

Collect, Analyze, and Archive Filters at two DISCOVER-AQ Houston Focus Areas: Initial Characterization of PM Formation and Emission



Rebecca J. Sheesley and Sascha Usenko

Department of Environmental Science, Baylor University, Waco, TX



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Project Objectives:

- Characterize initial OC and EC concentrations using fine particulate matter ($PM_{2.5}$) and total suspended particulate (TSP) air filter samples collected at two of DISCOVER-AQ Houston's focus areas.
 - Focus areas include ground stations near Katy and H-NET Jones Forest.
 - Archive filters for two years at $-10\text{ }^{\circ}\text{C}$ for future research opportunities.
 - Provide access of filters to DISCOVER-AQ project leadership and external research groups and collaborators.
- Measure optical BC using a seven channel aethalometer at the H-NET Jones Forest ground station.
- Compare ground-based OC, EC, and optical BC with other aerosol measurements made directly over focus areas on NASA's P-3B and B200 aircraft (i.e. water soluble organic carbon and BC).



Moody Tower ground-based sampling



Two HVTSP sampler, a HV2.5 sampler, a MV2.5 sampler, and an aethalometer.

Manvel Croix ground-based sampling



Two HVTSP sampler, a HV2.5 sampler, a MV2.5 sampler, and an aethalometer.

Secondary ground-based sampling site La Porte and Conroe



La Porte



Conroe

Particulate Matter Samples

Ground-based Sites	Sampler Type	Sampler Operator	Sampler Provider
Moody Tower	HVTSP	BU	BU
Moody Tower	MV2.5 *	BU	BU
Moody Tower	HV2.5	BU	EPA
Moody Tower	HVTSP	BU	UW
Moody Tower	Aethalometer	BU	BU
Manvel Croix	HVTSP	BU	BU
Manvel Croix	MV2.5	BU	BU
Manvel Croix	HV2.5	BU	EPA
Manvel Croix	PAX	BU	DMT
Conroe	HV2.5	UT	EPA
La Porte	HVTSP	EPA	UW

* Dual sample train with quartz fiber and Teflon filters

EPA denotes Environmental Protection Agency

BU denotes Baylor University

UW denotes University of Wisconsin-Madison

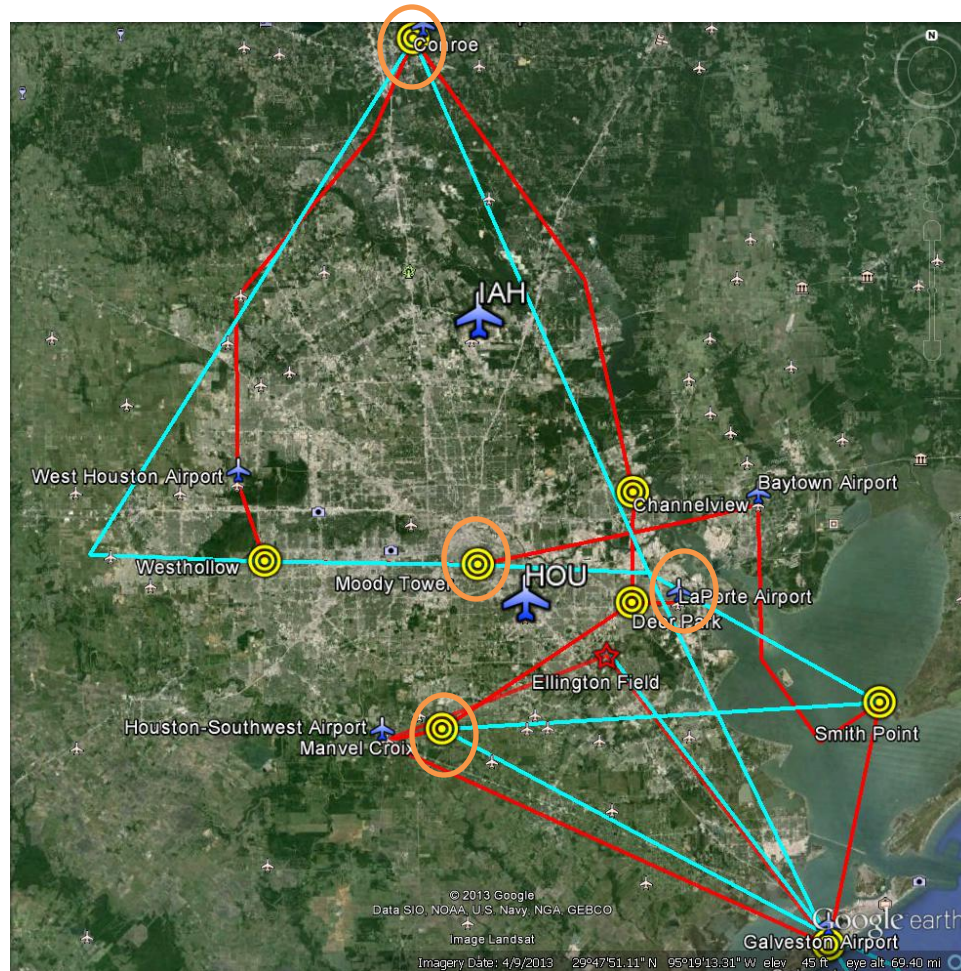
UT denotes University of Texas -Austin

DMT denotes Droplet Measurement Technologies

Particulate Matter Samples

Site	Filter Type	Potential Analysis	Total collected
Moody Tower	QFF	OCEC, WSOC, 14C, organic contaminants and molecular markers	107
Moody Tower	Teflon	Mass, Trace metals	25
Moody Tower	Aluminum	OCEC, WSOC, 14C, elemental and single particle analysis	35
Moody Tower/ Manvel Croix	PUF	Organic contaminants and molecular markers	9
Manvel Croix	QFF	OCEC, WSOC, 14C, organic contaminants and molecular markers	74
Conroe	QFF	OCEC, WSOC, 14C, organic contaminants and molecular markers	25
La Porte	QFF	OCEC, WSOC, 14C, organic contaminants and molecular markers	25

Sampling sites



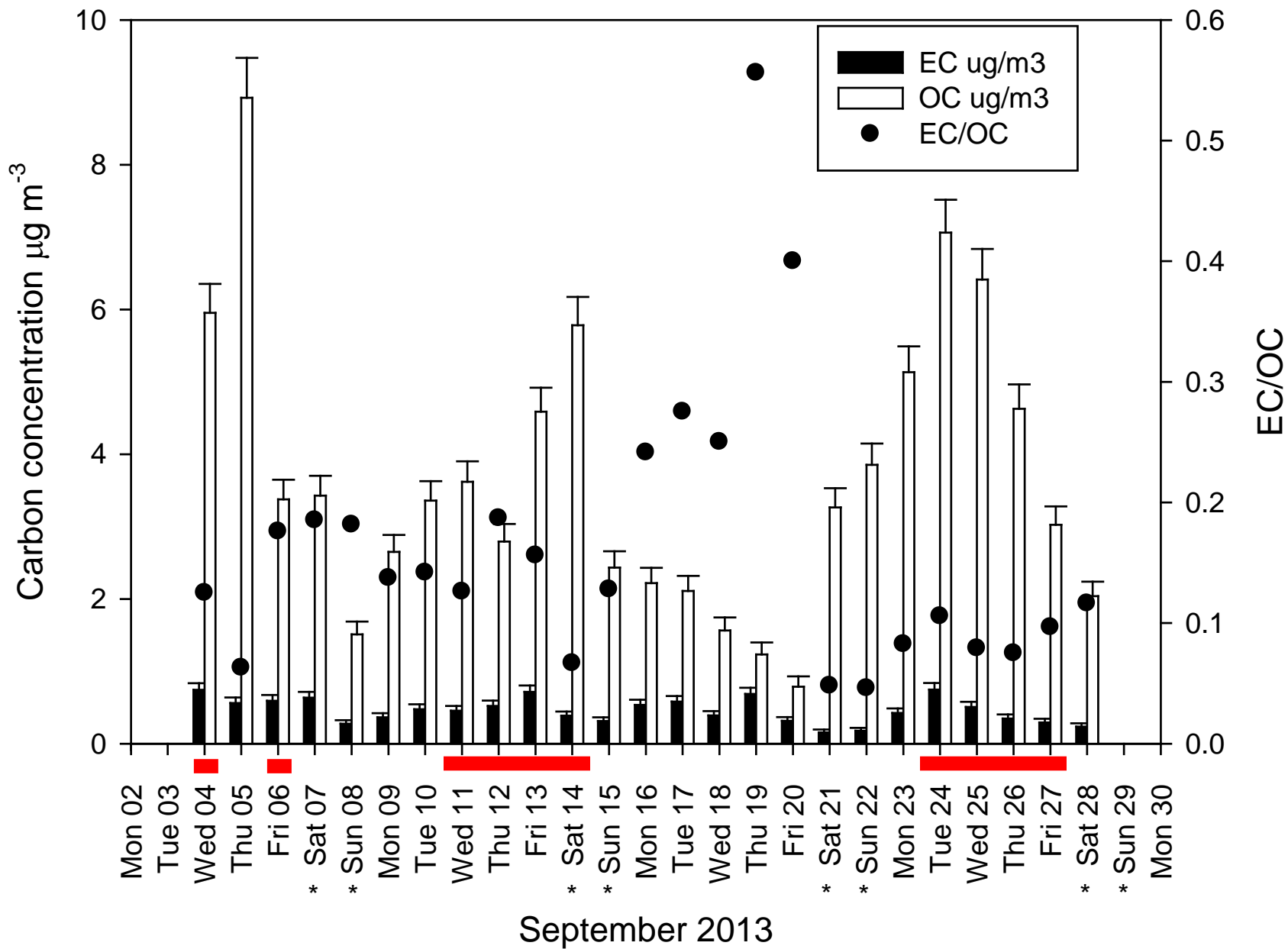
Moody Tower Calendar of Samples

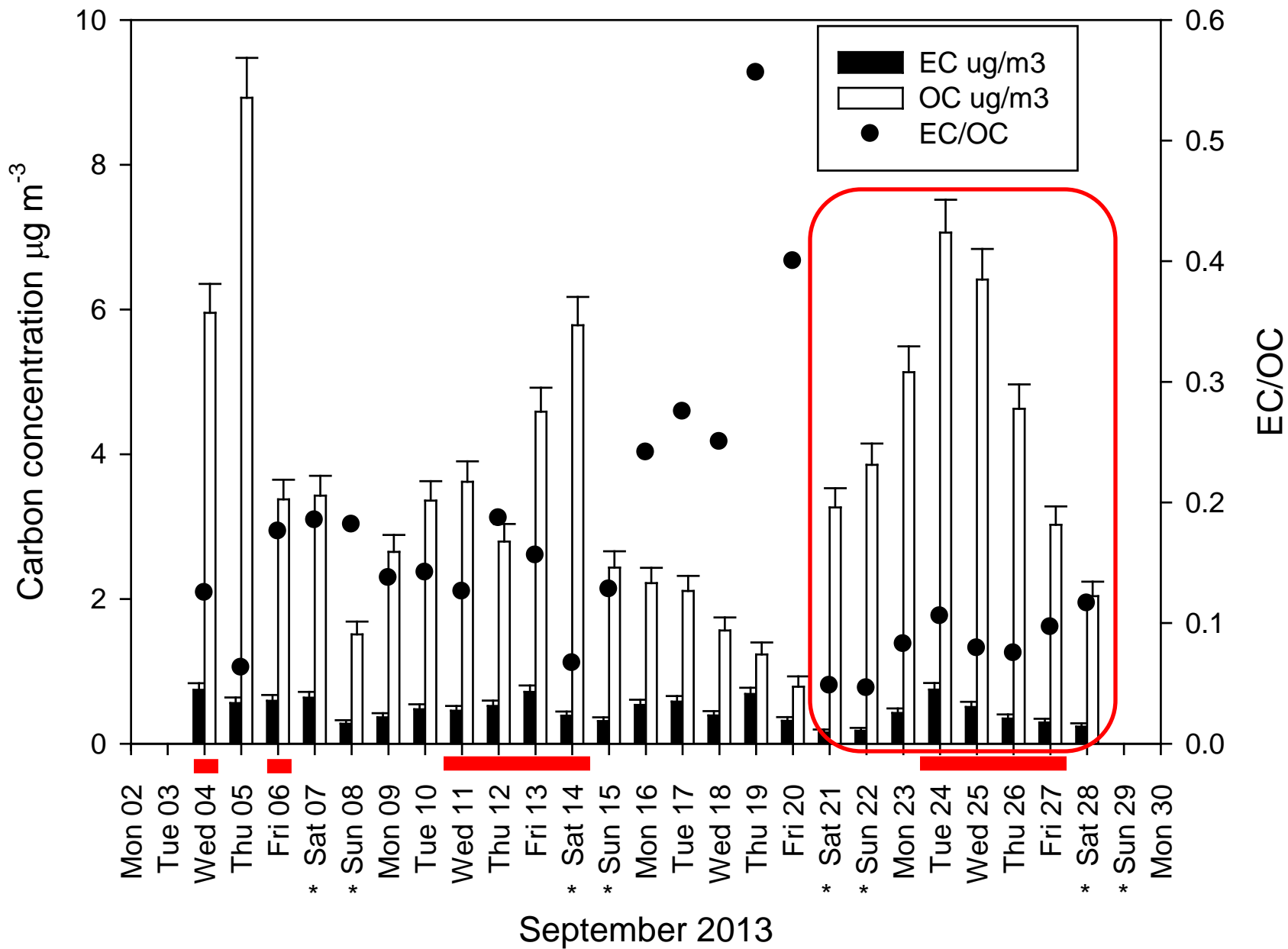
	Sunday	Monday	Tuesday	Wednesday	Thursday	Friday	Saturday
Date	1	2	3	Flight 4	5	Flight 6	7
TSP				M,A,N	M,A,N	D,N	D,N
HV2.5				M,A,N	M,A,N	D	
MV2.5/Teflon				24h	24h	24h	24h
PUF							
IMP							
Date	8	9	10	Flight 11	Flight 12	Flight 13	Flight 14
TSP	D,N	D,N	D,N	D,N	D,N	M,A	D,N
HV2.5	D	D	D	D	D	D	D
MV2.5/Teflon	24h	24h	24h	24h	24h	24h	24h
PUF				D	D		
IMP				D	D		
Date	15	16	17	18	19	20	21
TSP	D,N	M,A,N	M,A,N	24h	24h		D,N
HV2.5	D	D	M,A	M	M,A	D	D
MV2.5/Teflon	24h	24h	24h	24h	24h	24h	24h
PUF				D	D		
IMP				D	D		
Date	22	23	Flight 24	Flight 25	Flight 26	Flight 27	28
TSP	D,N	D,N	D,N	D,N	D,N	D,N	D
HV2.5	D	D	D	D	D	D	D
MV2.5/Teflon	24h	24h	24h	24h	24h	24h	24h
PUF		D	D	D	D	D	D
IMP				D	D		D

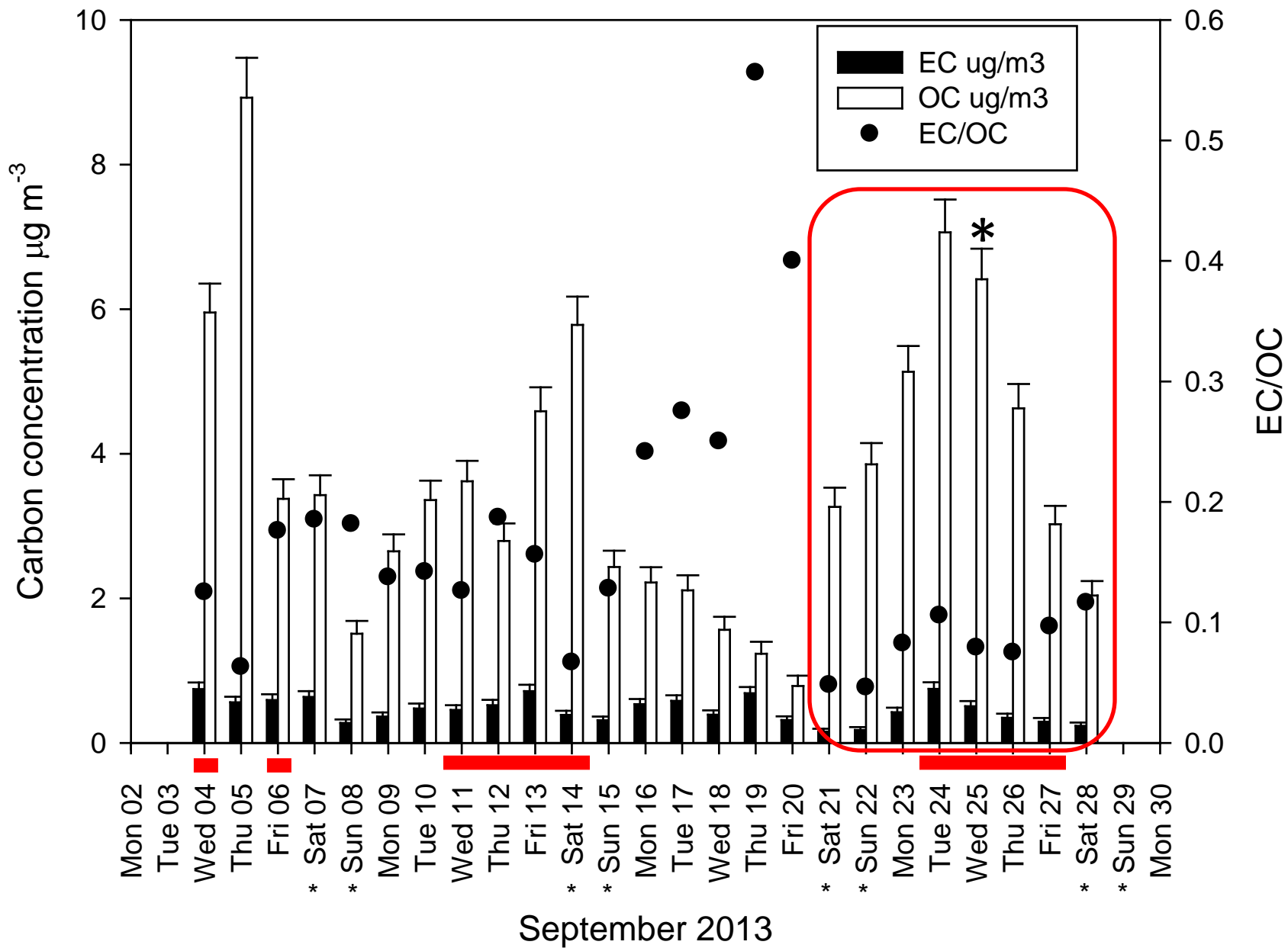
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M= Morning (06:00-10:00) A= Afternoon (10:00-20:00) N= Night (20:00-06:00)

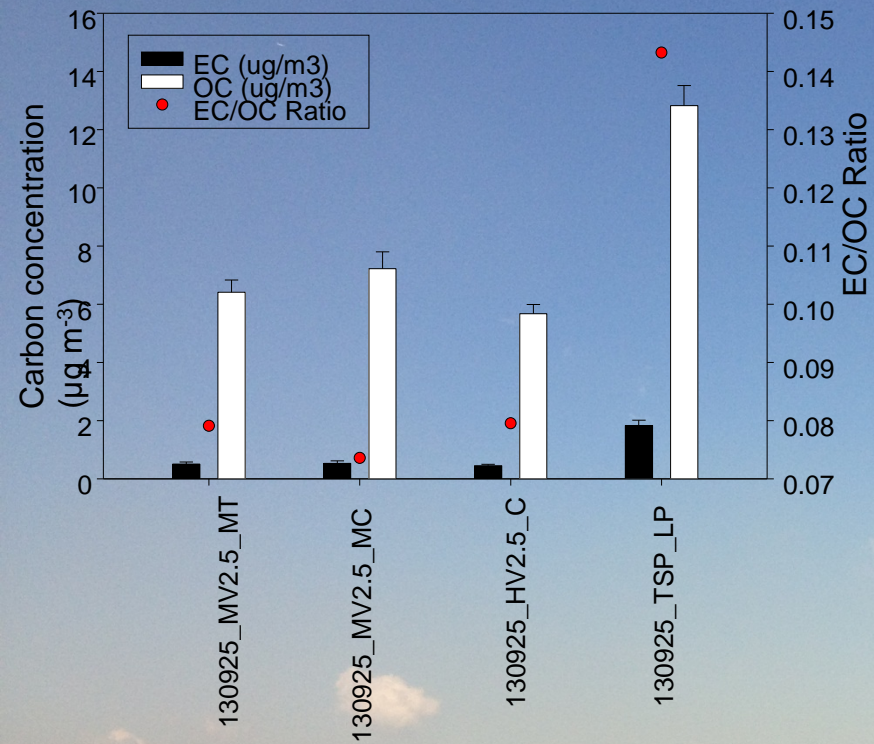
24h= 24 hour sample **Flight**= Discover AQ Flight Day

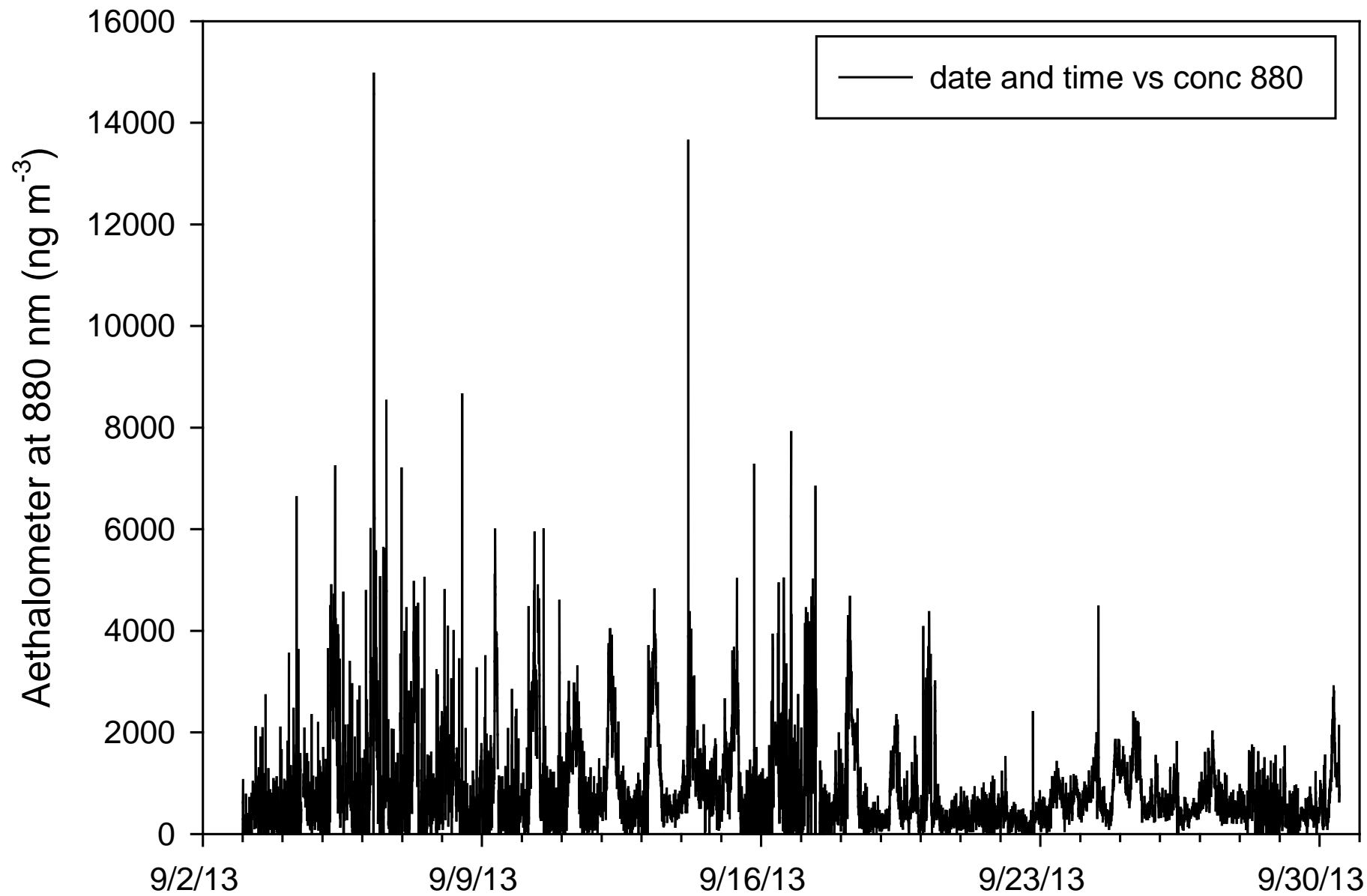


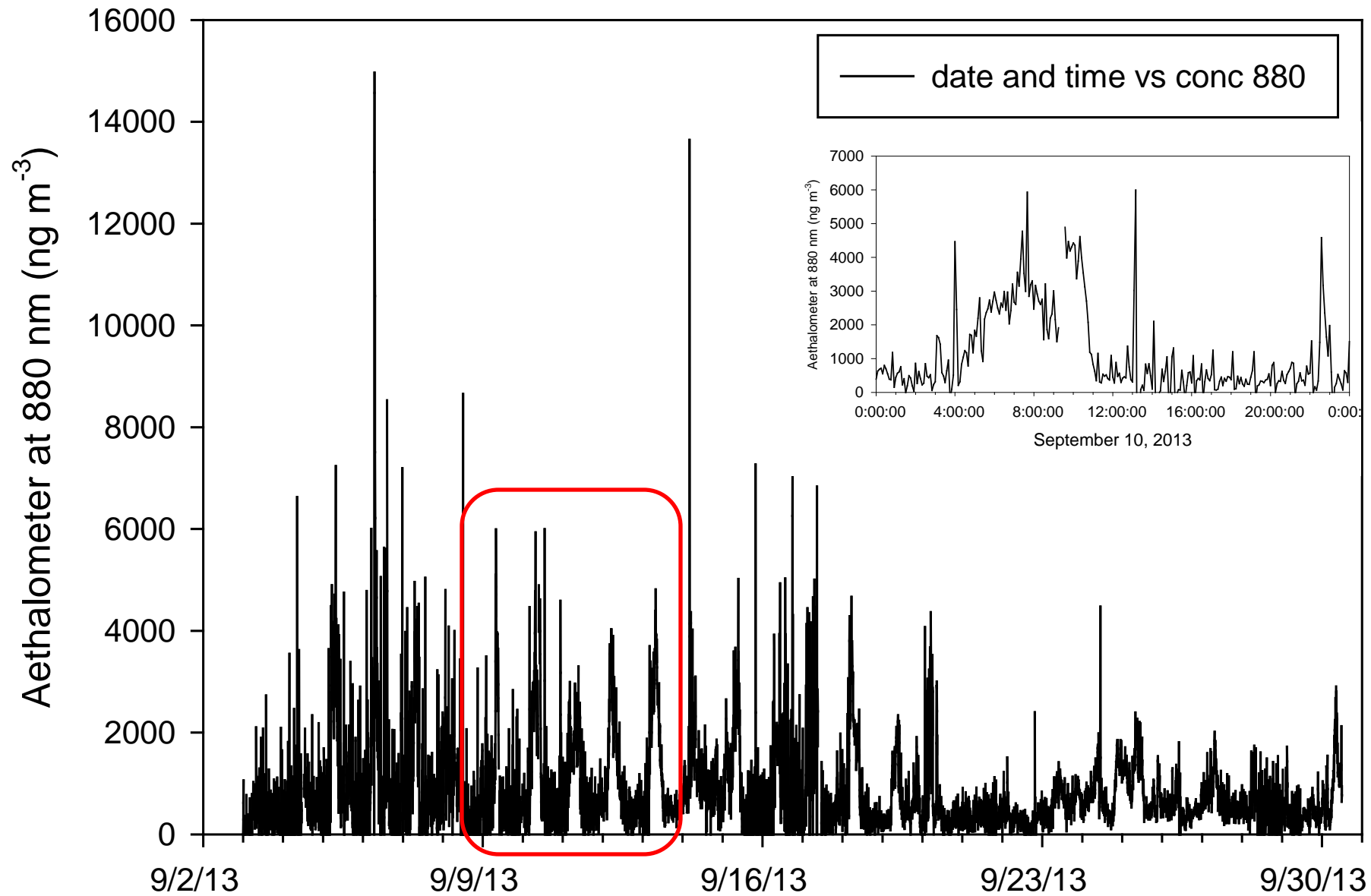




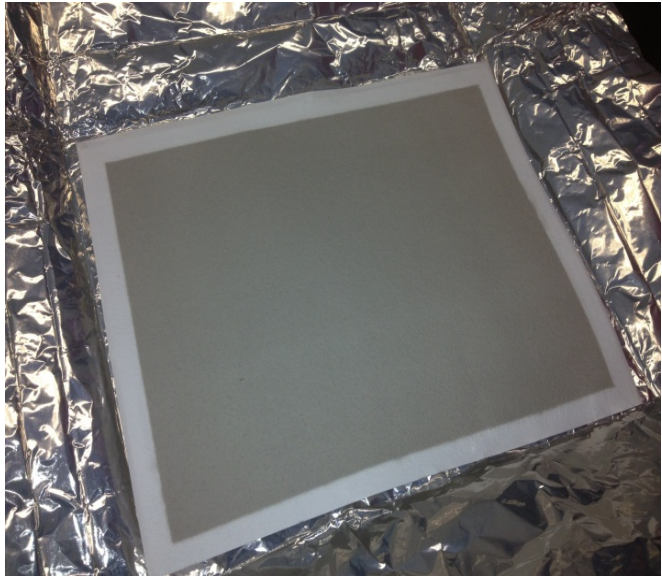
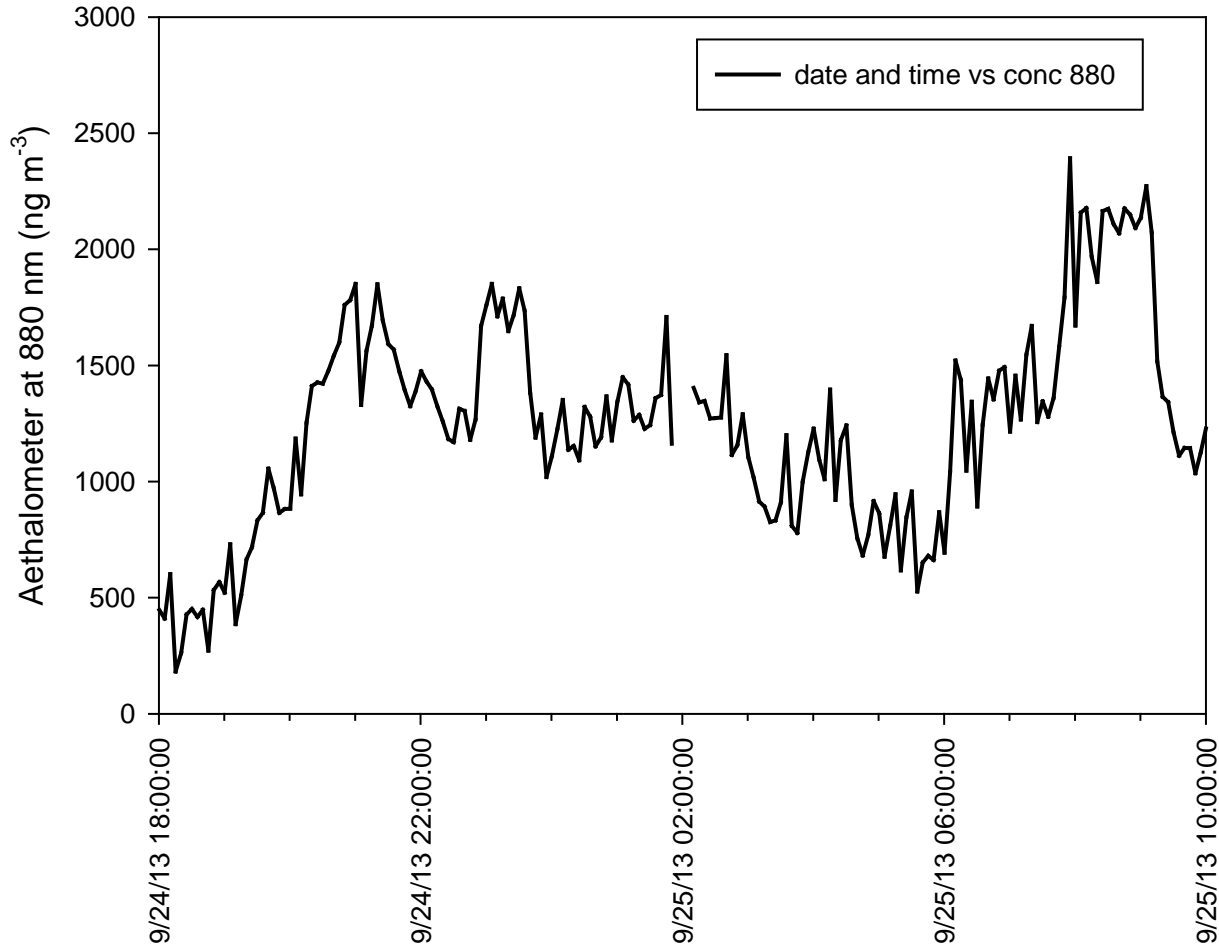
Sept 25th 2013
La Porte at 11:30 AM
West



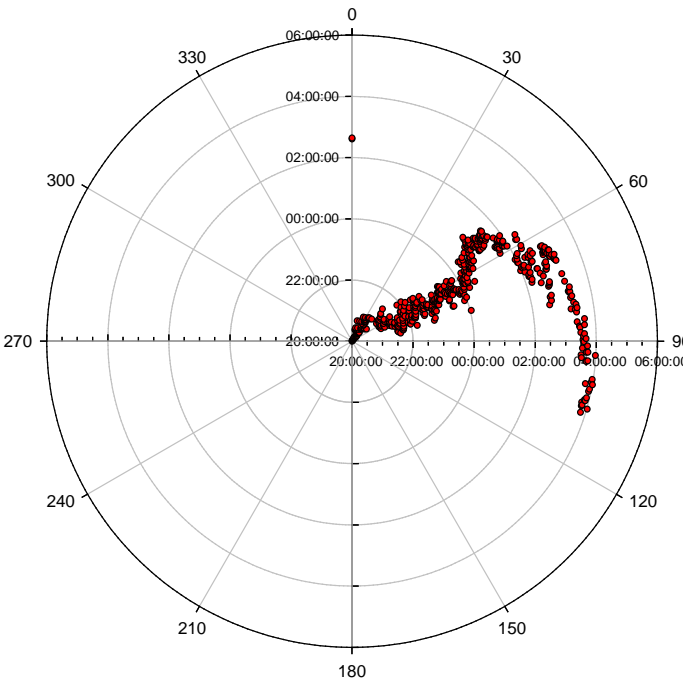




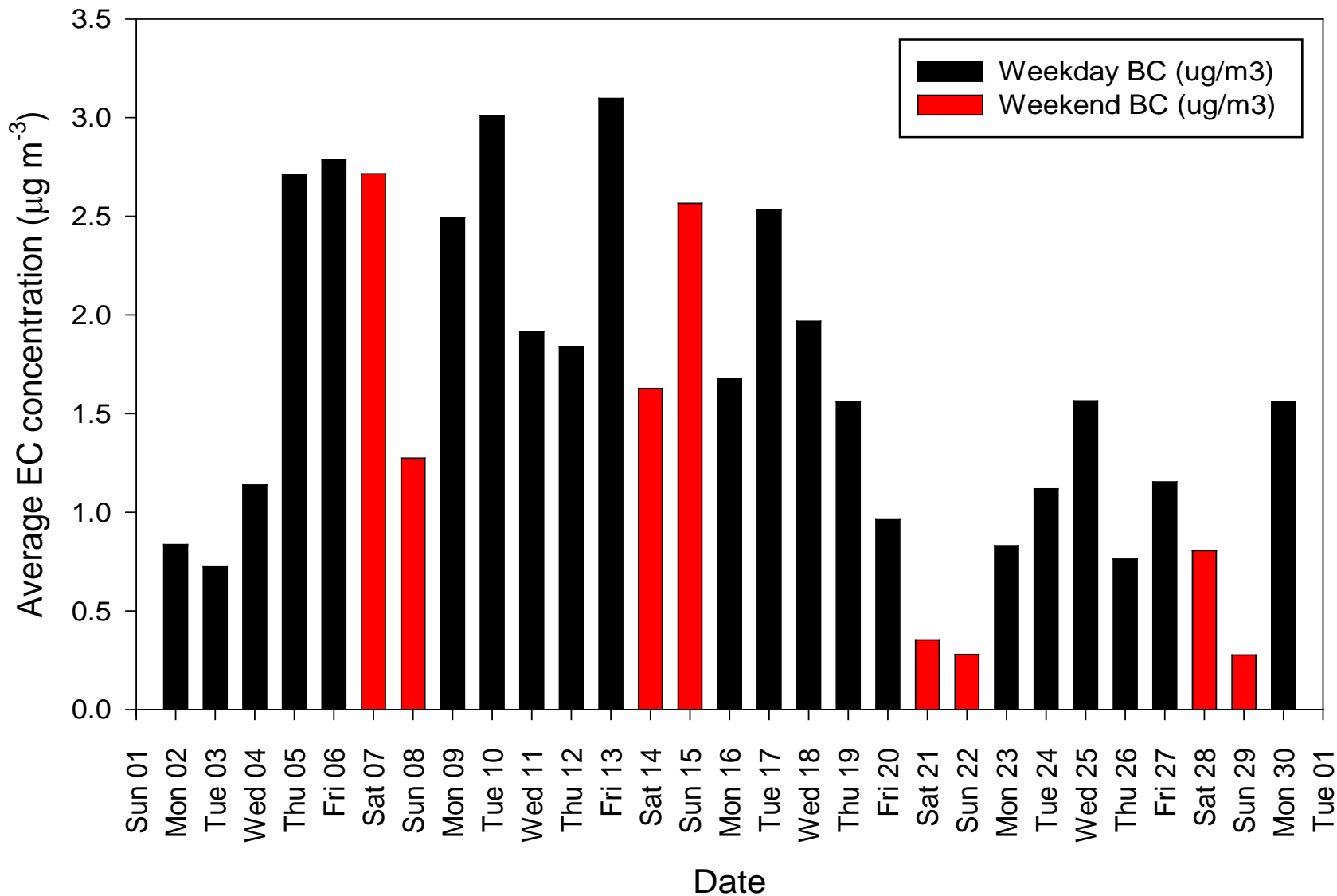
Night-time BC at Moody Tower



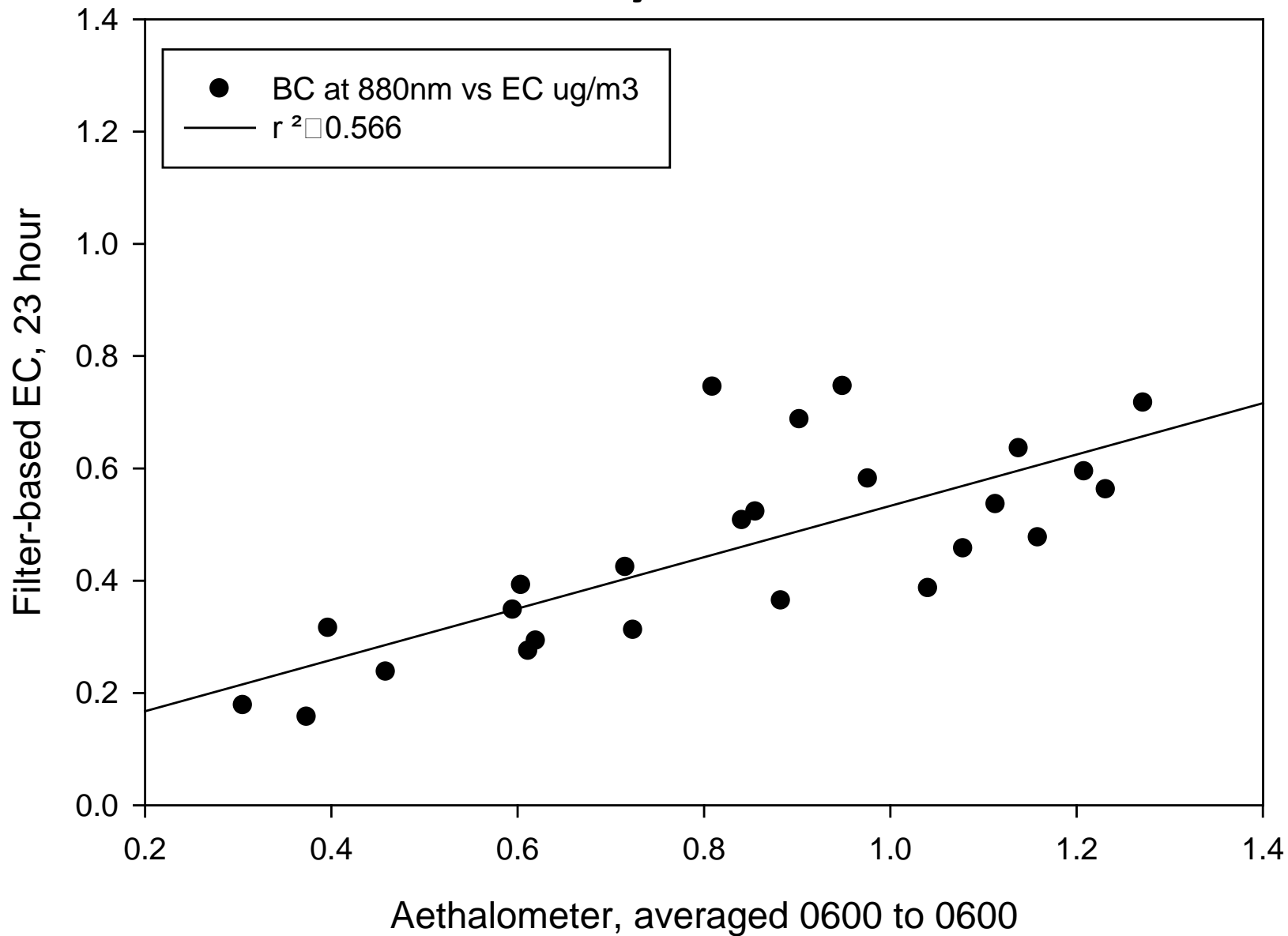
Wind Direction 9/24-9/25



Moody Tower Weekday vs. Weekend Rush Hour BC



Moody Tower



Manvel Croix Calendar of Samples

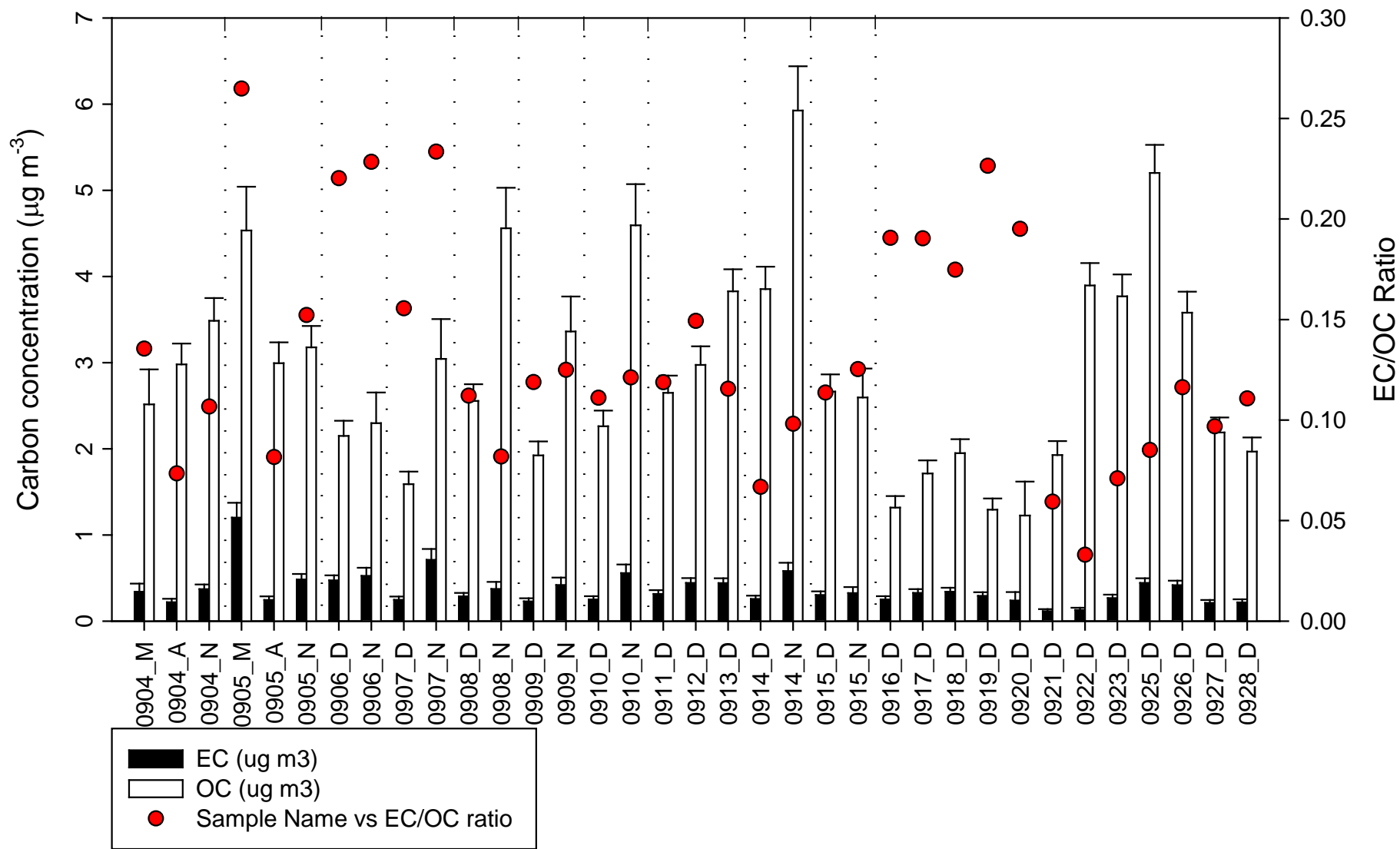
	Sunday	Monday	Tuesday	Wednesday	Thursday	Friday	Saturday
Date	1	2	3	Flight 4	5	Flight 6	7
TSP				M			
HV2.5				M,A,N	M,A,N	D	D
MV2.5				M,A,N	M,A,N	N	N
PUF							
Date	8	9	10	Flight 11	Flight 12	Flight 13	Flight 14
TSP				24h	24h	D	D
HV2.5	D	D	D	D	D	D	D
MV2.5	N	N	N	N		M	N
PUF							
Date	15	16	17	18	19	20	21
TSP	D	D	D	D	D		D
HV2.5	D	D	D	D	D	D	D
MV2.5	N		A	D	A	A	A
PUF							
Date	22	23	Flight 24	Flight 25	Flight 26	Flight 27	28
TSP	D	D	D	D	D	D	D
HV2.5	D	D	D	D	D	D	D
MV2.5	A	A	A	A	A	A	D
PUF				D	D		

D = Day (06:00-20:00)

M= Morning (06:00-10:00) A= Afternoon (10:00-20:00) N= Night (20:00-06:00)

24h= 24 hour sample **Flight**= Discover AQ Flight Day

Manvel Croix



Conclusions

- Preliminary conclusions on OCEC
 - High morning BC concentrations not solely due to rush hour traffic, possible contribution from Houston Ship Channel
 - Strong photochemical production on 09/04 and 9/23-9/26
 - Regional OC sources vs. local EC sources (OC washed out during rain events in the region)
 - Absorption not solely due to BC based on Aethalometer data
- Good coverage during DISCOVER-AQ campaign at 4 sites around Houston



Recommendations

- Detailed investigation of spatial characteristics in Houston $PM_{2.5}$
 - Analysis of emission contributions across 4 sites
 - Define impacts of local contributions
 - Define regional contributions
 - Characterize PM under different regimes
 - Primary vs. secondary



Acknowledgements

- Funding – Texas AQRP
- University of Houston – Site Access and Site Modification
- TCEQ – Site Access and Site Modification
- UT-Austin – Site access and Site Modification
- USEPA – Samplers
- University of Wisconsin-Madison – Samplers
- Droplet Measurement Technologies
- USEPA – Filter Collection
- UT- Austin – Filter Collection

