北京大学环境科学与工程学院
College of Environmental Sciences and Engineering

“Aerodyne AMS/CIMS 北大研讨会”会议通知

Aerodyne AMS/CIMS 北大研讨会由北京大学环境科学与工程学院协助 Aerodyne 主办，将于 **2017 年 5 月 8 日至 5 月 12** 日在北京举行。在此，我们诚挚邀请各位莅临参加。

Introduction: Overview of Applications

Doug Worsnop

ARI/PKU AMS/CIMS Users Meeting

Monday, 8 May

Aerodyne / PKU AMS / CIMS Users Meeting, Beijing, 8-12 May 2017

2001	1st/2nd AMS Users Meeting	Portland / Aerodyne		
2002	3rd	Aerodyne		
2003	4th	Caltech		
2004	5th	GaTech		
2005	6th	Juelich		
2006	7th	Minnesota		
2007	8th	DRI, Reno, NV		
2008	9th	Manchester	Hi-Res Clinic	Boulder
2009	10th	Toronto	Data Analysis Clinics	Boulder, PSI
2010	11th	Hyytiala		PSI (EUCAARI)
2011	12th	Orlando		Barcelona, Boulder
2012	13th	Minnesota		Boulder, PSI (ACSM)
2013	14th	Prague		Boulder (AMS + CIMS)
		AMS Meeting at PKU		
2014	15th	Korea / Orlando		CIMS Aerodyne
2015	16th	Milan	Boulder	CIMS Fort Collins
2016	17th	Portland		CIMS Boulder
		AMS Workshop at IAP		
2017	AMS/CIMS	PKU, Beijing	*18th Zurich (PSI)*	*CIMS Helsinki*

AMS Introduction

Doug Worsnop

AMS Users Meeting

~~Aerodyne~~

~~Caltech~~

~~Georgia Tech~~

~~FZ - Juelich~~

~~University of Minnesota~~

~~Desert Research Institute~~

~~Manchester~~

~~Toronto → Hyytiala → Orlando -> Minnesota -> Prague → Busan~~

~~October 2001/2002~~

~~October 24, 2003~~

~~October 8, 2004~~

~~25 August, 2005~~

~~16 September, 2006~~

~~29 September, 2007~~

~~5 September 2008~~

~~October 2009 → September 2010 → October 2011 -> October 2012 → 2013 → 2014 → 2015~~

Nitrate

Sulfate

Ammonia

Organics (44,57)

OOA, HOA

OOA1, OOA2

O/C/N/H ratios

SV-OOA, LV-OOA

OOA/HOA

SP -> BC

CIMS -> HOM

ELVOC

C2H3O2-, I-, NO3-

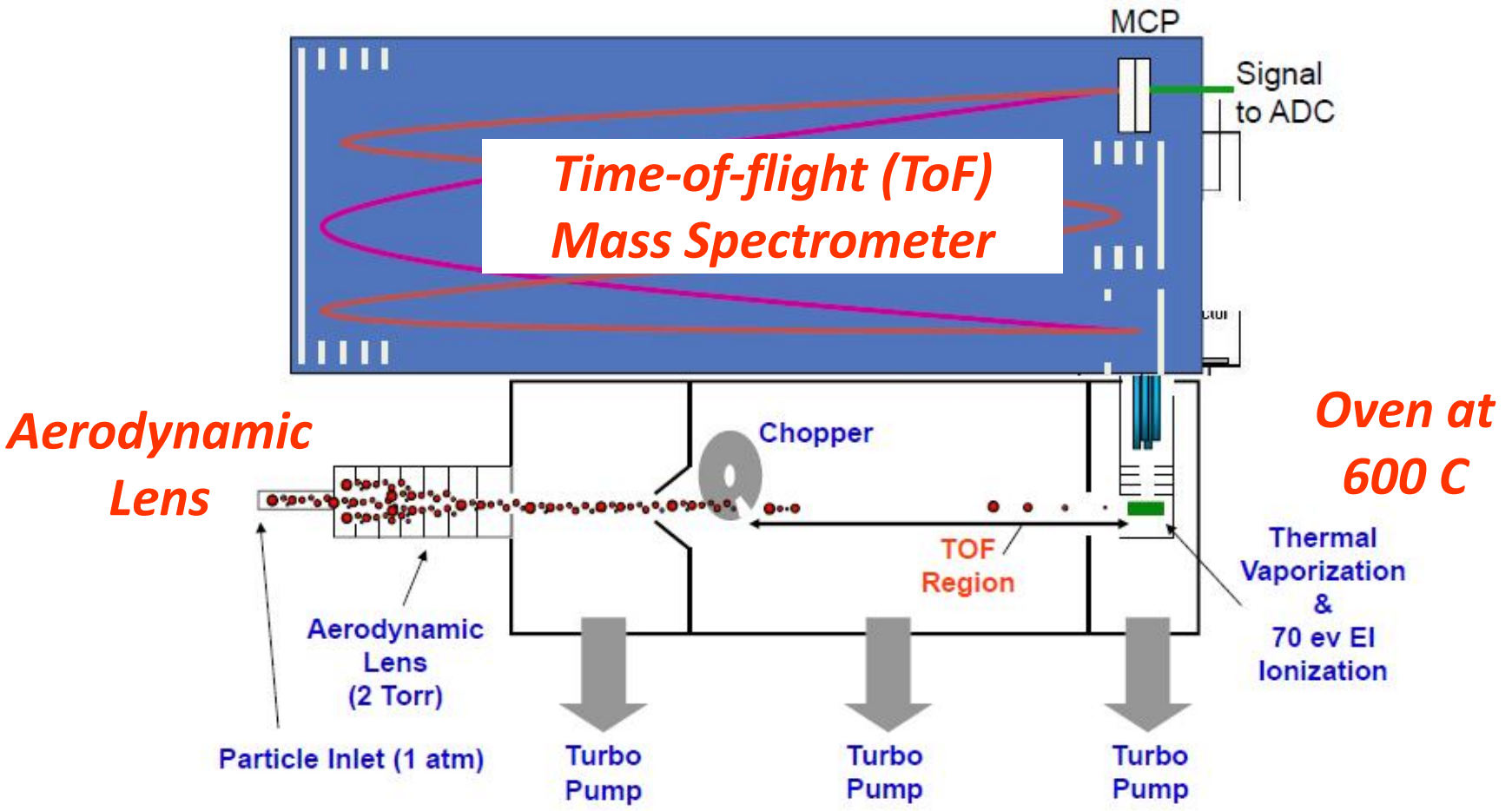
PM2.5, CE = 1

Portland, 21 October 2016

PMF/ME-2 → "source apportionment"

Size and (elementally) chemically resolved sub-micron aerosol composition

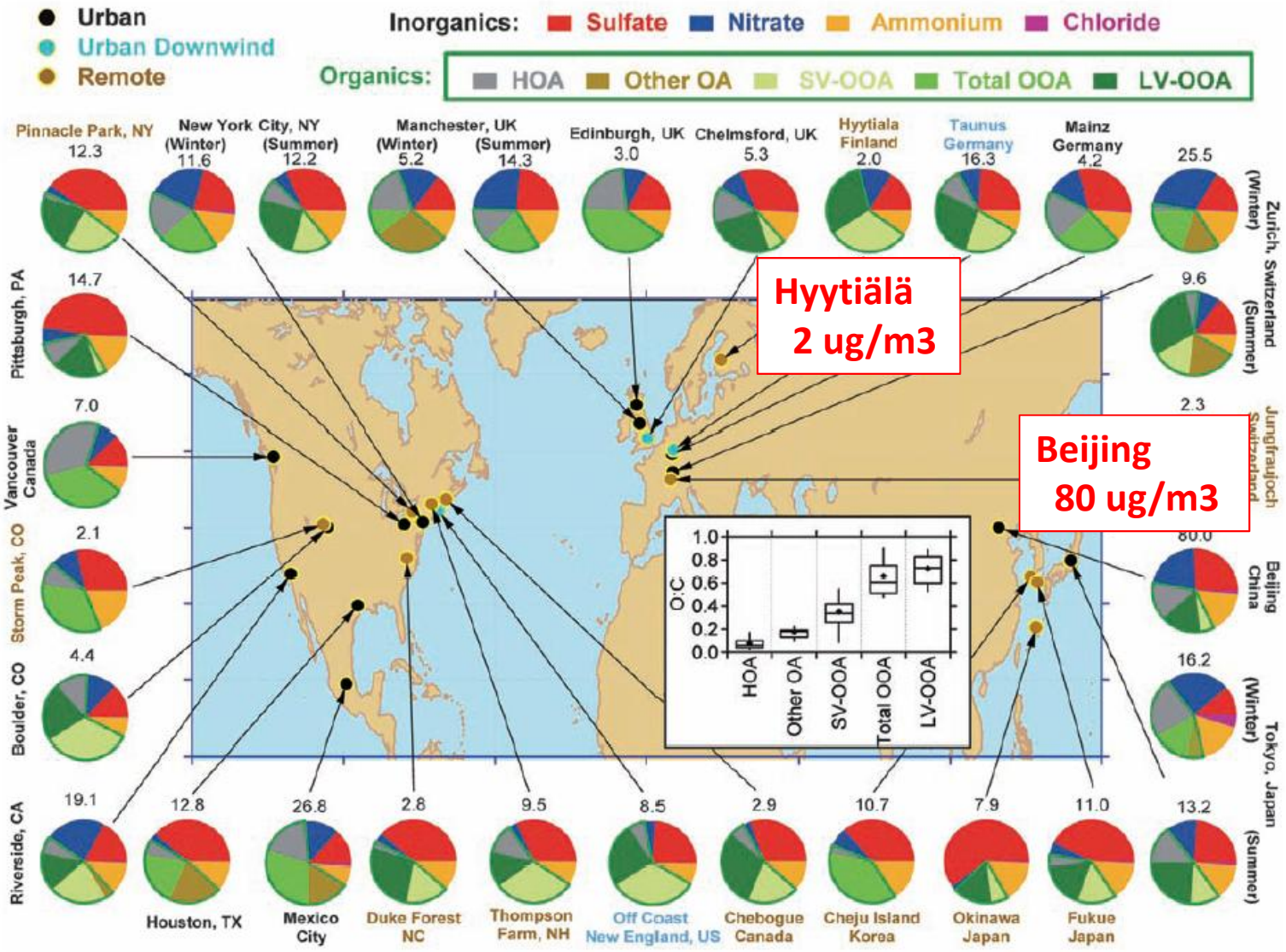
" A simple molecular beam mass spectrometer "



Jayne et al, 2000; Drewnick et al, 2005; DeCarlo et al., 2006; Onasch et al, 2012

Inorganic (SO4,NO3) ~ Organic (OOA)

O/C ~ 0.7

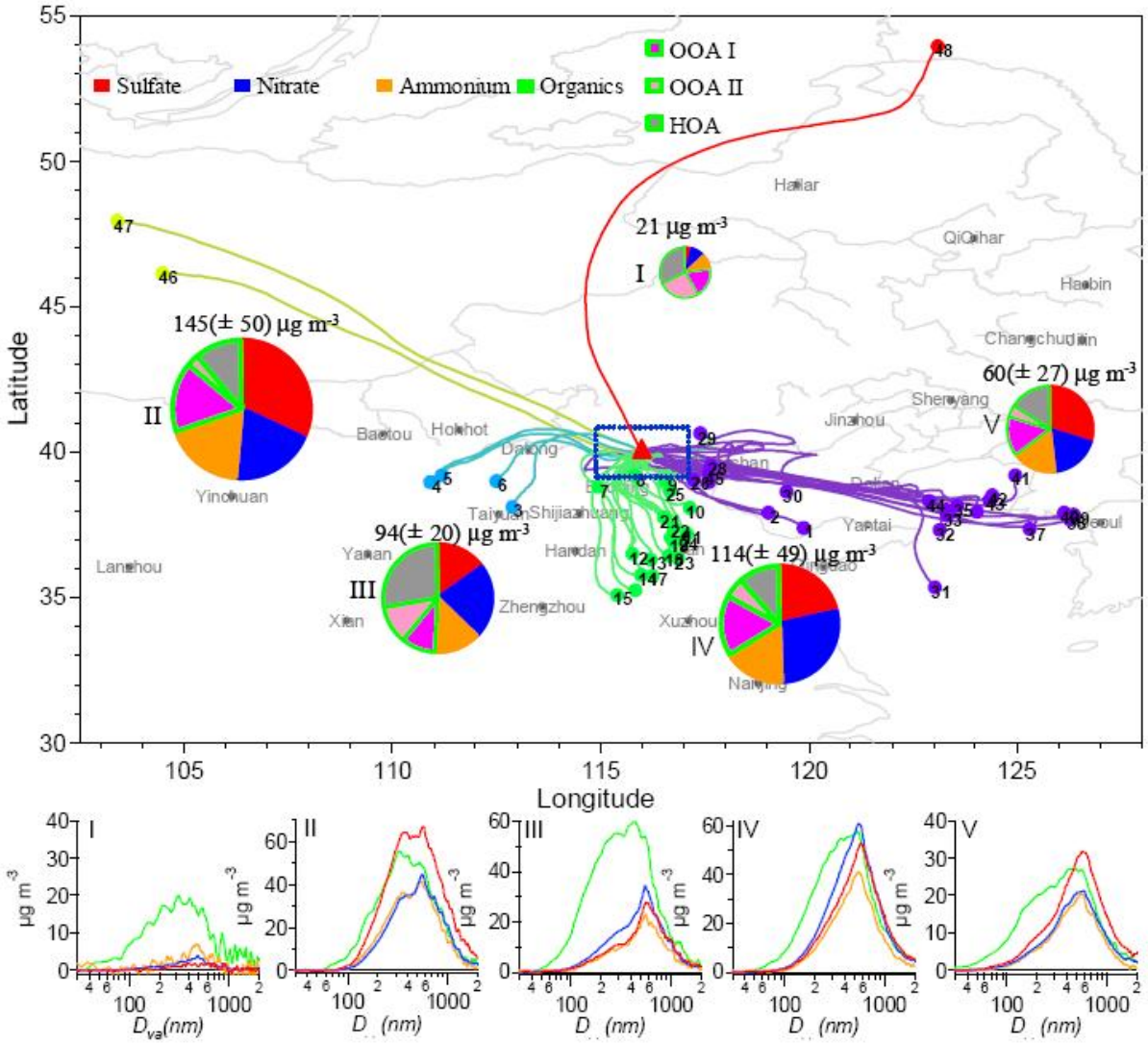


Jimenez et al, Science, 2009

Highly Time- and Size-Resolved Characterization of Submicron Aerosol Particles in Beijing, using an Aerodyne Aerosol Mass Spectrometer

Junying Sun*, Yangmei Zhang, Xiaochun Zhang, Xiaoye Zhang

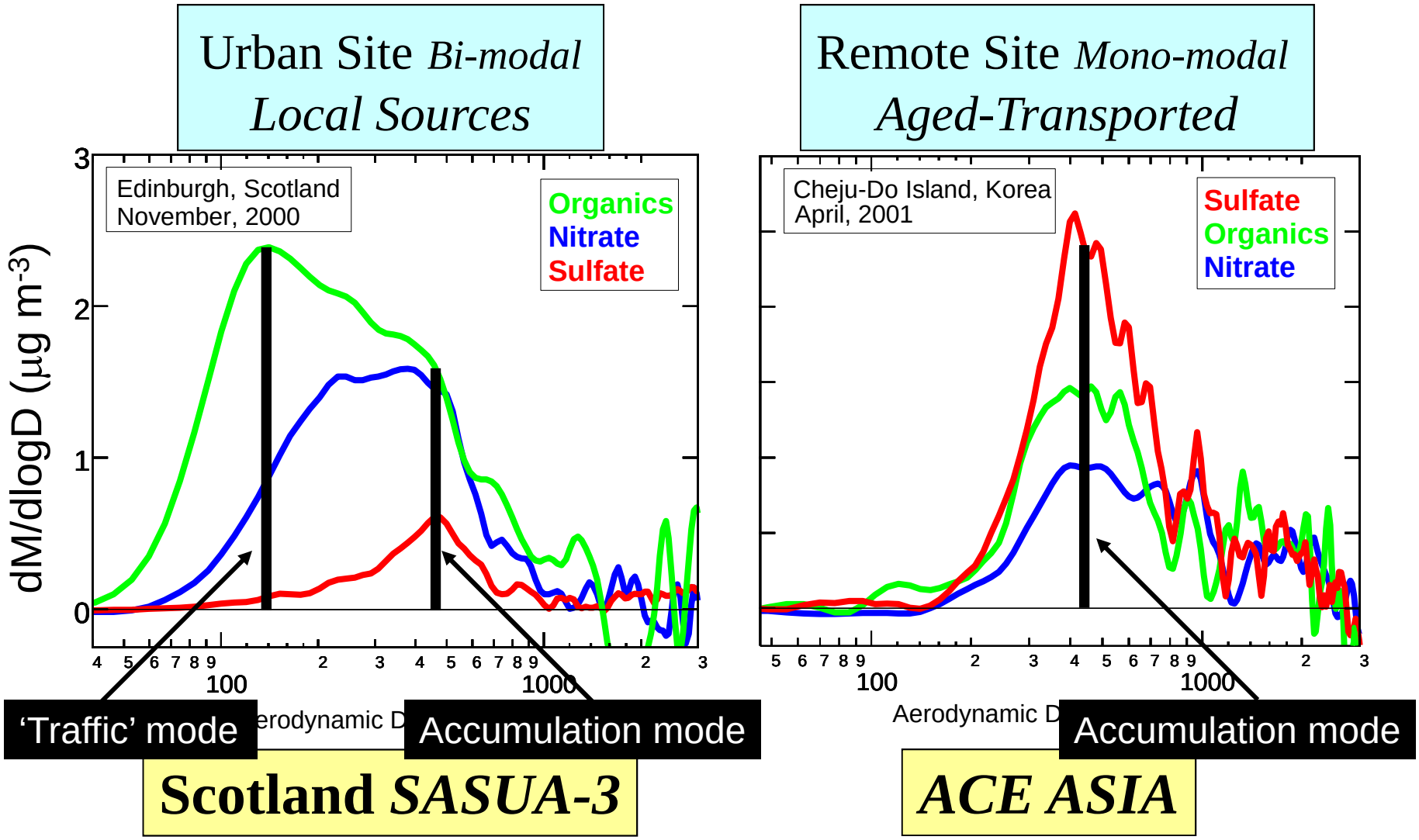
Nga L. Ng, Manjula R. Canagaratna, John T. Jayne, Douglas R. Worsnop, Yele Sun, Qi Zhang,



CAMS 2006

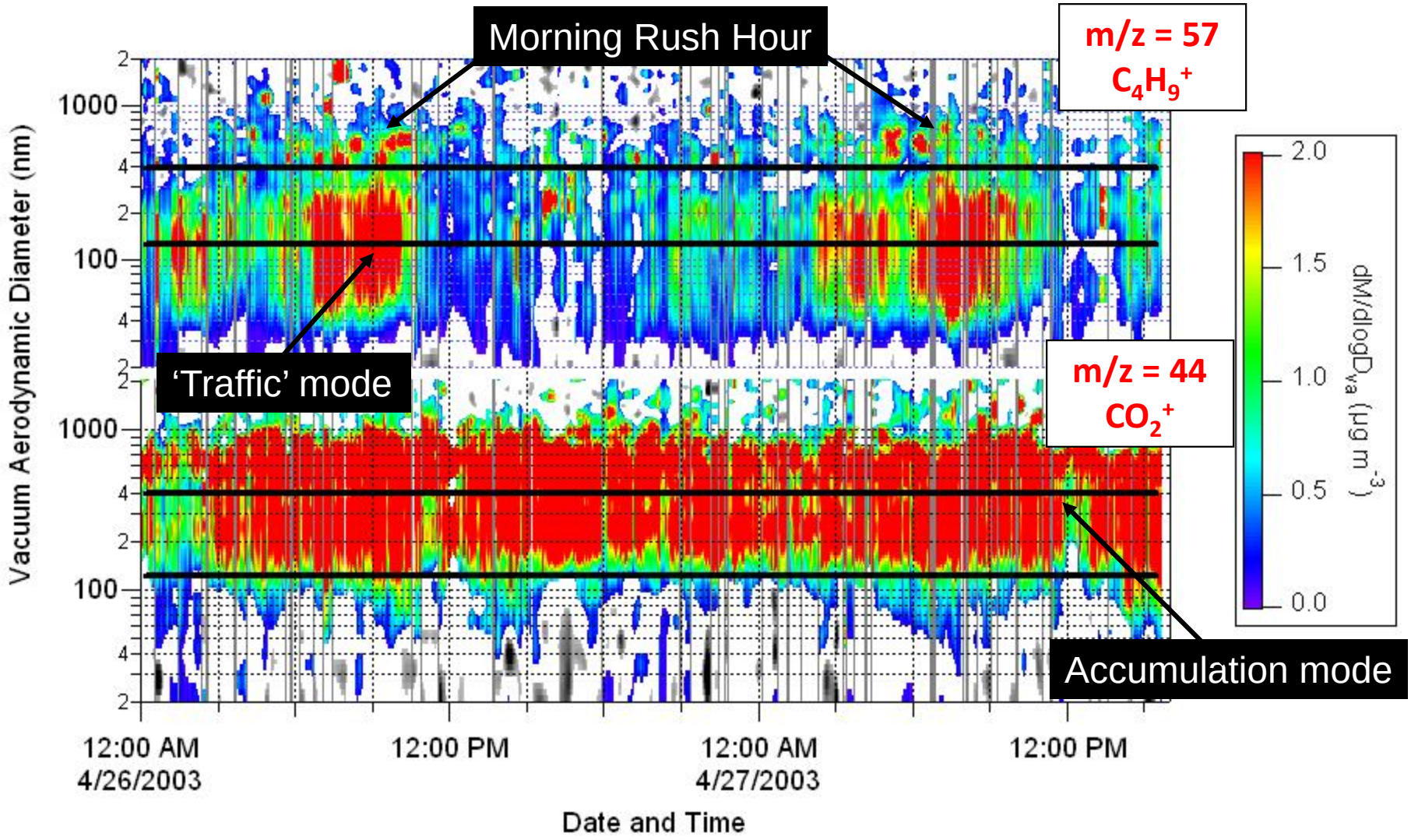
Atmospheric Environment (2009)

Observed ***'Urban'*** and ***'Remote'*** Size Modes

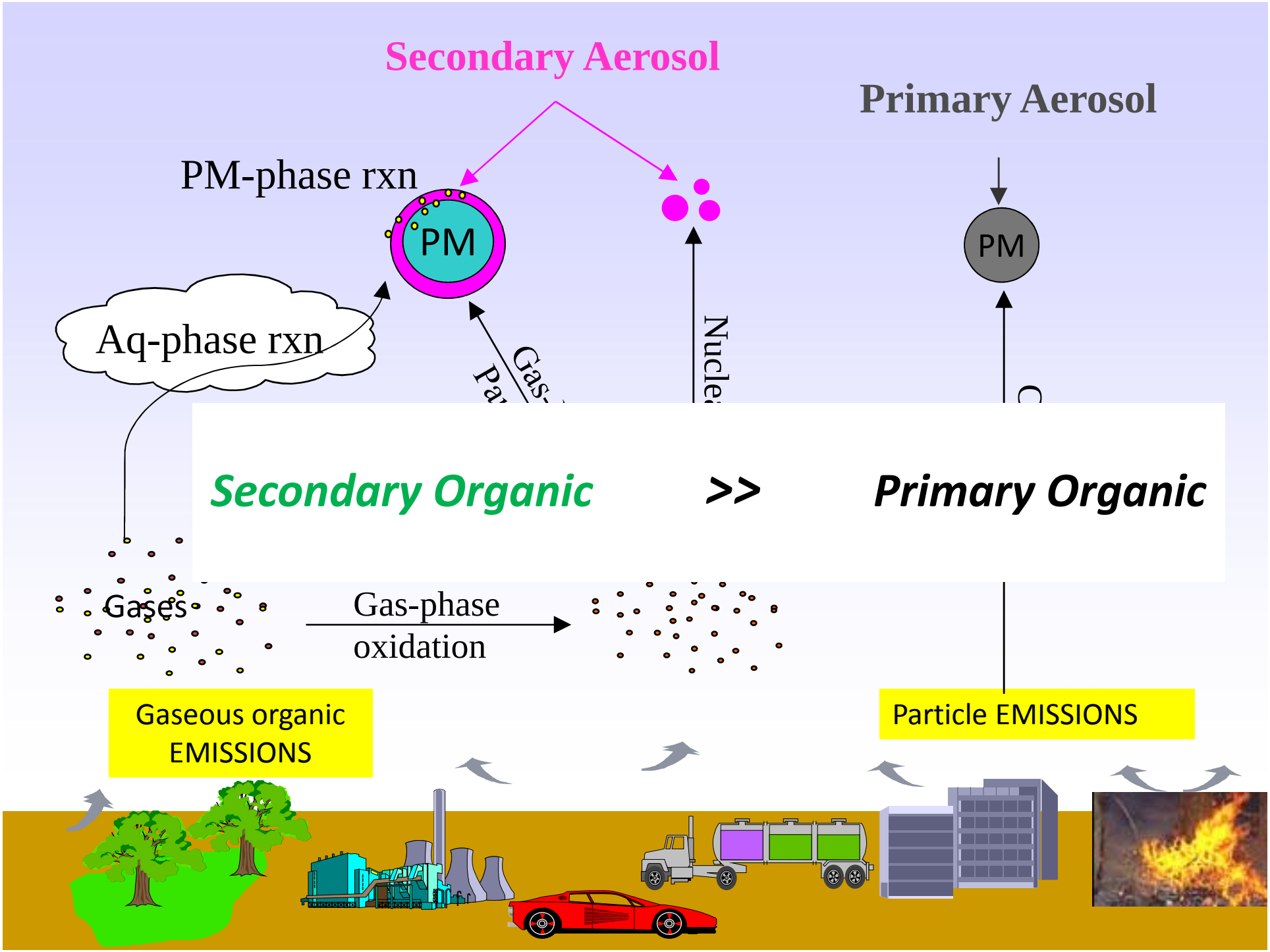


Allan, Alfarra et al. (U. Manchester)

Organic Mass Distributions



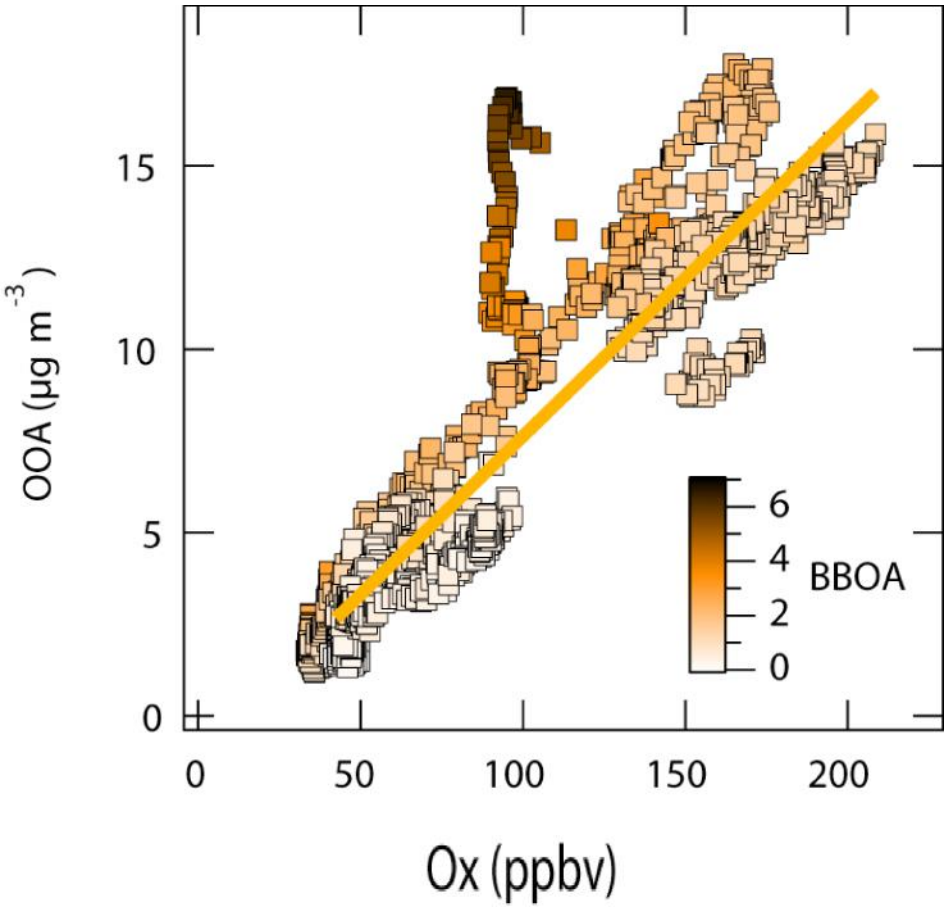
- Small mode, hydrocarbon-based, primary traffic organic PM
- Accumulation mode oxidized organic PM


Secondary Aerosol
Primary Aerosol
PM-phase rxn
PM
PM
Aq-phase rxn
Secondary Organic
>>
Primary Organic
Gases
Gas-phase
oxidation
Gaseous organic
EMISSIONS
Particle EMISSIONS

GEOPHYSICAL RESEARCH LETTERS, VOL. 35, L15804, doi:10.1029/2008GL034058, 2008

Correlation of secondary organic aerosol with odd oxygen in Mexico City

Scott C. Herndon,[1] Timothy B. Onasch,[1] Ezra C. Wood,[1] Jesse H. Kroll,[1] Manjula R. Canagaratna,[1] John T. Jayne,[1] Miguel A. Zavala,[2,3] W. Berk Knighton,[4] Claudio Mazzoleni,[5] Manvendra K. Dubey,[5] Ingrid M. Ulbrich,[6] Jose L. Jimenez,[6] Robert Seila,[7] Joost A. de Gouw,[8] Benjamin de Foy,[9] Jerome Fast,[10] Luisa T. Molina,[2,3] Charles E. Kolb,[1] and Douglas R. Worsnop[1]



$O_x = O_3 + NO_2$

Primary Emission | **Secondary Formation**

SO_2 → H_2SO_4

one compound

VOC → OOA

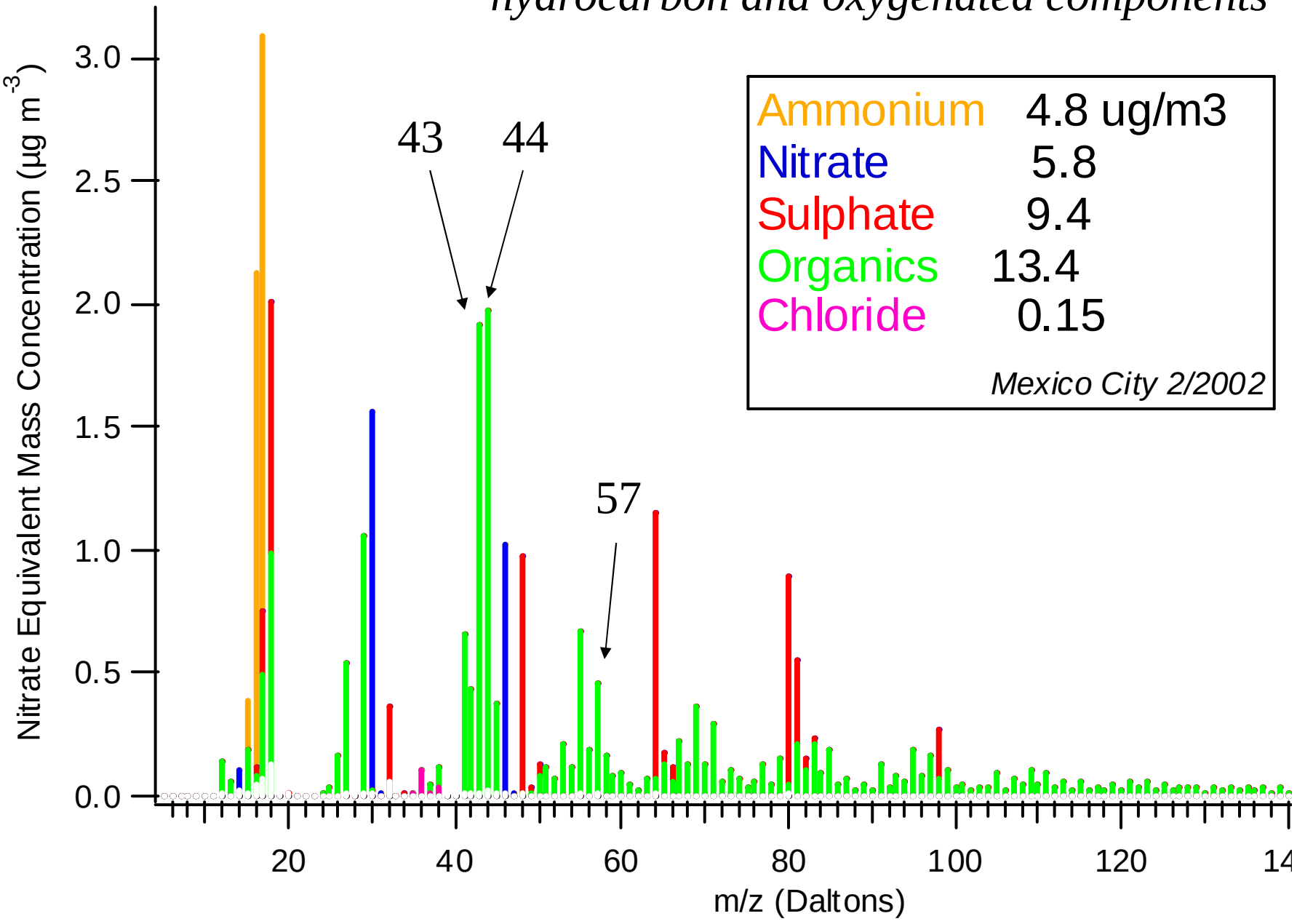
"Volatile Organic Compounds" | ***"Oxygenated Organic Aerosol"***

1,000's compounds

Analytical Challenge:

AMS mass spectra simplify classification of too many organic compounds to identify

Urban organic aerosol is a mixture of hydrocarbon and oxygenated components

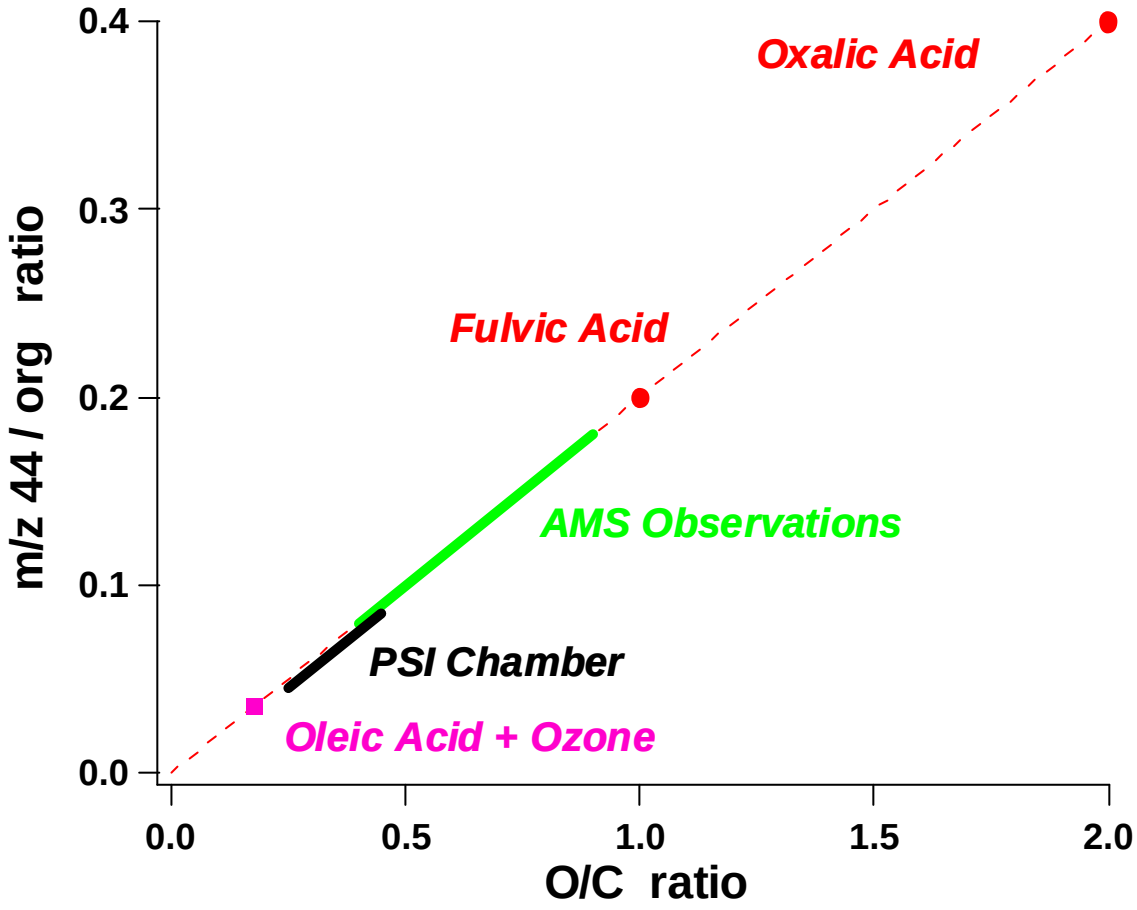


600C, e^-

$C_nH_mO_y$ ------> H_2O^+ CO^+ CO_2^+

18 ***28*** ***44*** ***43, 55***

f44 vs O/C



2004

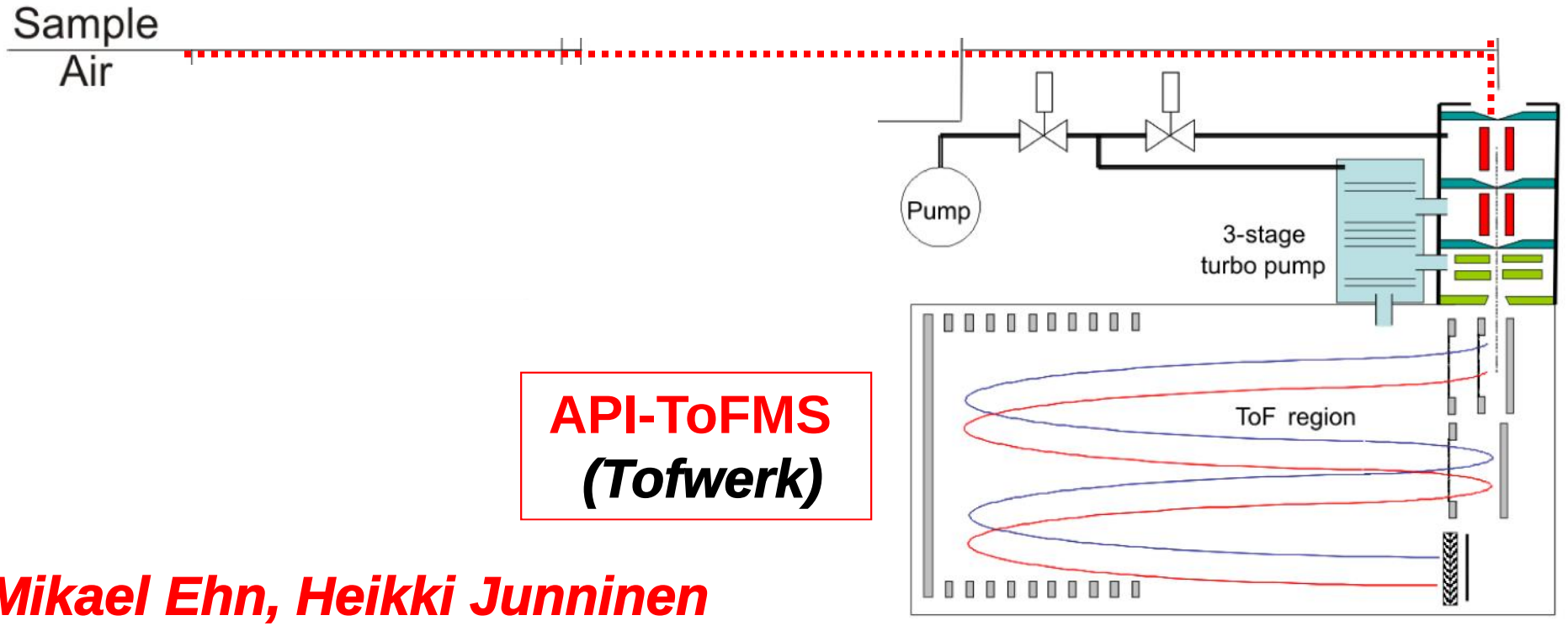
A high-resolution mass spectrometer to measure atmospheric ion composition

H. Junninen[1], M. Ehn[1], T. Petäjä[1], L. Luosujärvi[2], T. Kotiaho[2,3], R. Kostiainen[3], U. Rohner[4], M. Gonin[4], K. Fuhrer[4], M. Kulmala[1], and D. R. Worsnop[1,5]

Atmos. Meas. Tech. Discuss., 3, 599–636, 2010

Atmospheric Measurement Techniques Discussions

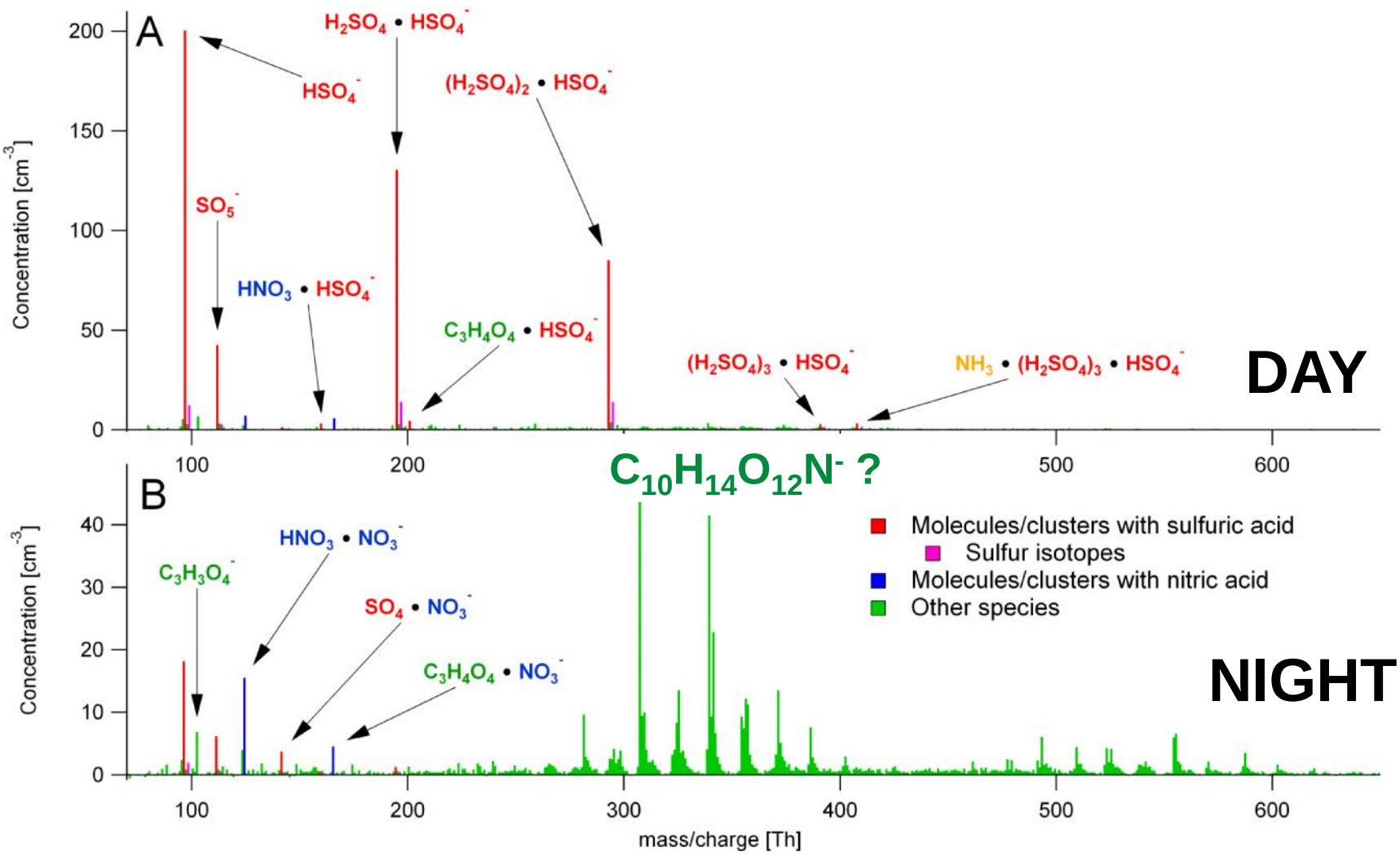
Atmospheric (pressure) Ions



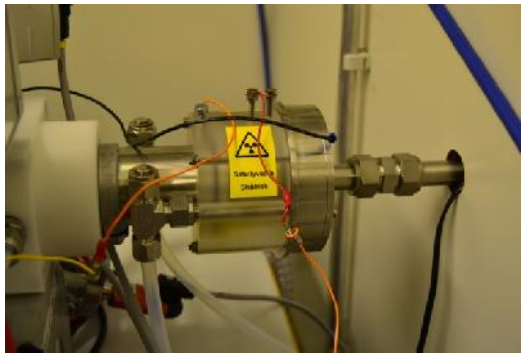
API-ToFMS
(Tofwerk)

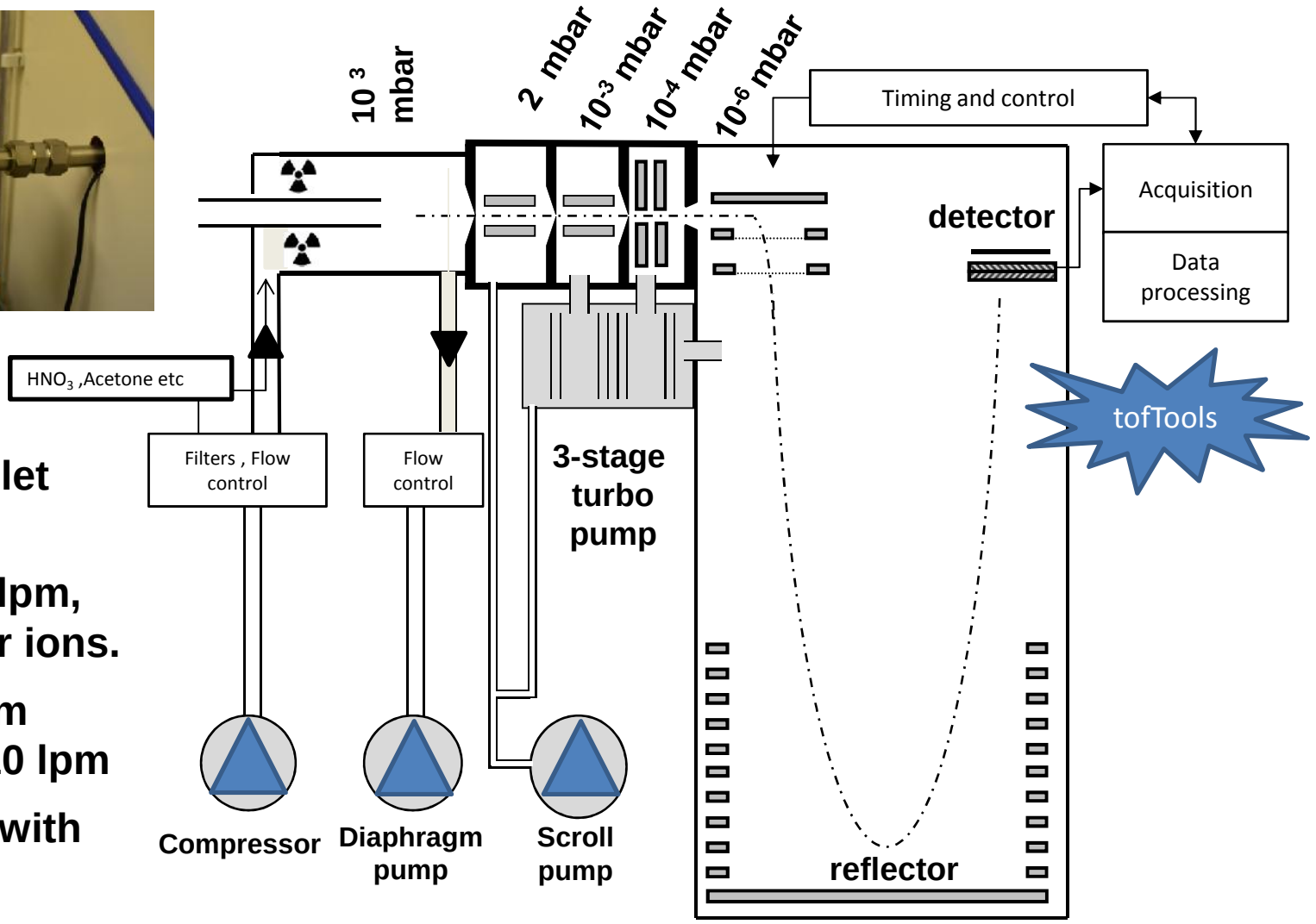
Mikael Ehn, Heikki Junninen

Negative ion spectra from Hyytiälä



CI-APi-TOF for neutral compound measurements





-"Eisele type" inlet design.

-Sheath flow 20 lpm, includes charger ions.

-Total flow 30 lpm -> sample flow 10 lpm

-Sample mixing with electric field

-APi samples 0.8 lpm

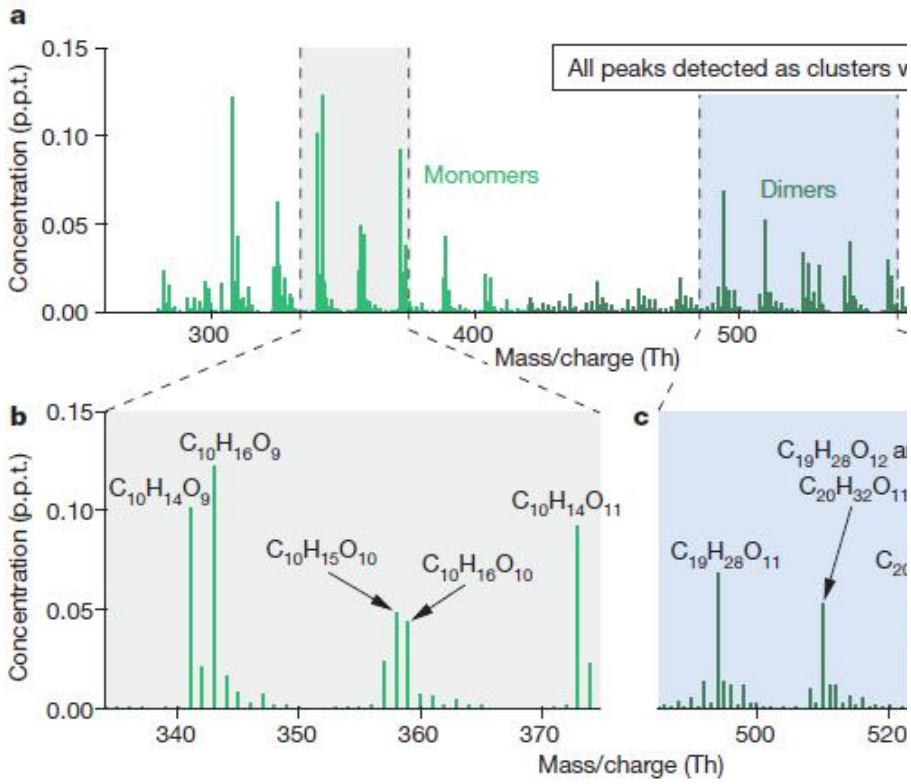
476 | NATURE | VOL 506 | 27 FEBRUARY 2014

LETTER

doi:10.1038/nature13032

A large source of low-volatility secondary organic aerosol

Mikael Ehn[1,2], Joel A. Thornton[2,3], Einhard Kleist[4], Mikko Sipilä[2], Heikki Junninen[2], Iida Pullinen[1], Monika Springer[1], Florian Rubach[1], Ralf Tillmann[1], Ben Lee[3], Felipe Lopez-Hilfiker[3], Stefanie Andres[1], Ismail-Hakki Acir[1], Matti Rissanen[2], Tuija Jokinen[2,5], Siegfried Schobesberger[2], Juha Kangasluoma[2], Jenni Kontkanen[2], Tuomo Nieminen[2,6], Theo Kurtén[7], Lasse B. Nielsen[8], Solvejg Jørgensen[8], Henrik G. Kjaergaard[8], Manjula Canagaratna[9], Miikka Dal Maso[10], Torsten Berndt[5], Tuukka Petäjä[2], Andreas Wahner[1], Veli-Matti Kerminen[2], Markku Kulmala[2], Douglas R. Worsnop[2,9], Jürgen Wildt[4] & Thomas F. Mentel[1]



ELVOC

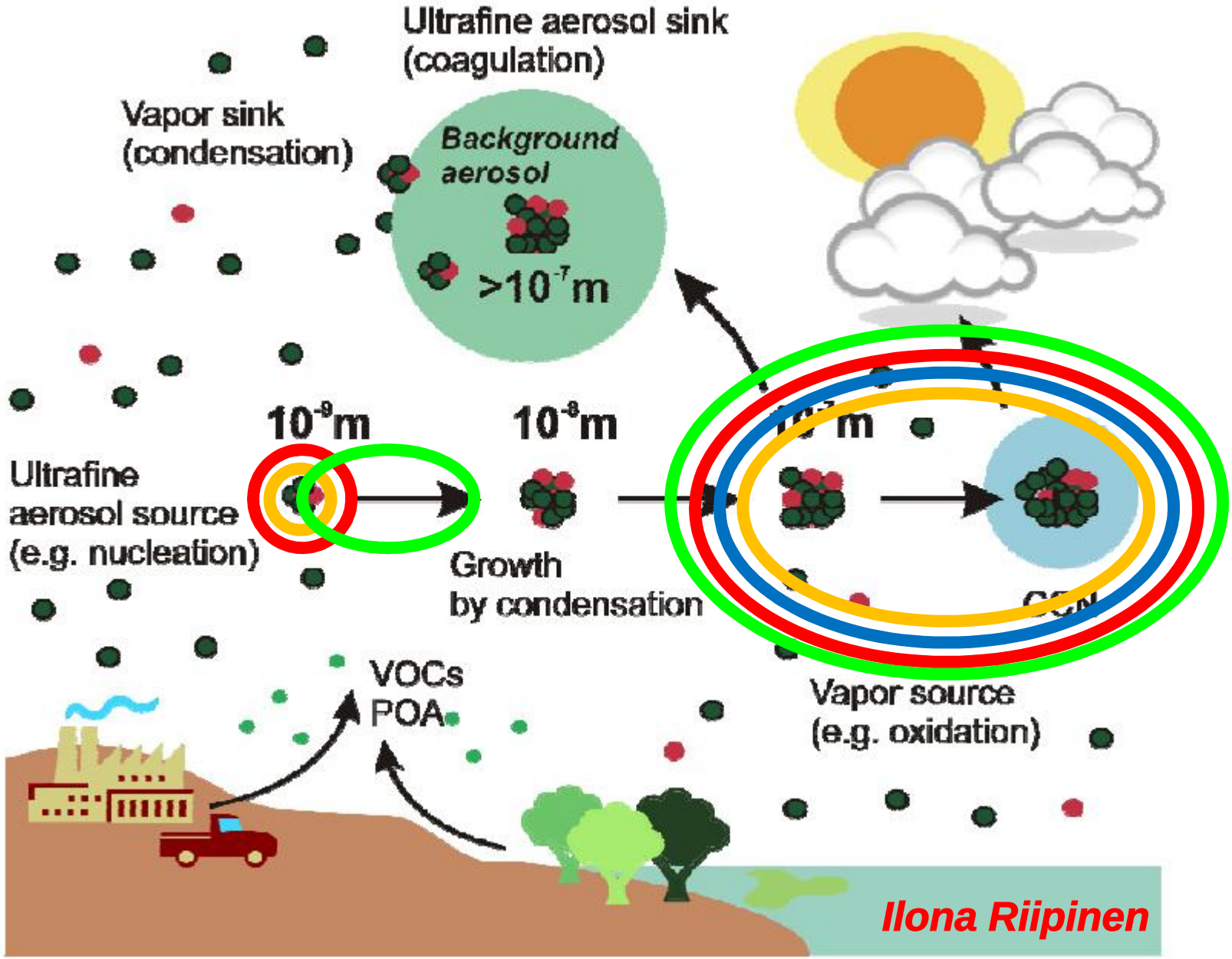
C10,C20 in the gas phase

O/C > 0.7

Nucleation, Clusters

Nanoparticle growth

< ppt → ppt → ppb (ppm)



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