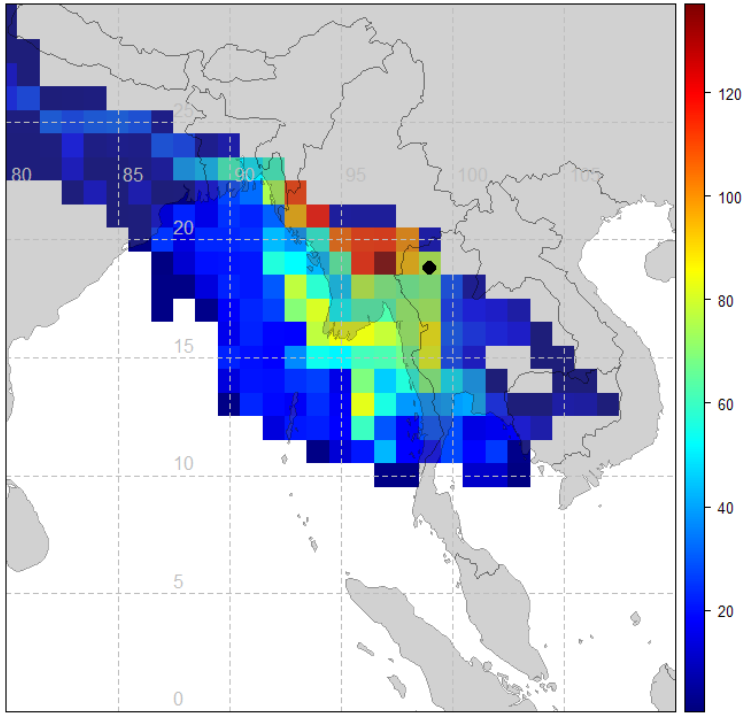


Synoptic Meteorology - HYSPLIT

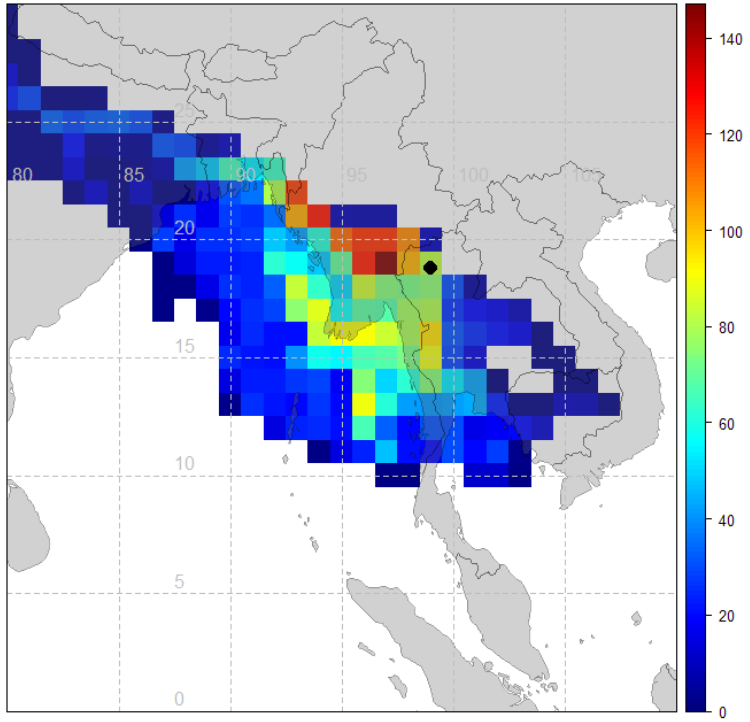


Source apportionment – HYSPLIT CWT

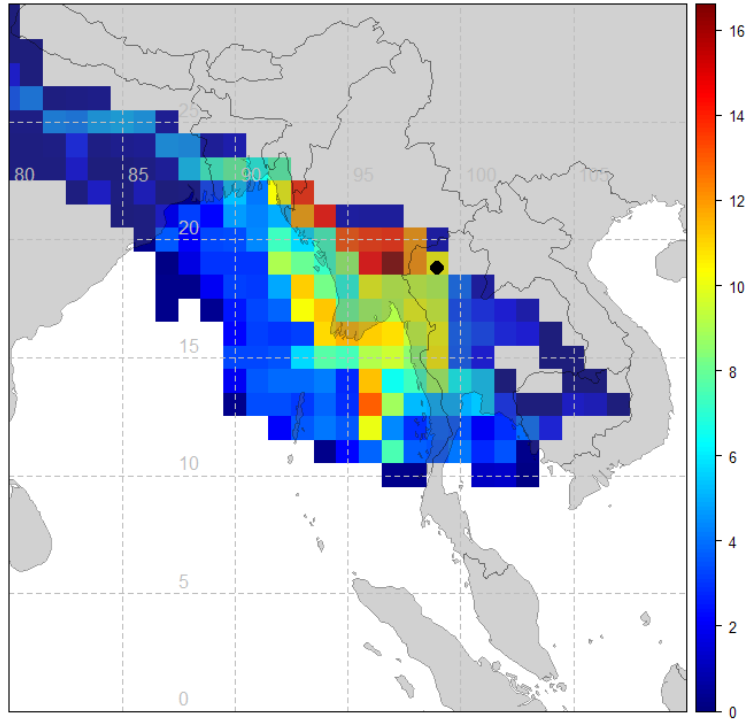
$PM_{2.5}$



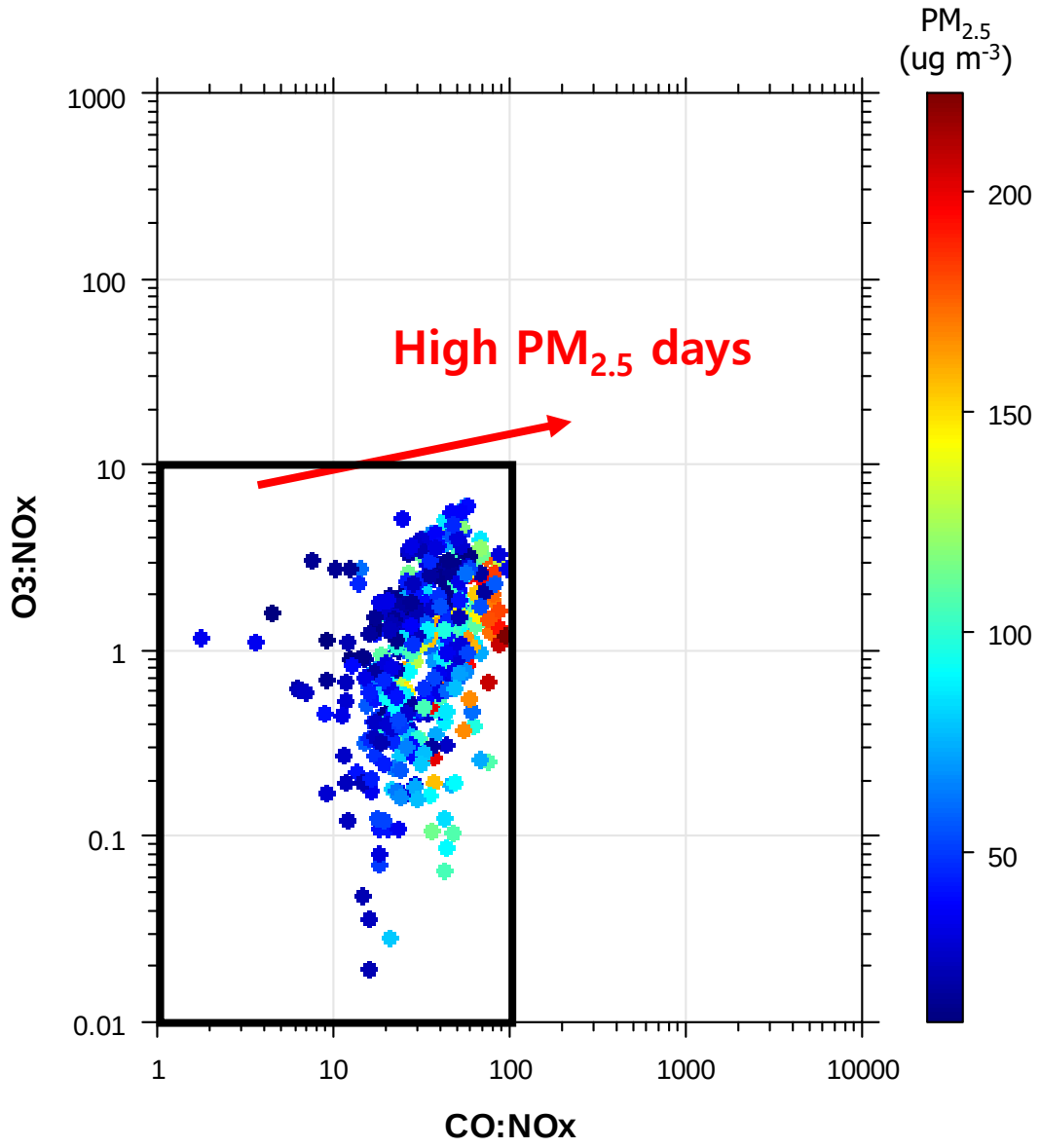
PM_{10}

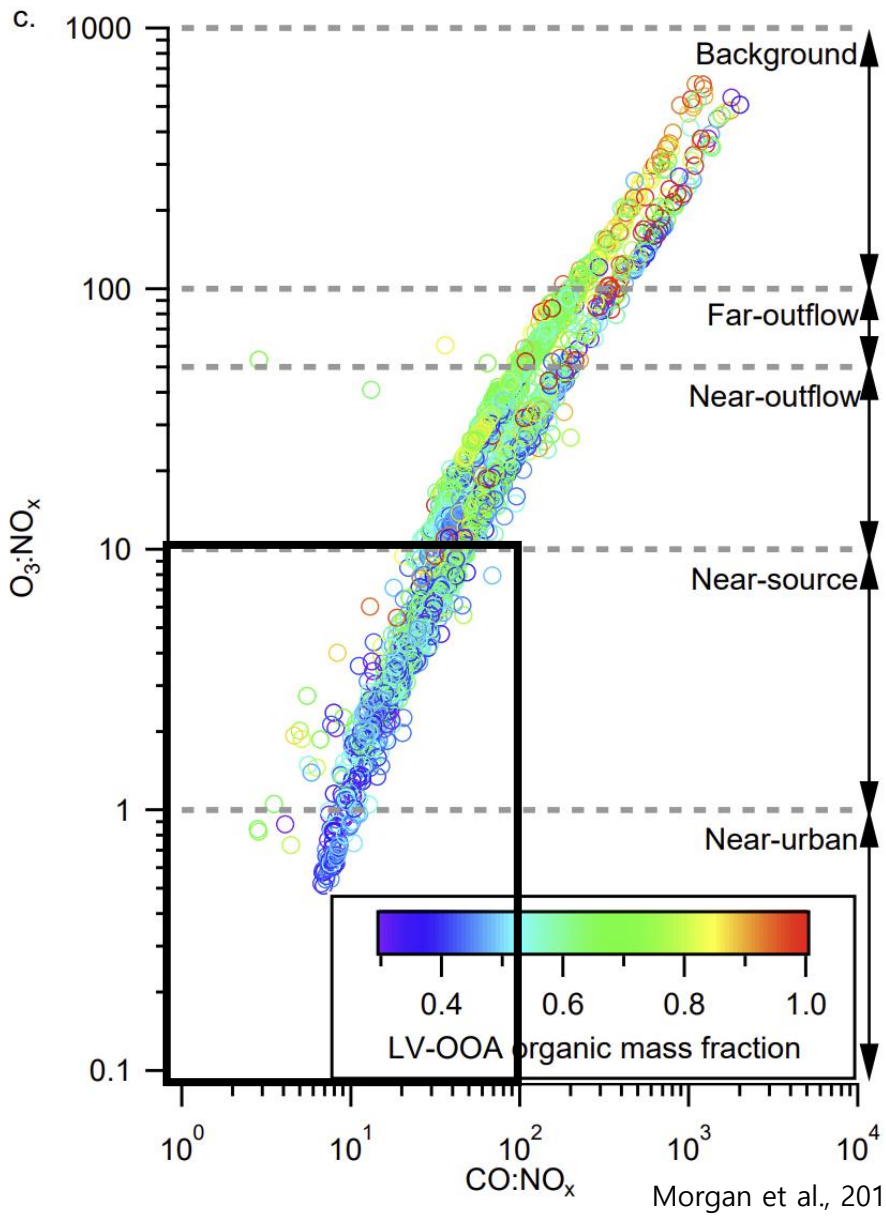


BC



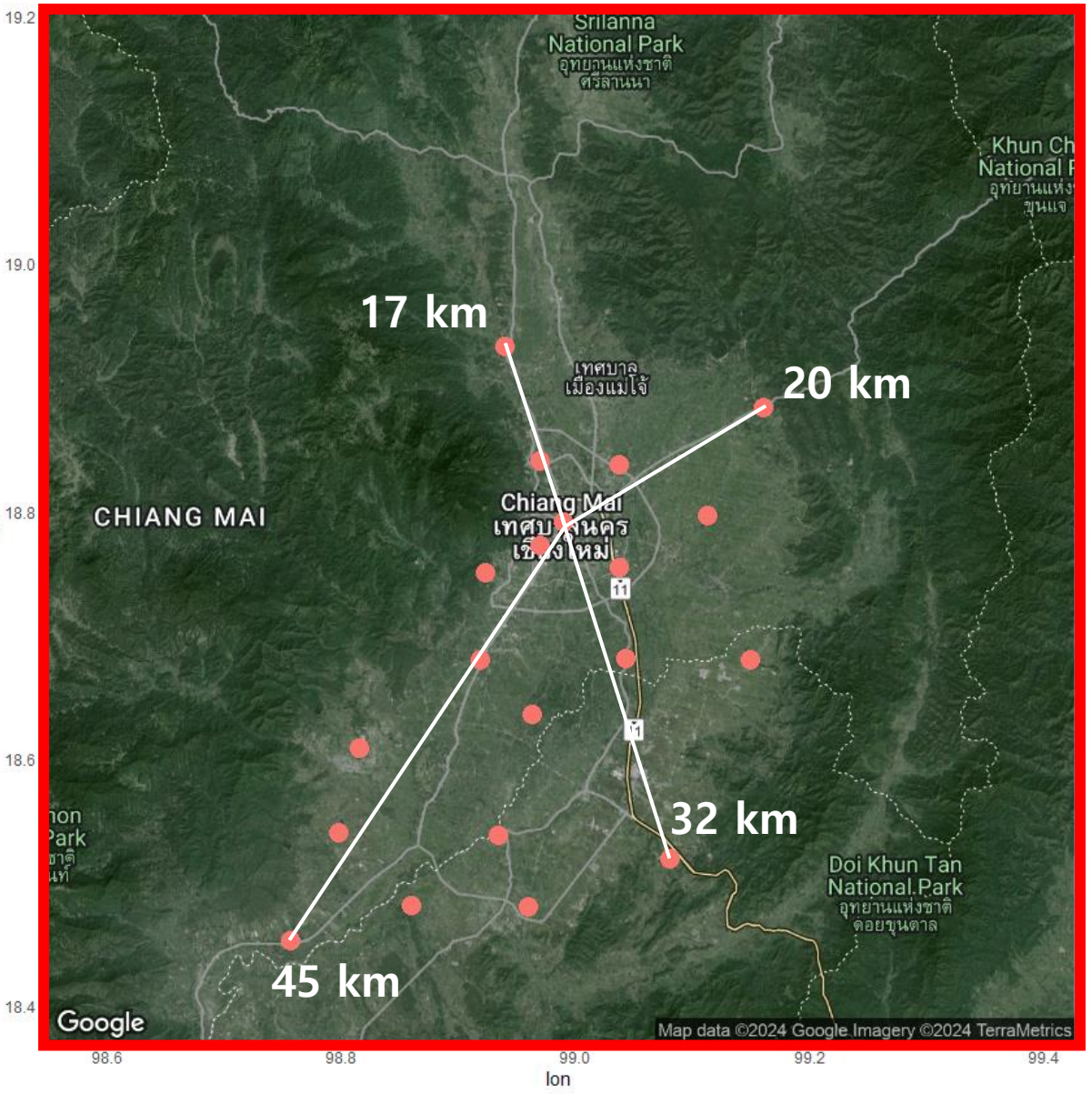
Local dir-emission / transport ?





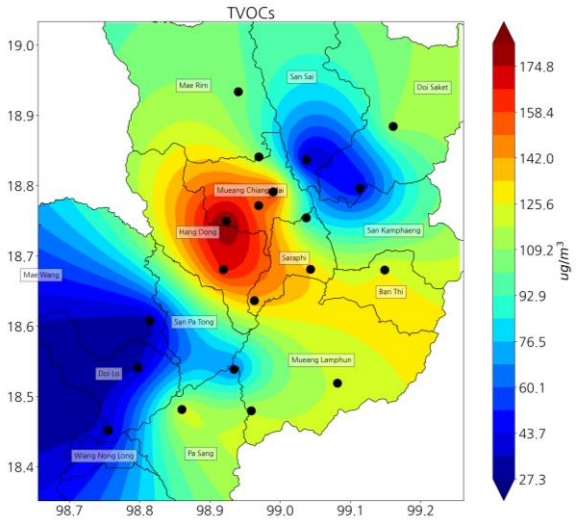
Morgan et al., 2010, ACP

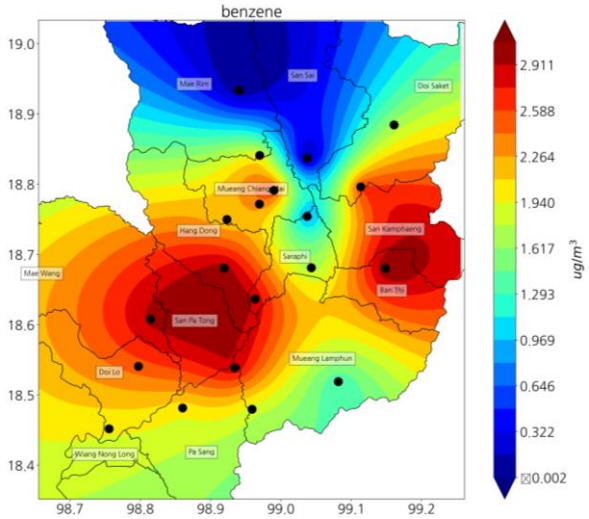
Passive sampling sites (Chiang-Mai state)

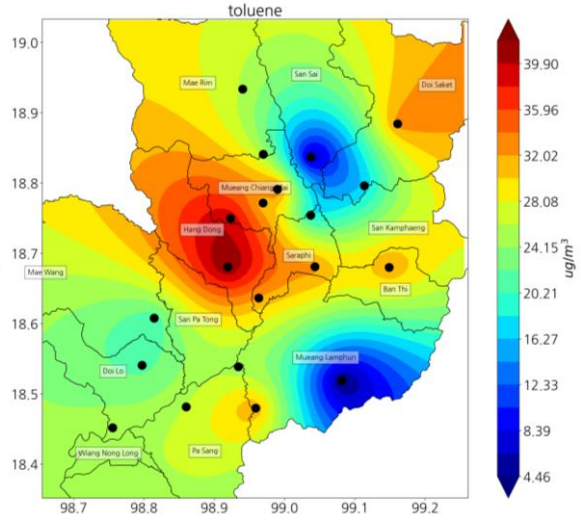


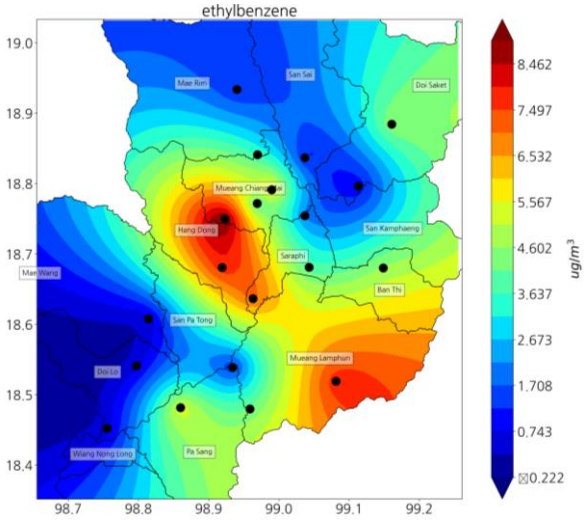
20 points for passive sampling
→ **NO_2/SO_2/NH_3/VOCs**

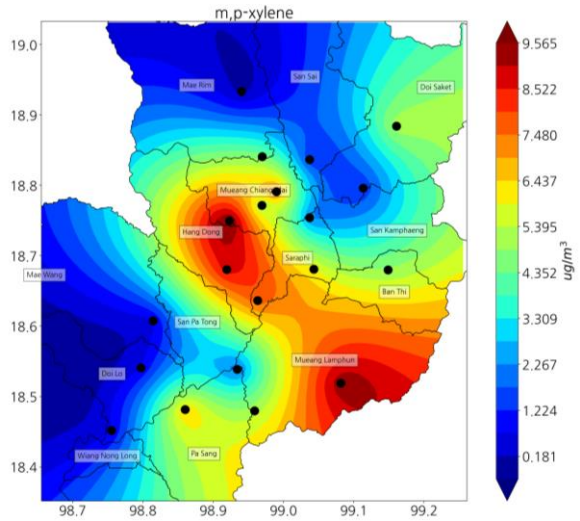
Passive sampling results (VOCs)







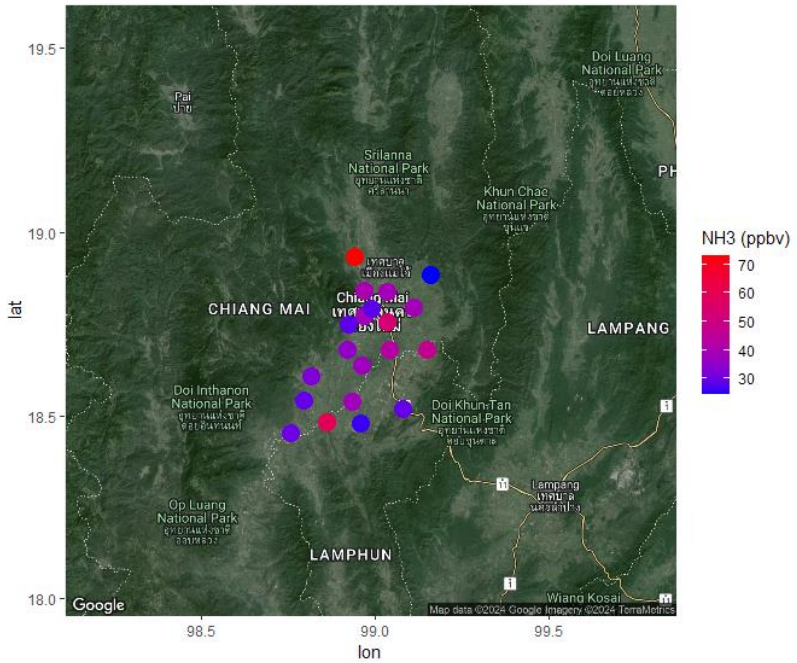


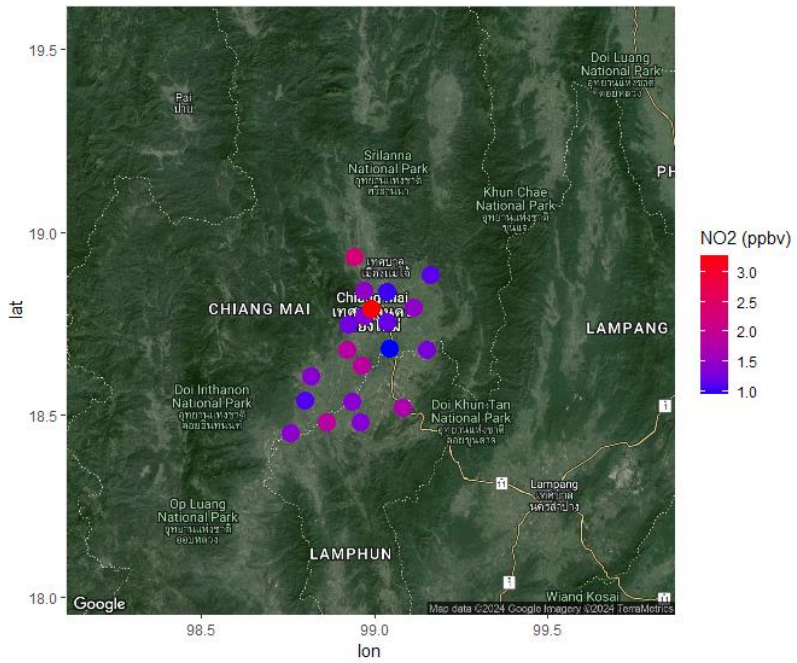


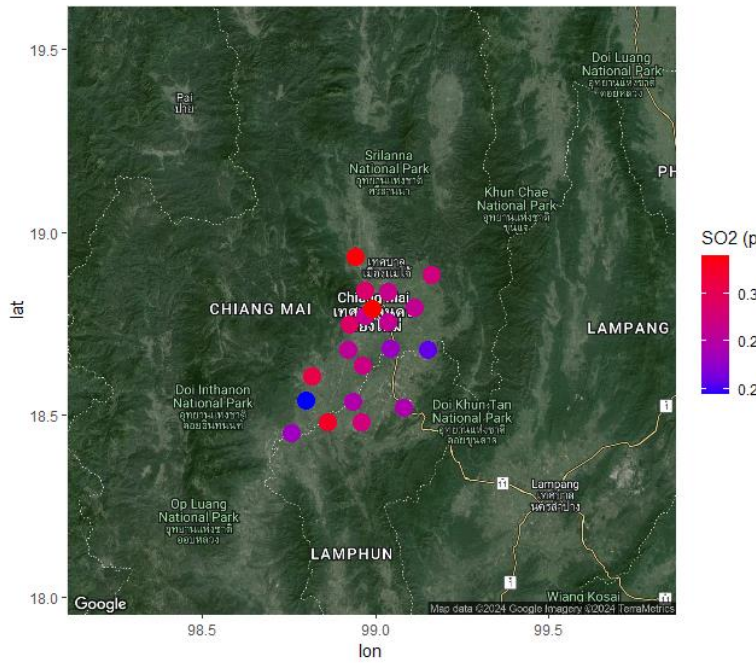
- **TVOC**: High concentration observed at Inner city
- **BTEX**: Benzene (East), Ethylbenzene & m,p-xylene (South-East)

- **Highest concentration** (ug m^{-3})
: Toluene (26.1), n-hexane (10.8), n-pentane (6.3)
→ Anthropogenic emission indicator?

Passive sampling results (NH_3, NO_2, SO_2)







- NH_3, NO_2, SO_2: High concentration observed at near entrance point (North & South)
- NO_2, SO_2: Also high at inner city

Thank you for attention!

Department of Earth and Environmental Sciences
Korea University

Contact: darkuncler@korea.ac.kr

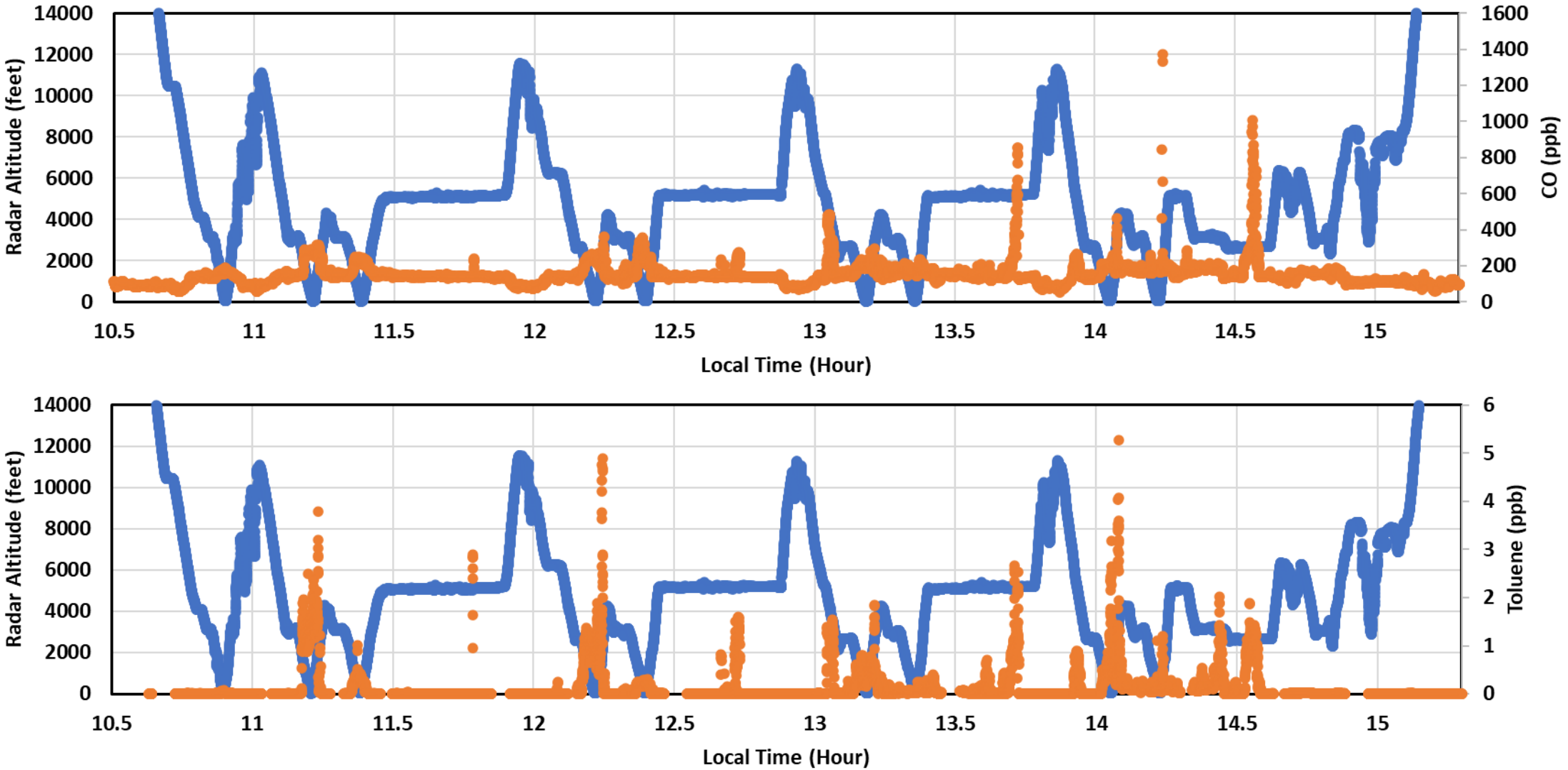
Brainstorming (from last time)

- Korea: offshore pollution demonstrating what can be potentially transported. Origin, age, fire contribution?
- All: Demonstrate that missed approaches are a viable sampling strategy and show much greater variability than expected.
- Thailand: Examine the shift in GEMS HCHO. Is it real? Fires vs biogenics.
- All: Examine differences in constituent profile shapes and perturbation depths.
- Thailand: Examine similarities and differences in emission ratios for Thai smoke versus crop fires and wildfires during FIREX-AQ.
- Thailand: Examine relationship between O3 and HCHO in GEMS and Pandora observations
- All: Evaluate the effectiveness of the air quality monitoring network
- Philippines and Thailand: Examine the role of black carbon.
- Thailand: Characterize north-south gradients in aerosol composition…extent of fire influence
- Philippines: What's up with ozone? Why is it not higher over Manila.
- Philippines: How important is the sea salt contribution to PM2.5?
- Taiwan: Characterize VOC mixtures and toxics in Kaohsiung.
- All: Compare footprint of ascents and descents compared to spiral profiling (and duration and location)
- All: Evaluate whether the surface temperature measurement offers any insight into PBLH and urban heat island effects.

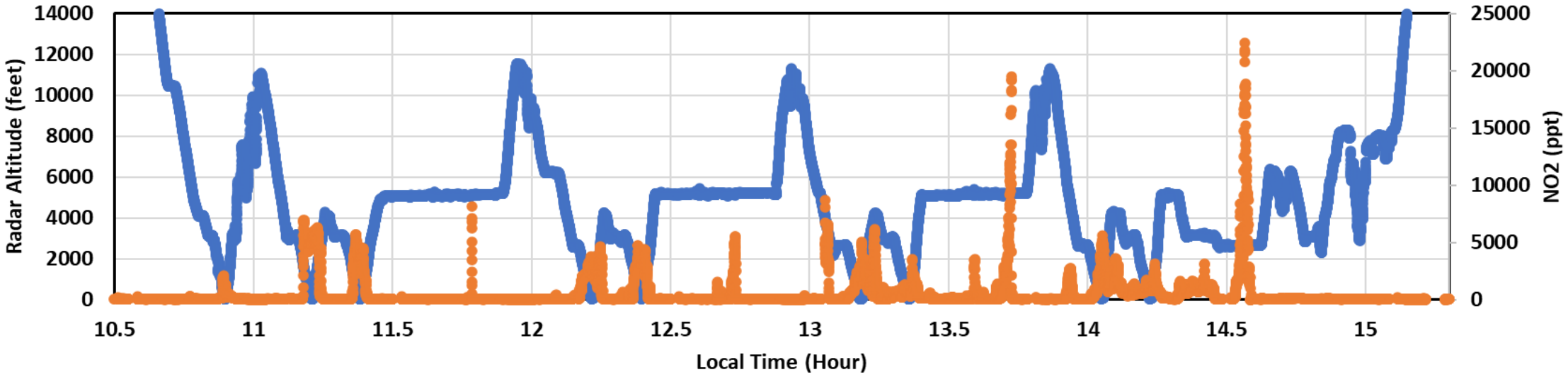
Brainstorming (new input)

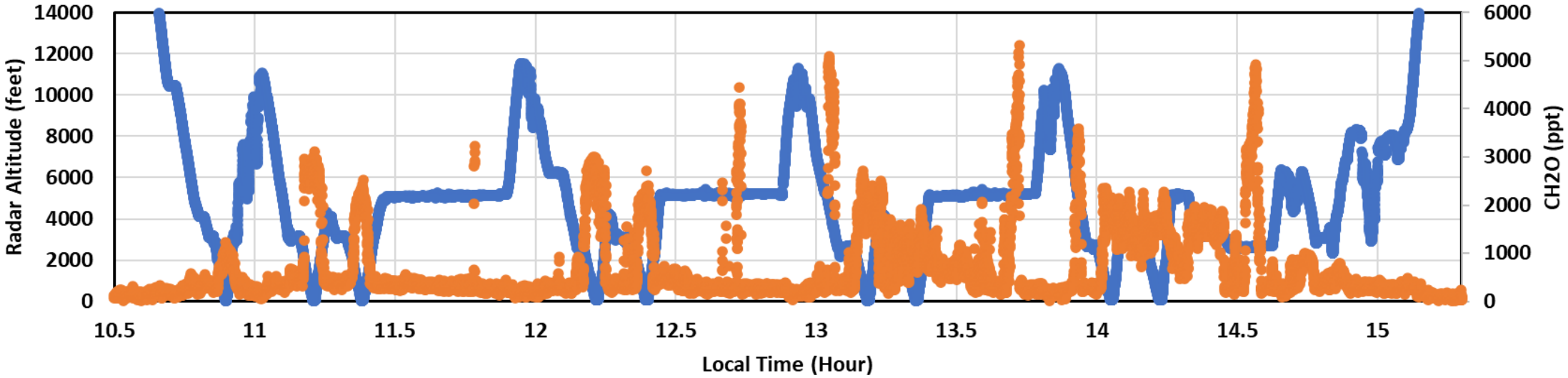
- **Philippines: Assuming similar emission profiles on the different flight days, what are the conditions that lead to polluted days and relatively cleaner days (given the complex topography of Manila and the Northeast monsoon season)**
- **Philippines: How do conditions on the more polluted and cleaner days help to inform the aerosol-meteorology relationship.**

Taiwan (preliminary data, 15 Feb)



Taiwan (preliminary data, 15 Feb)





Organizing the Roadmap Ahead

Rough timeline and milestones:

1 October 2024 - Final Data Submission and Public Release

(develop questions and outlines for synthesis reports by this date)

Mid-January 2025 - Science Team Meeting - tentative suggestion is for UKM in Malaysia to host

(5 days – one day dedicated to each country with talks, posters, and breakouts to further develop draft synthesis reports)

Mid-February to mid-March 2025 - Deliver and publicize synthesis reports in each country