

Florida Mercury TMDL Project

SuperSite Update

Mercury TMDL Stakeholder's Meeting

Tallahassee, FL

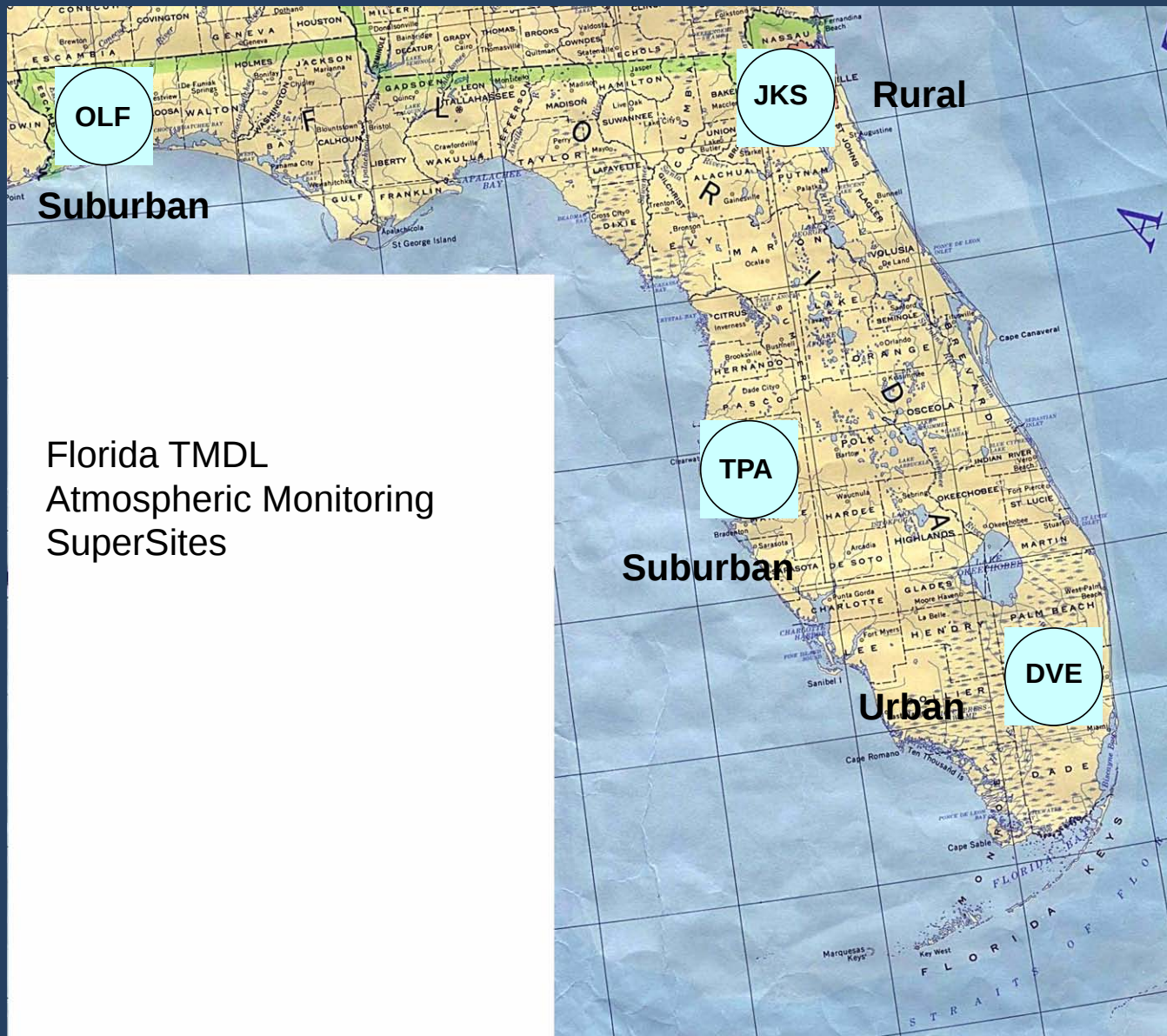
January 4, 2011

SuperSite Objectives

- Provide data to assess statewide mercury wet and dry deposition.
- Provide data to assess emission source contributions to the measured mercury wet and dry deposition.
- Provide data to validate and compare with atmospheric models.

Atmospheric Monitoring Supersites

PRELIMINARY



Typical SuperSite (JKS)

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SuperSite Measurements

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Class	Variable(s)	Detection	Manufacturer	Model	Time Resolution
Hg Speciation	Hg ⁰	CVAFS	Tekran	2737A or B	5-minute, 1-hour
	RGM	CVAFS	Tekran	2737A or B	1-hour
	Hg _{wp}	CVAFS	Tekran	2737A or B	1-hour
Cont. Gas Analyzer	O ₃	UV absorption	Thermo-Env.	49c or i	5-minute, 1-hour
	CO	NDIR	Thermo-Env.	48c or i	5-minute, 1-hour
	SO ₂	UV fluorescence	Thermo-Env.	43c or i	5-minute, 1-hour
	NO	NO-O ₃ CL	Thermo-Env.	42c or i	5-minute, 1-hour
	NO _y	NO-O ₃ CL	Thermo-Env.	42c or i	5-minute, 1-hour
Discrete Gas Sampler	HNO ₃ /HNO ₂ /NH ₃ /SO ₂ /HCl	IC	URG	3000C-ADS	weekly, day/night
Discrete Particle Analyzer	PM _{2.5} Major Ions	IC	URG	ADS	weekly, day/night
Cont. Particle Analyzer	PM _{2.5} Major Ions	IC	URG	AIM	1-hour
	PM _{2.5} OC/EC	NDIR	Sunset Labs.	RT-ECOC	1-hour
	PM _{2.5} Mass	Light Scattering	Thermo-Env.	Sharp	5-minute, 1-hour
Dichotomous Sampler	PM _{2.5} and PM _{2.5-10} Mass	Gravimetric	R&P	2025	daily
	PM _{2.5} and PM _{2.5-10} Trace Elements	EDXRF or ICPMS	R&P	2025	daily
Wet Deposition	Total-Hg	CVAFS	UM	ASPS	event
	Trace Elements	ICP-MS	UM	ASPS	event
	Hg Isotopes	ICP-MS	UM	ASPS	event
	Major Ions	IC	UM	ASPS	event
Dry Deposition	Total-Hg	CVAFS	USEPA-NERL	prototype	daily
	Trace Elements	ICP-MS	USEPA-NERL	prototype	daily
	Major Ions	IC	USEPA-NERL	prototype	daily
Size-Segregated Particle Hg	Total-Hg	CVAFS	USEPA-NERL	MOI	daily
Meteorology	Wind Speed	sonic anemometer	RMYoung	81000	5-minute, 1-hour
	Wind Direction	sonic anemometer	RMYoung	81000	5-minute, 1-hour
	Temperature	thermistor	Paroscientific	Met3A	5-minute, 1-hour
	Relative Humidity	thermistor	Paroscientific	Met3A	5-minute, 1-hour
	Barometric Pressure	manometer	Paroscientific	Met3A	5-minute, 1-hour
	Solar Radiation	pyranometer	Campbell Sci.	LI200 X-L	5-minute, 1-hour
	Precipitation	rain gauge	ETI	NOAH-IV	5-minute, 1-hour
	Surface Wetness	conductivity	Campbell Sci.	237	5-minute, 1-hour

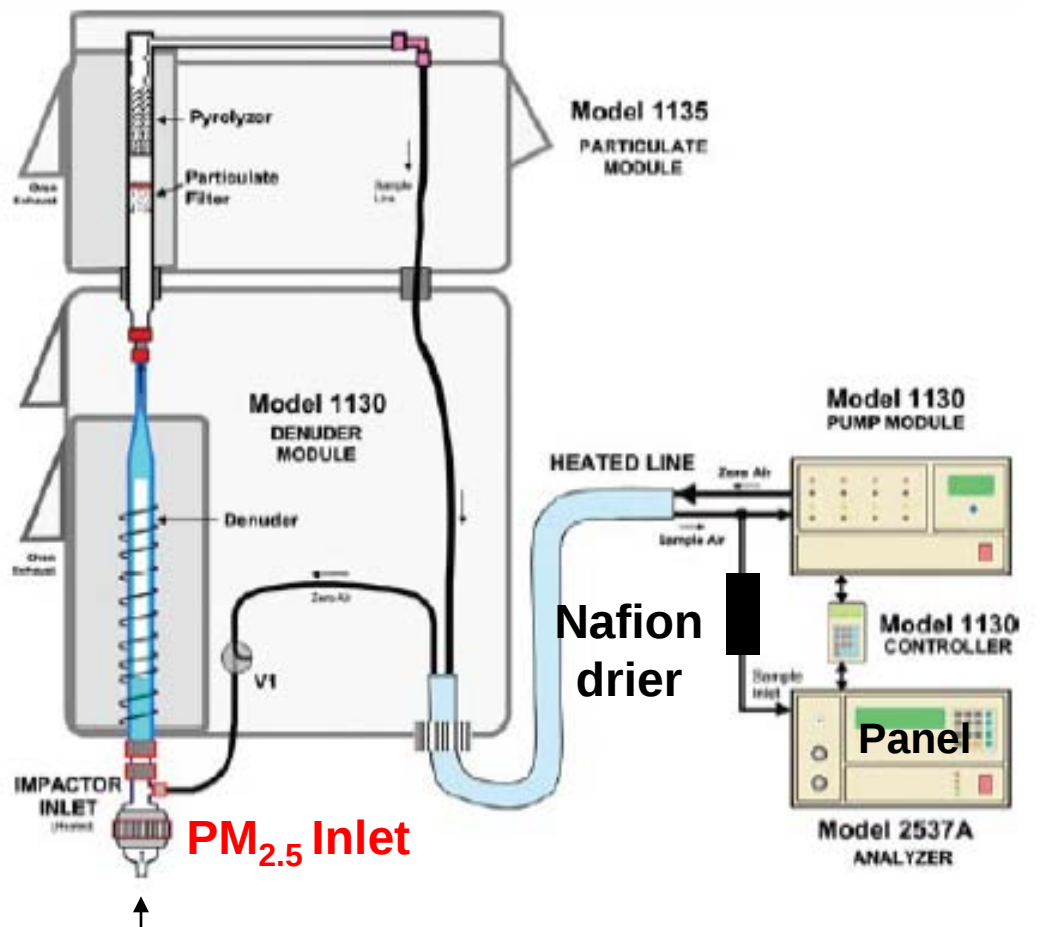
Terminated
8/5/09

Limited
Sites or
Periods

Continuous Hg Approach

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$Hg_{PM2.5}$ on
quartz
filter



Air in

$PM_{2.5}$ Inlet

Hg^0 transmits
quantitatively

$Hg_{Total} \sim 1.3 \text{ ng/m}^3$

$Hg^0 > 99\%$
($0.5\text{-}5 \text{ ng/m}^3$
 $0.1\text{-}0.5 \text{ ppt}$)

$Hg_{PM2.5} < 1\%$
($<1\text{-}10 \text{ pg/m}^3$
 $0.1\text{-}0.5 \text{ ppq}$)

RGM $< 1\%$
($<1\text{-}100 \text{ pg/m}^3$
 $0.1\text{-}10 \text{ ppq}$)

External QA Audits by USEPA Region IV

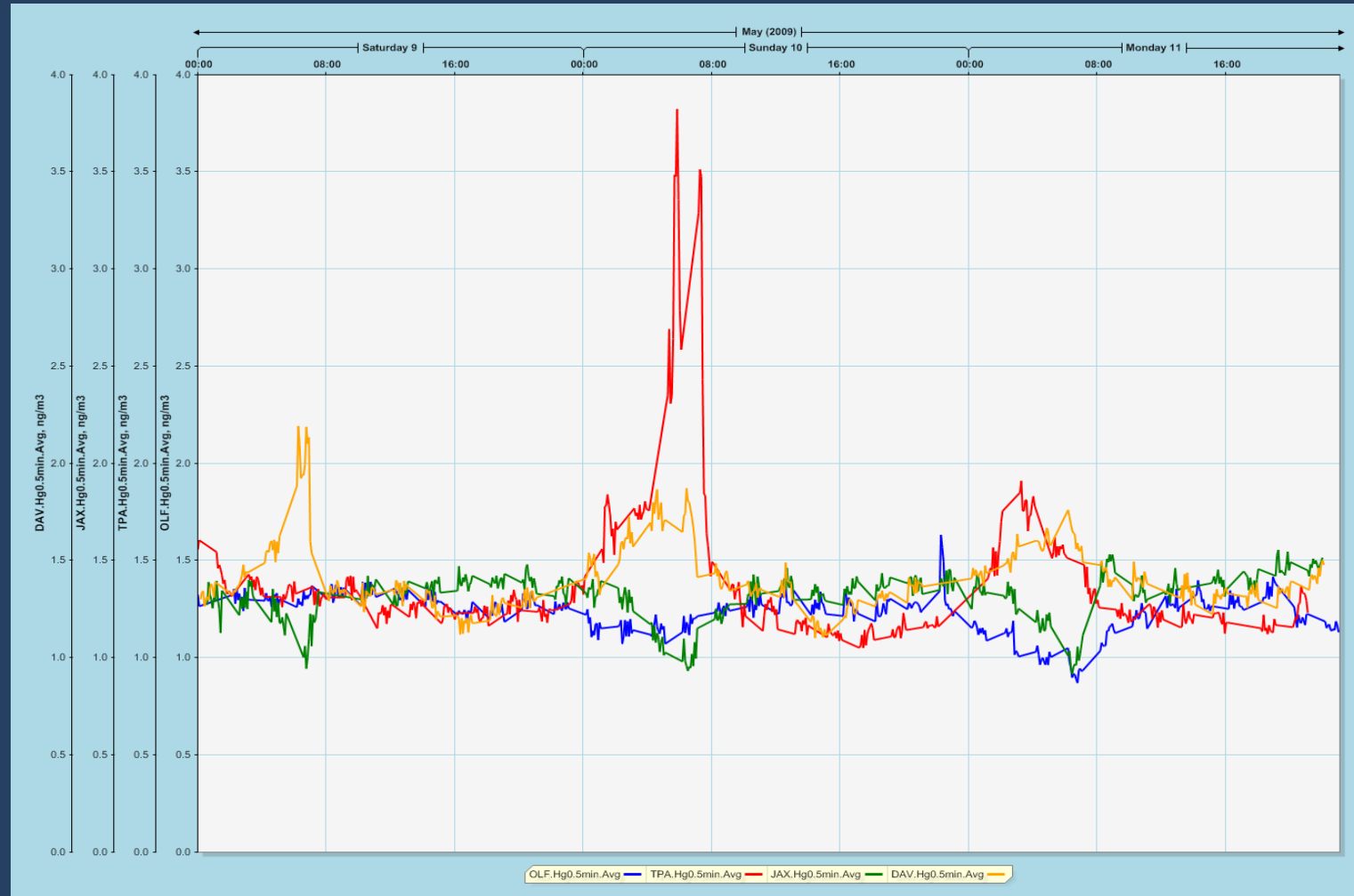
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	Error (%)	
	Panel	Inlet
OLF	2.1±2.2	4.2±3.2
TPA	2.4±3.6	4.7±3.1
JKS	3.6±3.1	6.6±3.6
DVE	2.2±2.6	3.2±2.8

Elemental Hg at 4 Sites

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SuperSite Start Dates and Continuous Data Capture (through 8/31/10)

Site	Start Date	Hg ⁰	RGM	Hg _{PM2.5}	Trace Gases	Met
OLF	10/1/08	92	87	87	95	96
TPA	1/9/09	87	82	82	92	92
JKS	3/6/09	83	80	80	89	89
DVE	4/3/09	90	86	86	95	97

SuperSite Data Status

(as of 1/4/11)

Site	Time Period	Hg	Trace Gases	Met	Seq. Dichot
OLF	≤2010 Q2	Final	Final	Final	Final
	2010 Q3	Final	Final	Final	V0
TPA	≤2010Q2	Final	Final	Final	Final
	2010 Q3	V0	V0	V0	V0
JKS	≤2010Q2	Final	Final	Final	Final
	2010 Q3	V0	V0	V0	V0
DVE	≤2010Q2	Final	Final	Final	Final
	2010 Q3	V0	V0	V0	V0
V0-preliminary validation complete					
All data to be finalized by 3/31/11					

Ambient Hg Data

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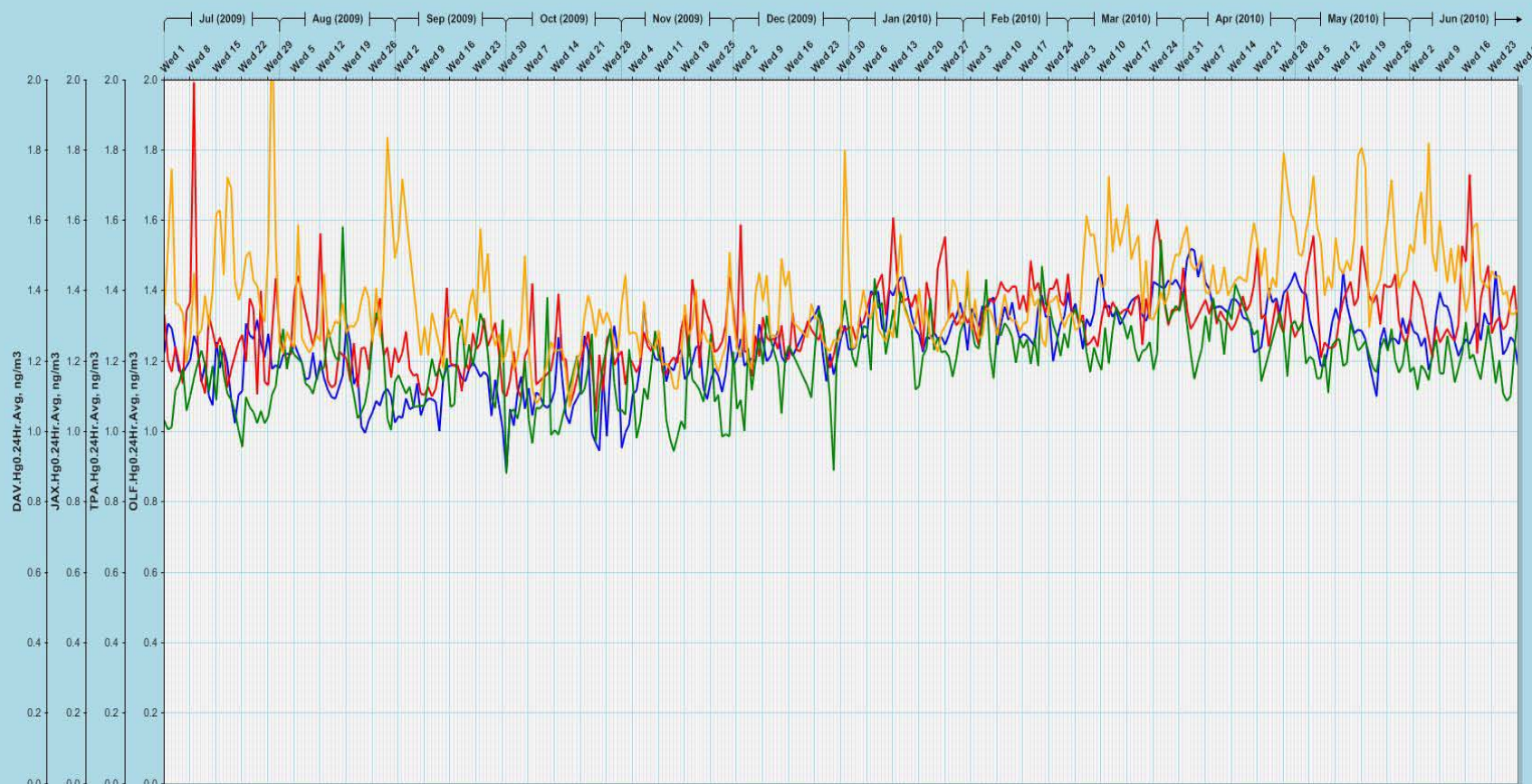
		10/08-8/10			7/09-6/10		
		Hg ⁰	RGM	Hg _{PM2.5}	Hg ⁰	RGM	Hg _{PM2.5}
OLF	mean	1.25	2.5	2.8	1.24	2.4	2.9
	s.d.	0.13	5.1	2.7	0.14	5.6	2.9
TPA	mean	1.32	4.0	2.9	1.29	3.4	2.5
	s.d.	0.2	7.6	4.2	0.18	6.7	3.3
JKS	mean	1.23	2.7	2.0	1.2	2.8	1.9
	s.d.	0.2	5.5	3.3	0.2	6.0	3.6
DVE	mean	1.40	6.6	2.1	1.39	6.4	2.1
	s.d.	0.26	10.9	2.6	0.25	10.4	2.5

Units are ng/m³ for Hg⁰ and pg/m³ for others

Daily Mean Hg⁰

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OLF



TPA



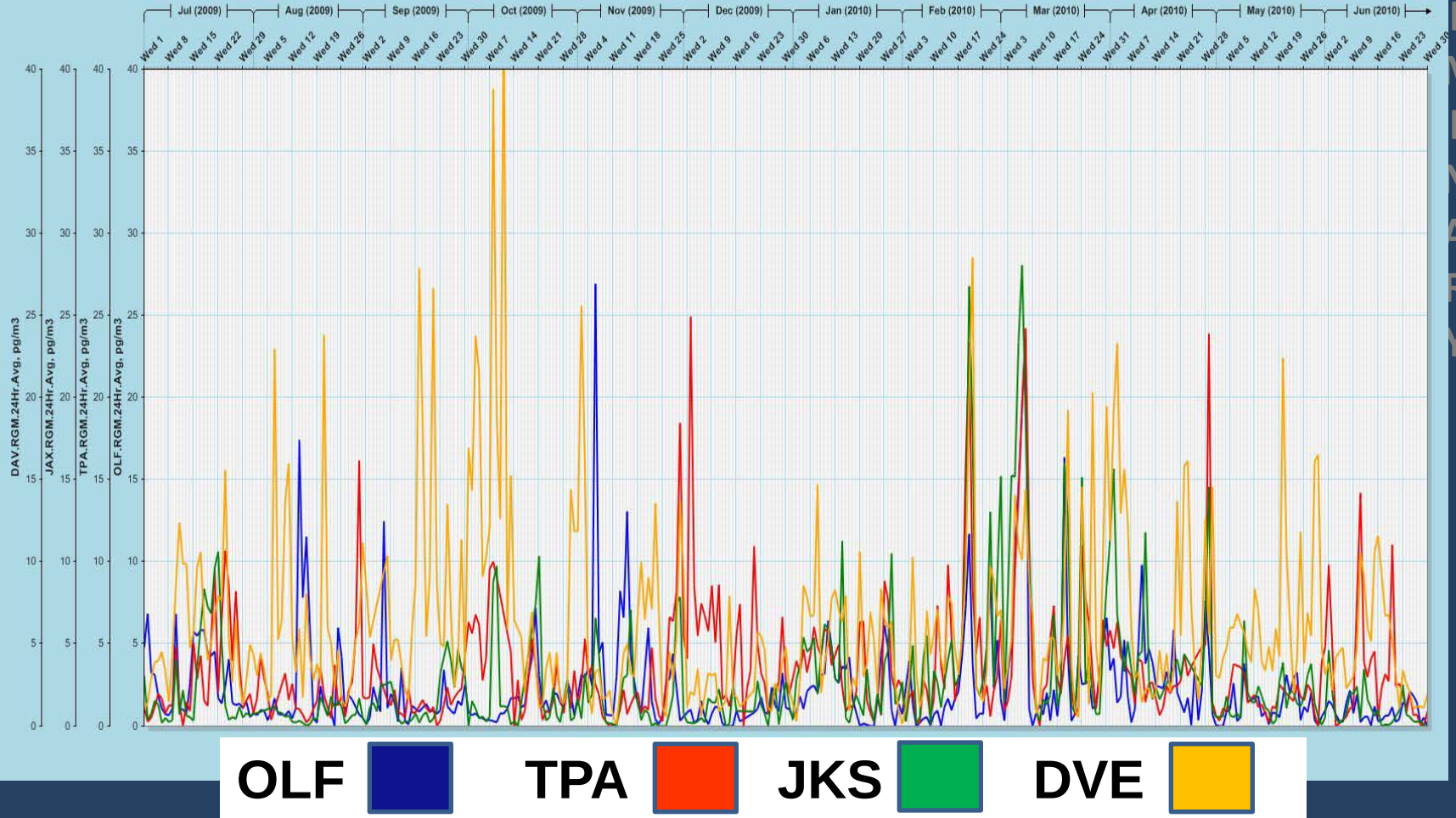
JKS



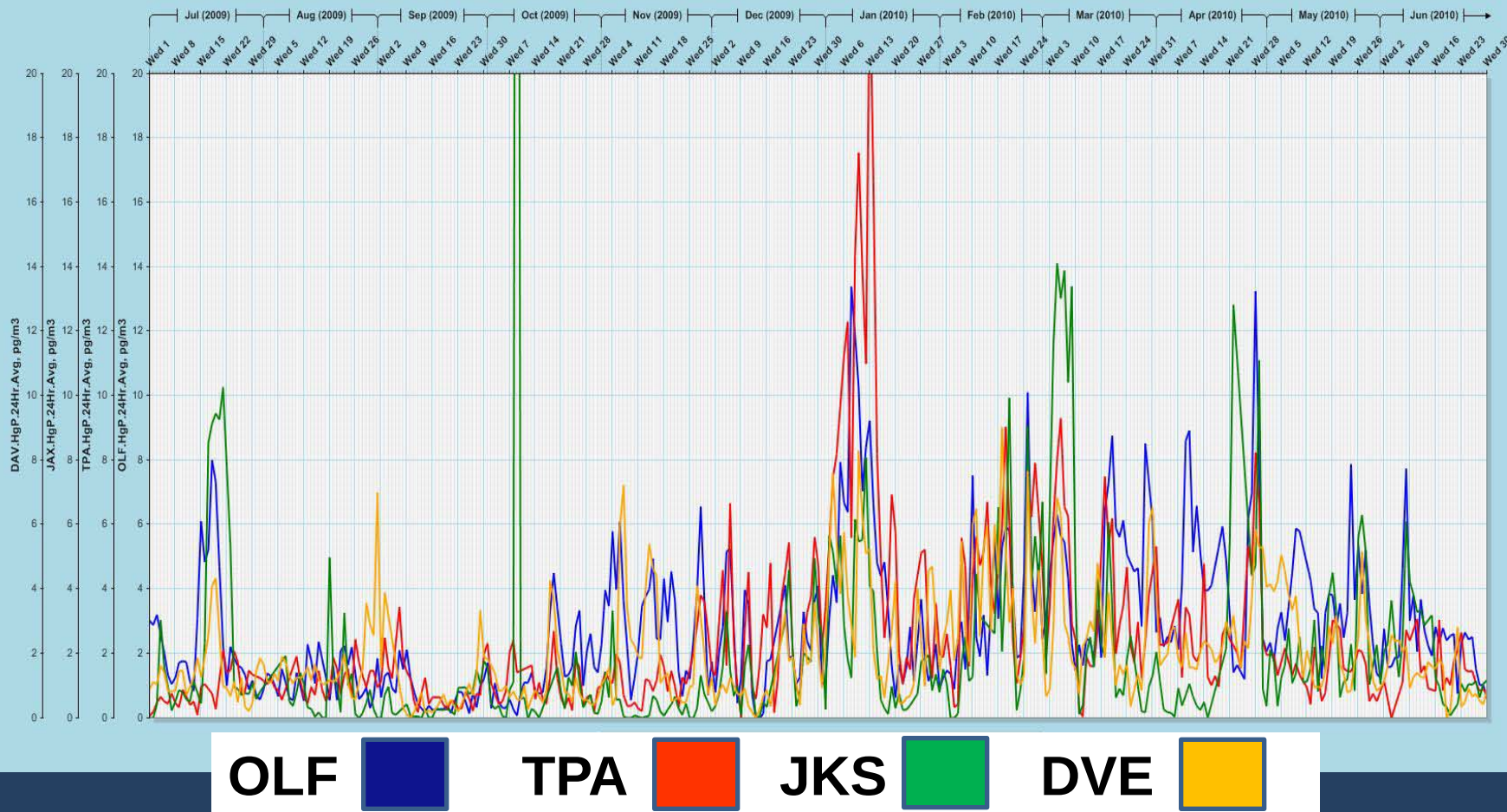
DVE



Daily Mean RGM

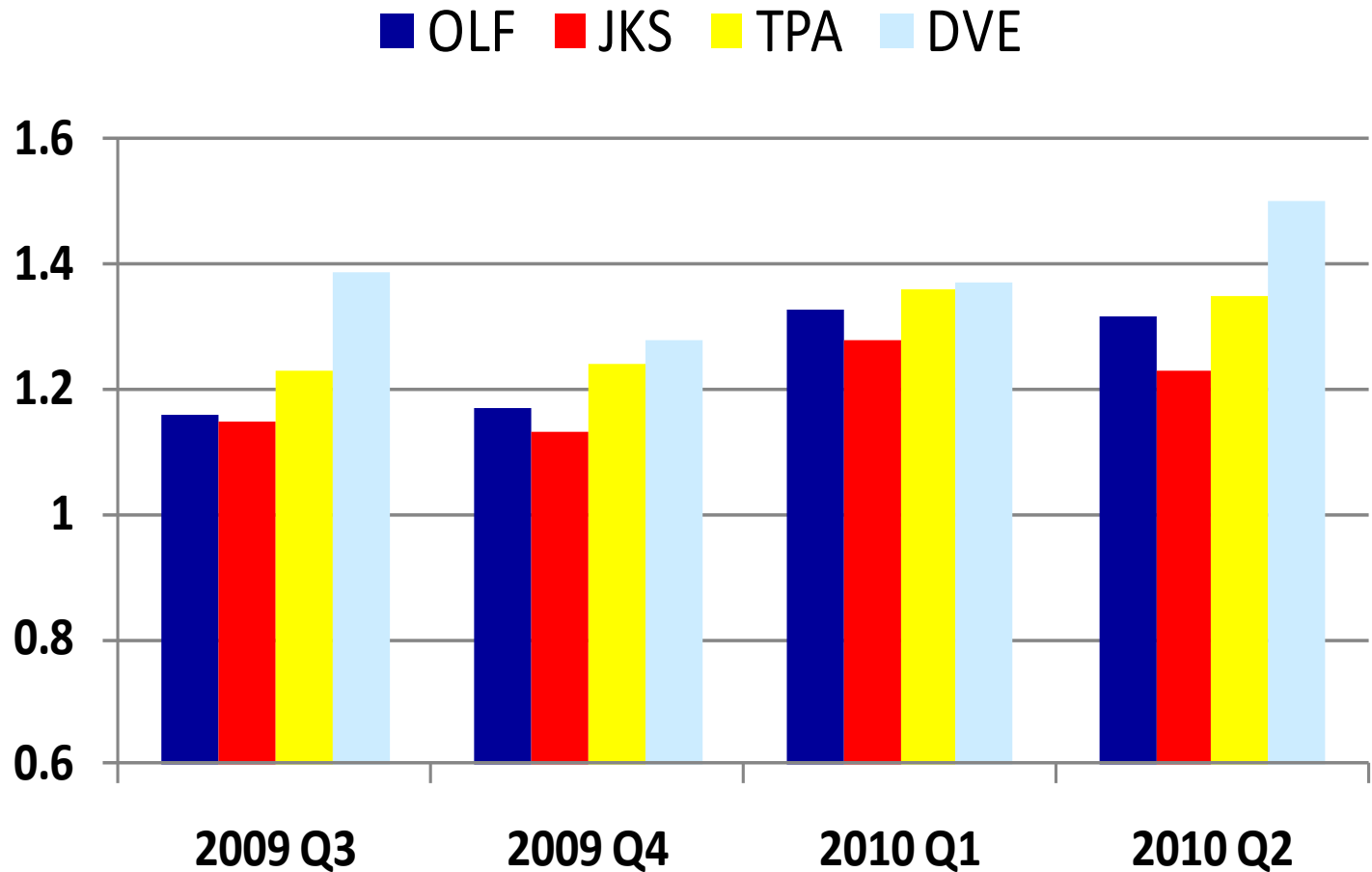


PRELIMINARY RESULTS



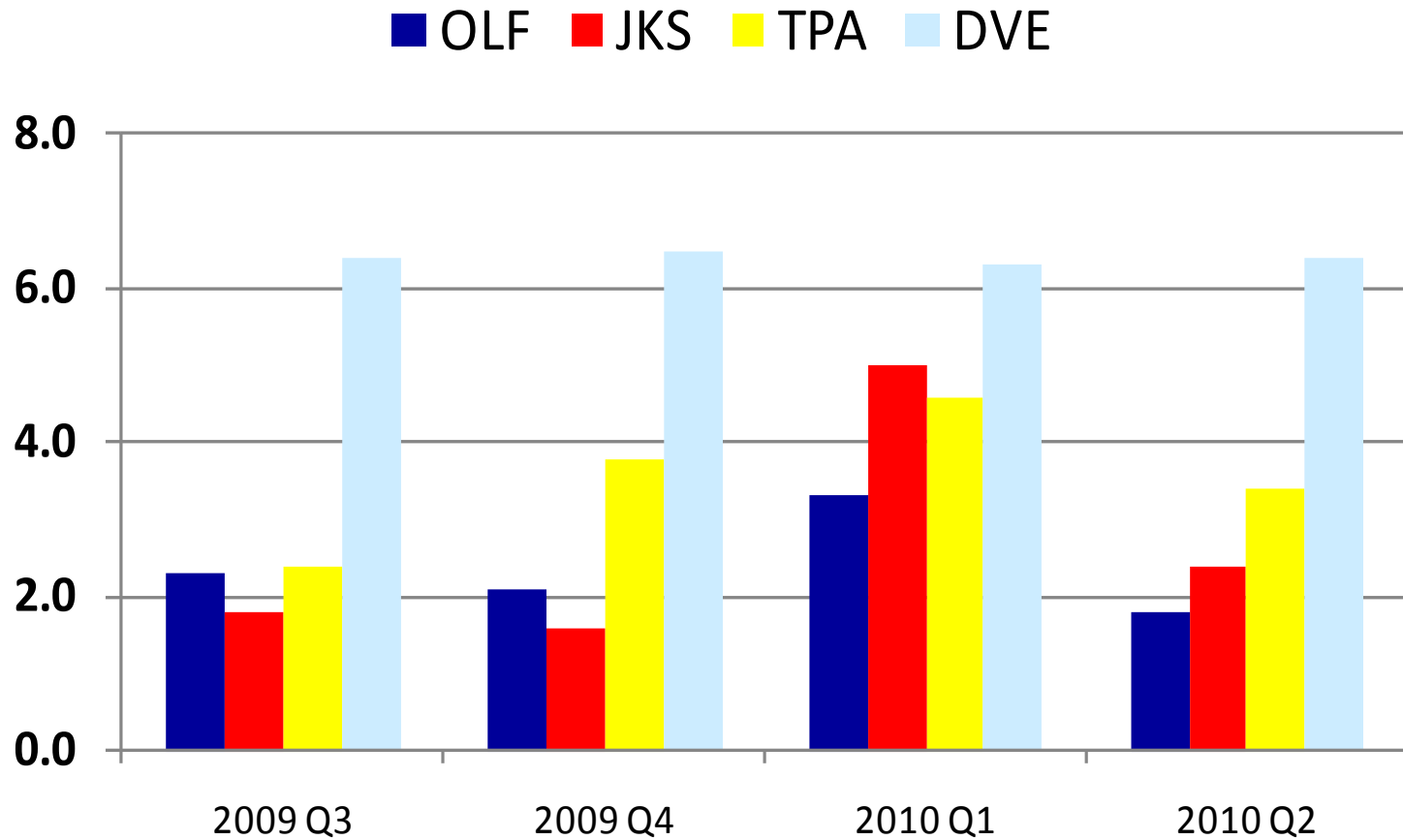
Hg⁰ by Quarter

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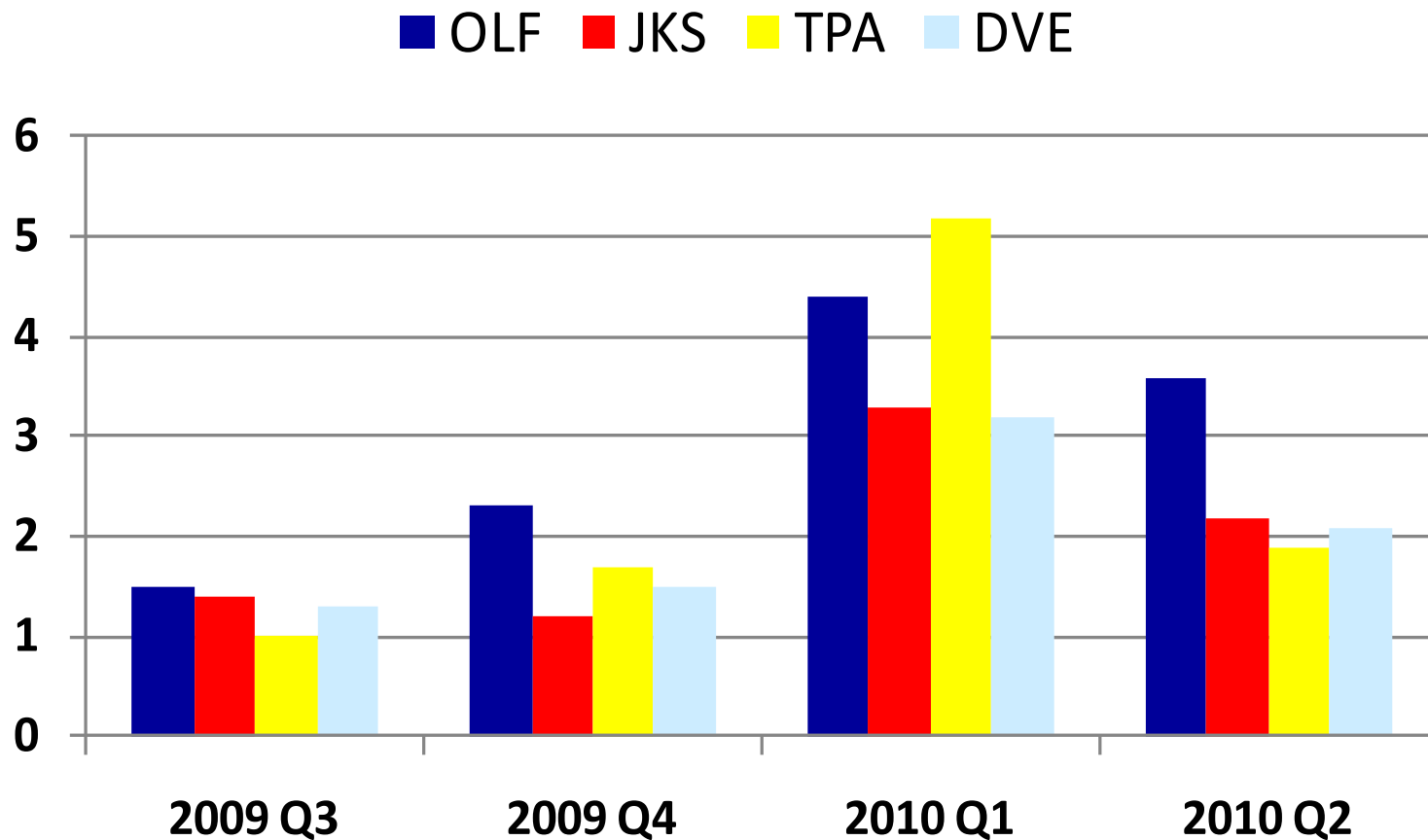
RGM by Quarter

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Hg_{PM2.5} by Quarter

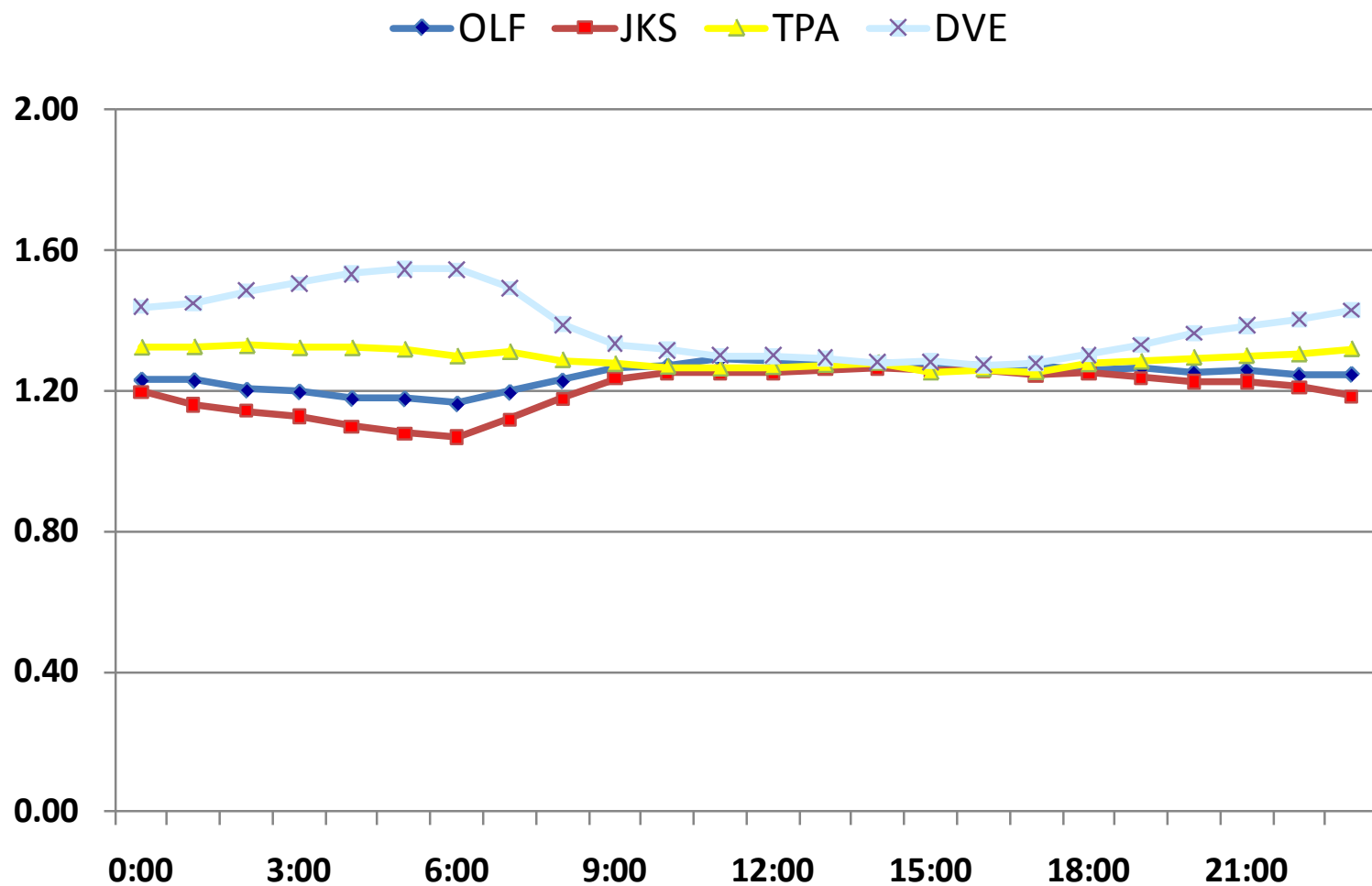
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Diurnal Pattern of Hg⁰

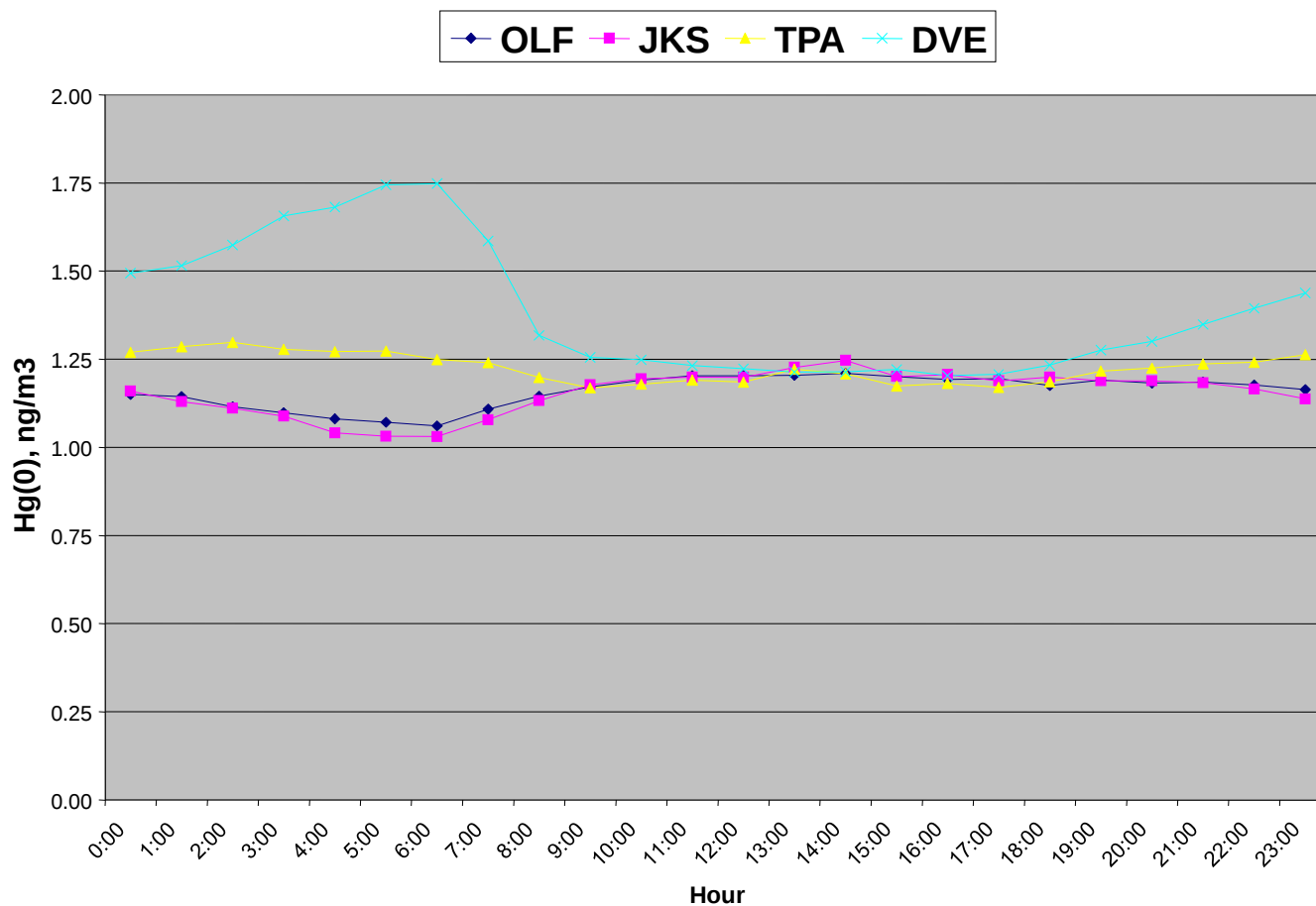
7/09-6/10

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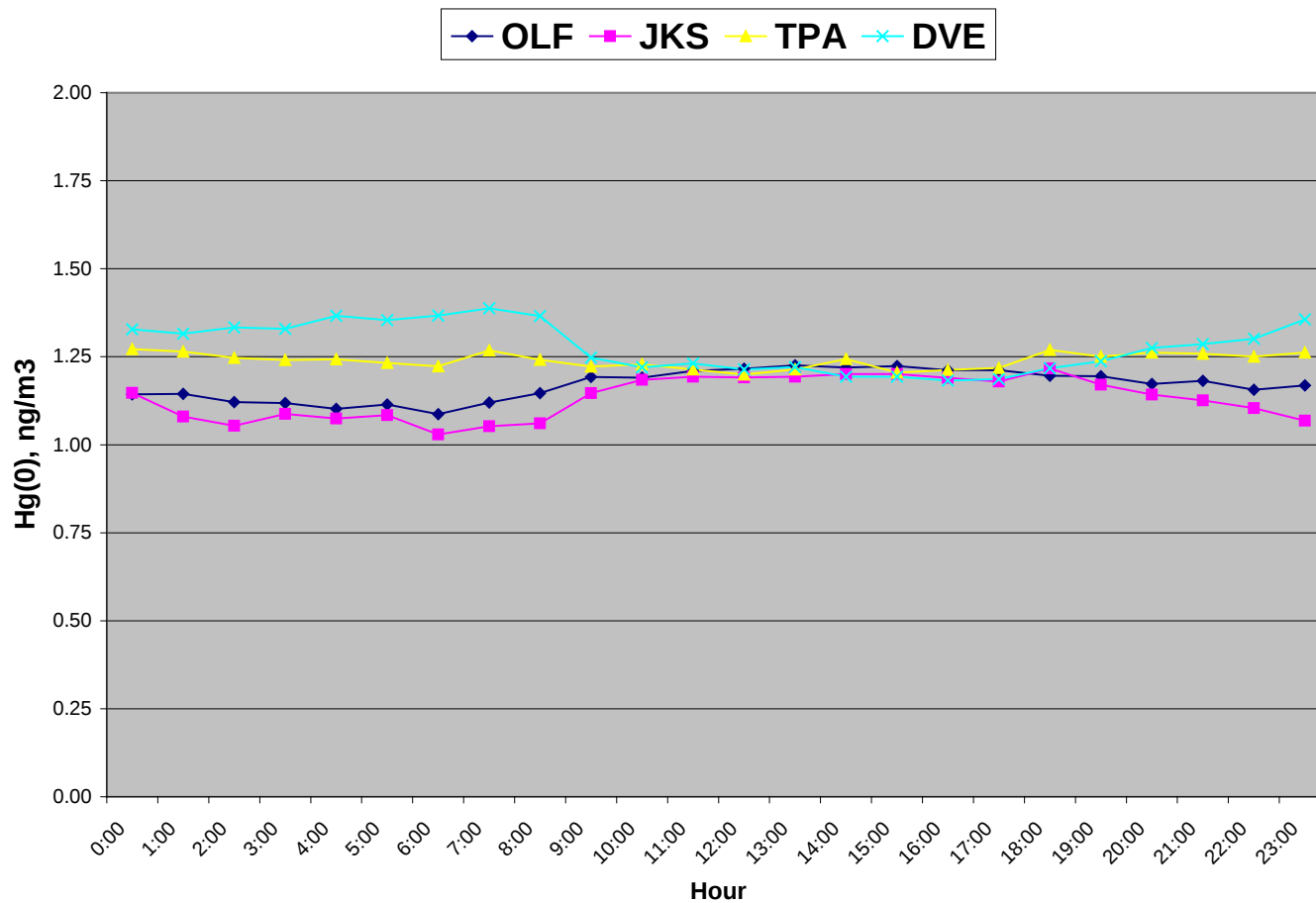
Diurnal Patterns of Hg⁰ 2009 Q3

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Diurnal Patterns of Hg⁰ 2009 Q4

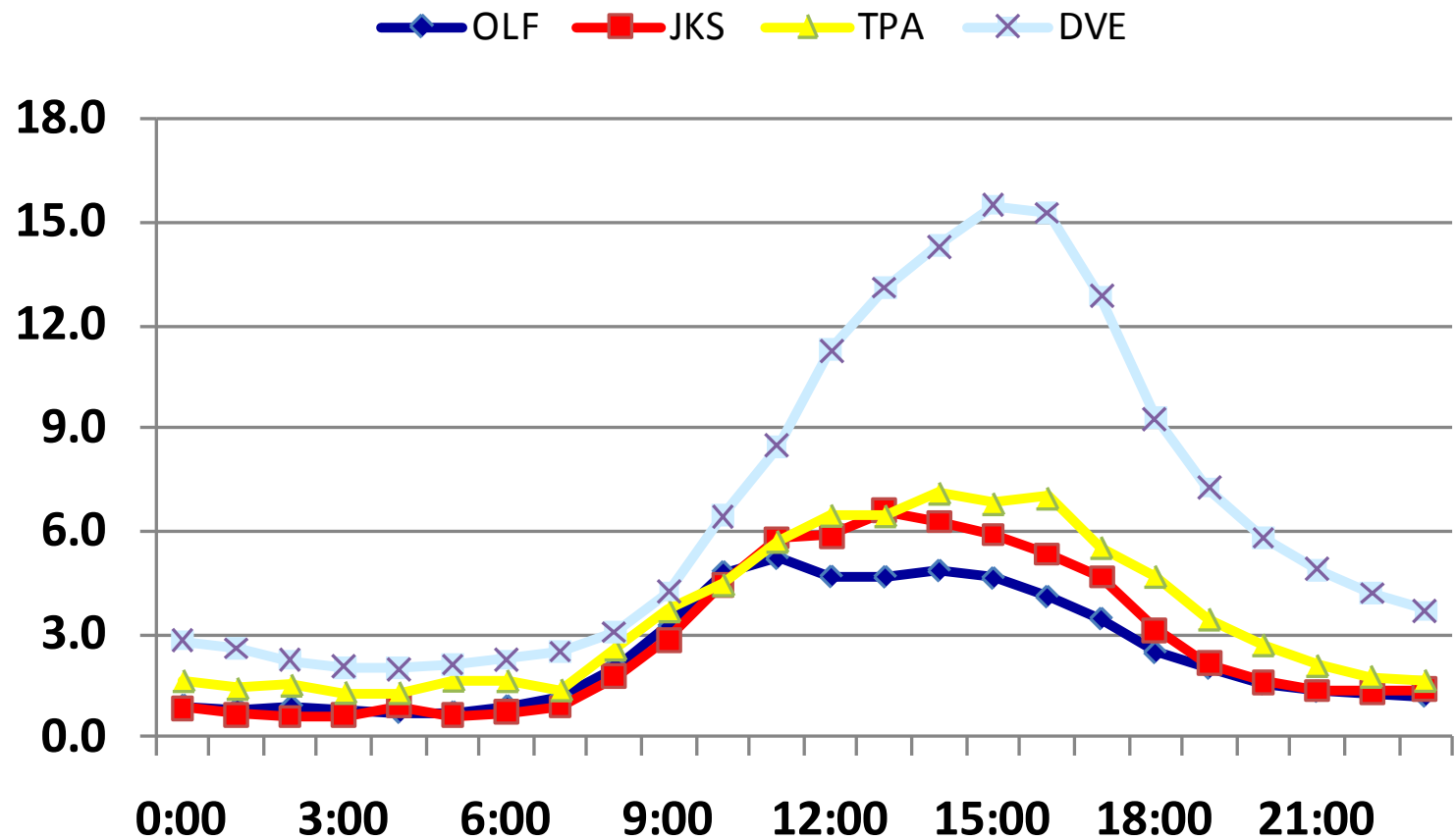
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Diurnal Patterns of RGM

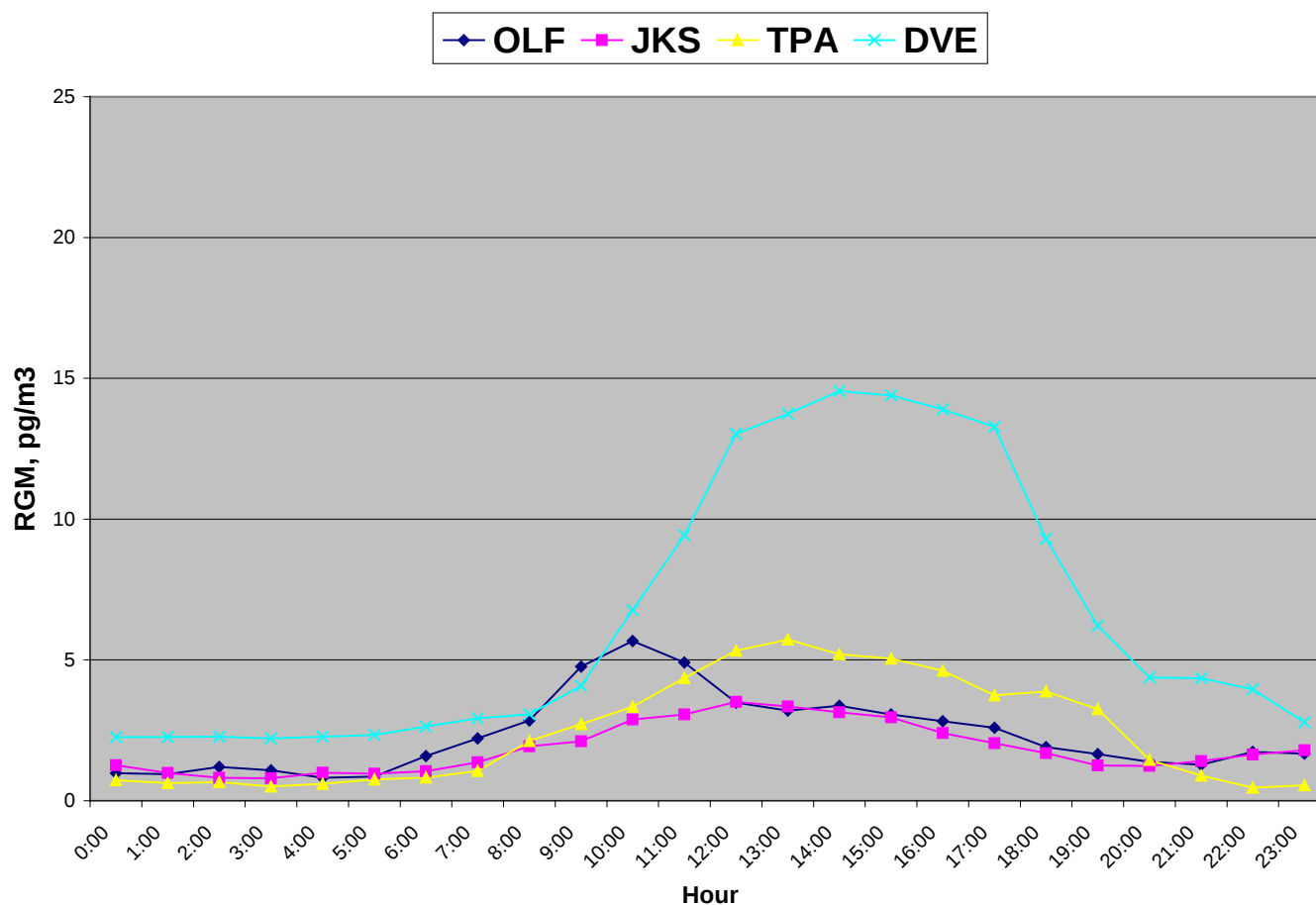
7/09-6/10

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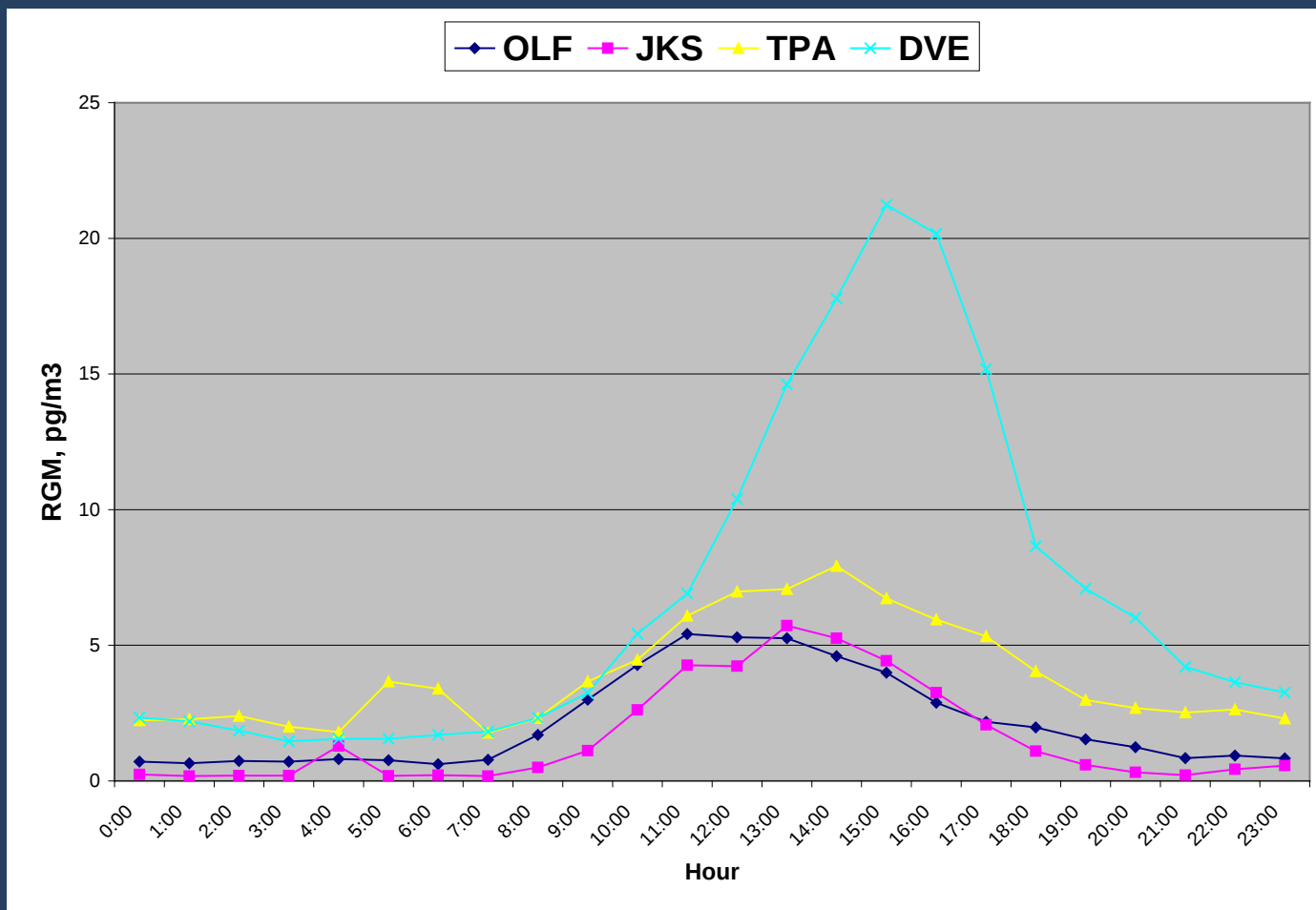
Diurnal Patterns of RGM 2009 Q3

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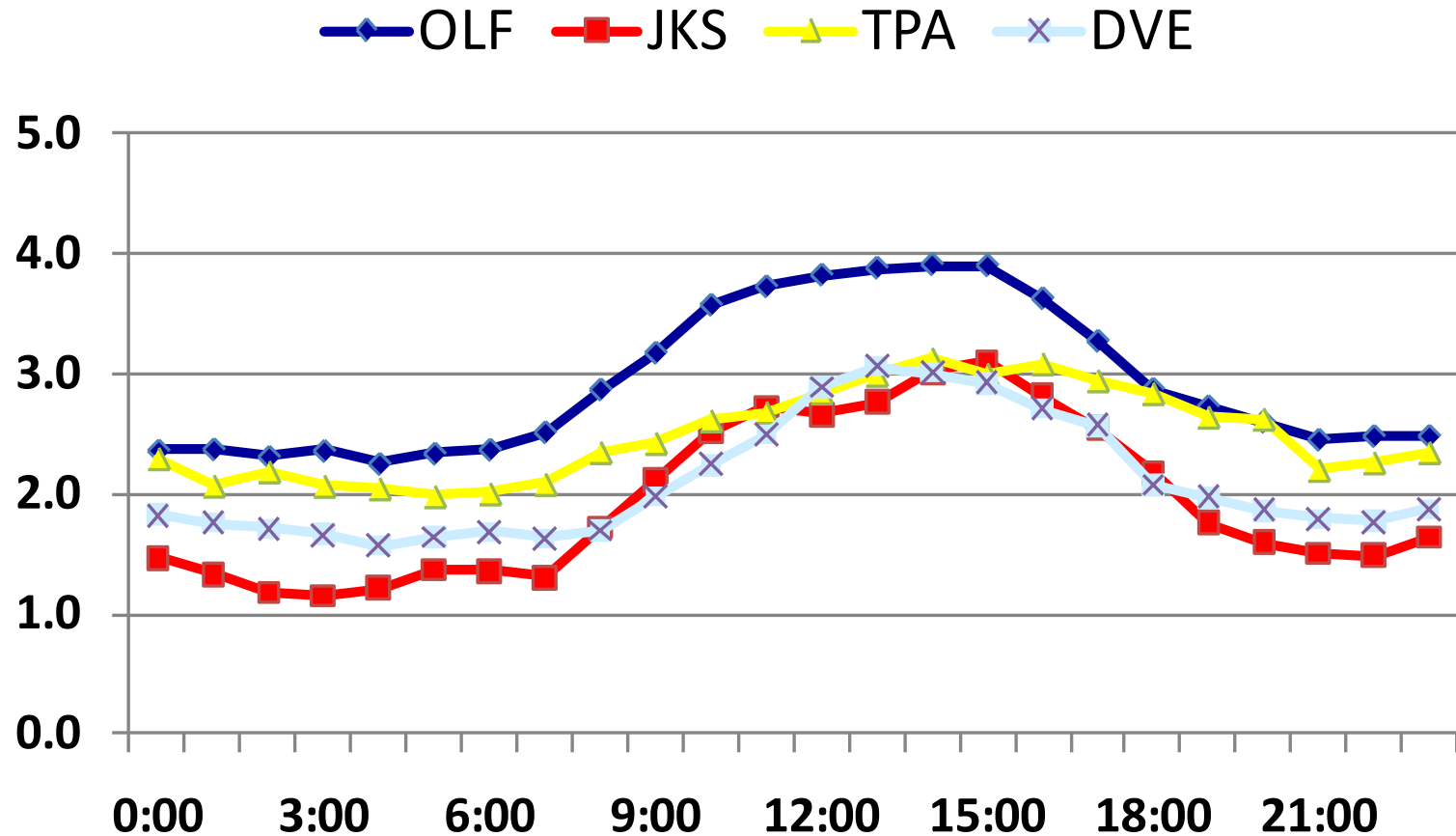
Diurnal Patterns of RGM 2009 Q4

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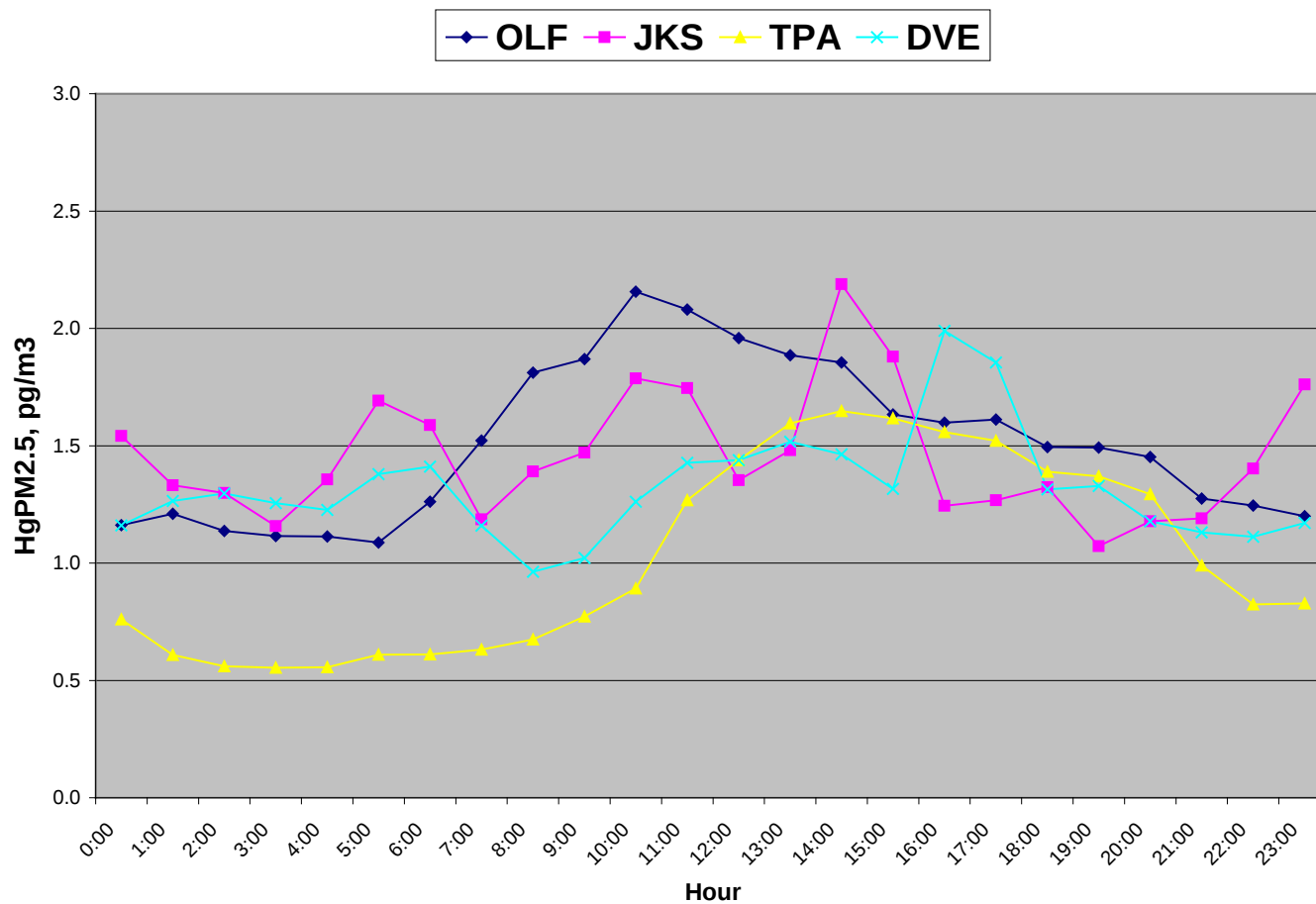
Diurnal Patterns of Hg_{PM2.5} 7/09-6/10

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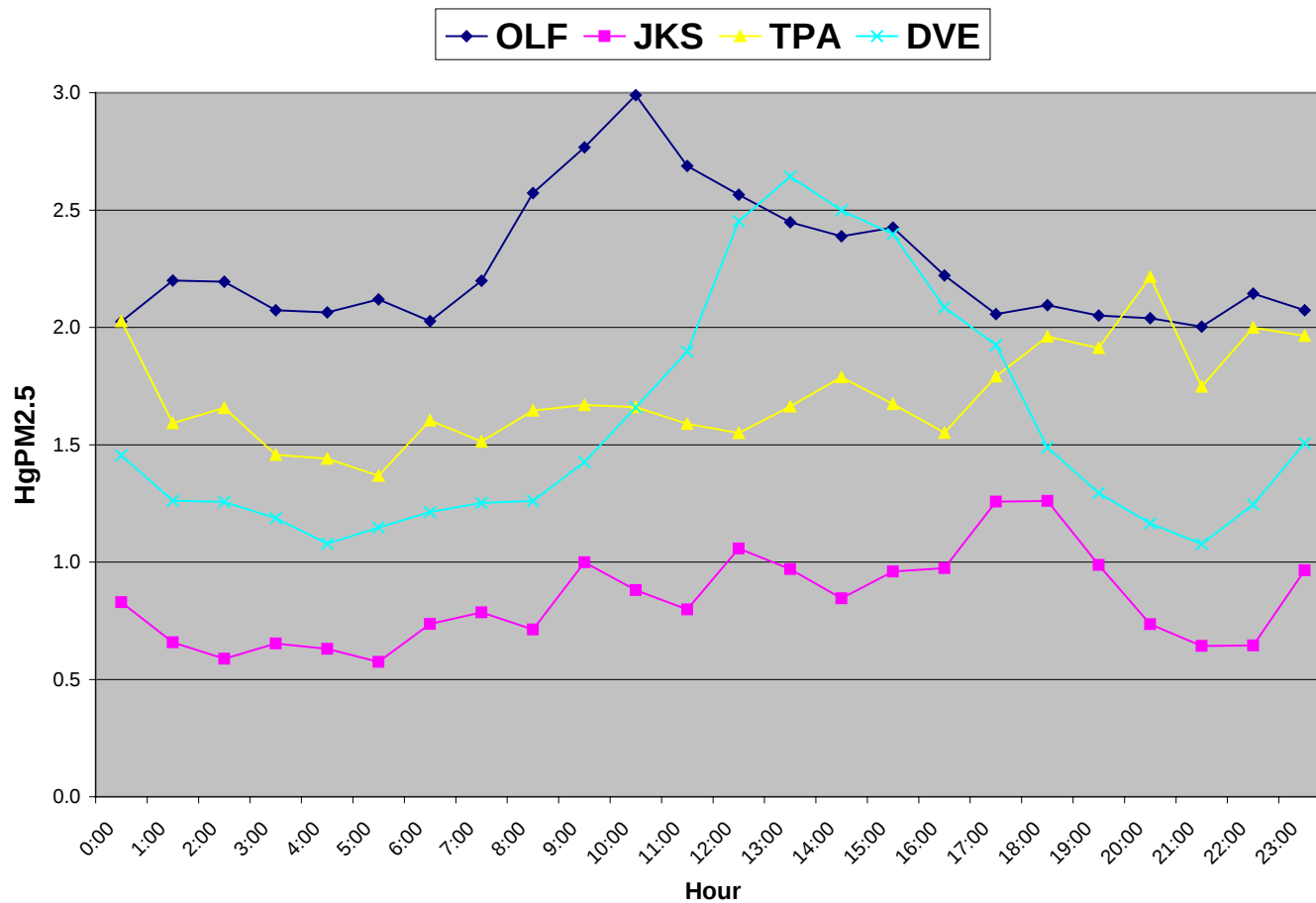
Diurnal Patterns of Hg_{PM2.5} 2009 Q3

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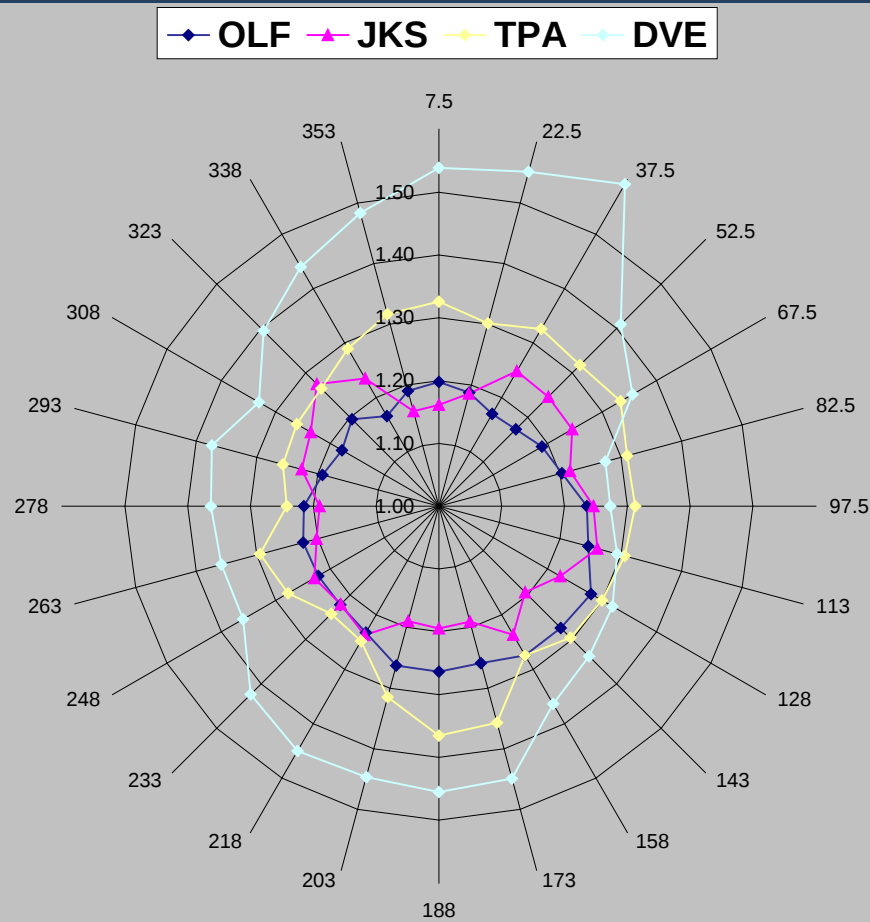
Diurnal Patterns of Hg_{PM2.5} 2009 Q4

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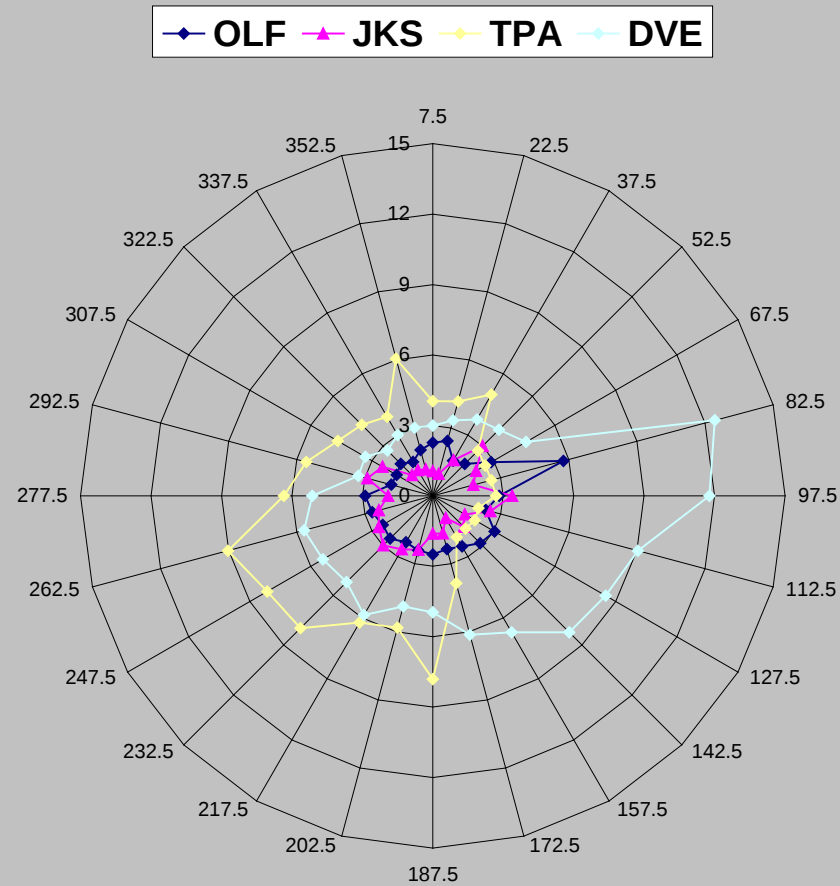
Hg⁰ vs. WD (15 deg. Bins)

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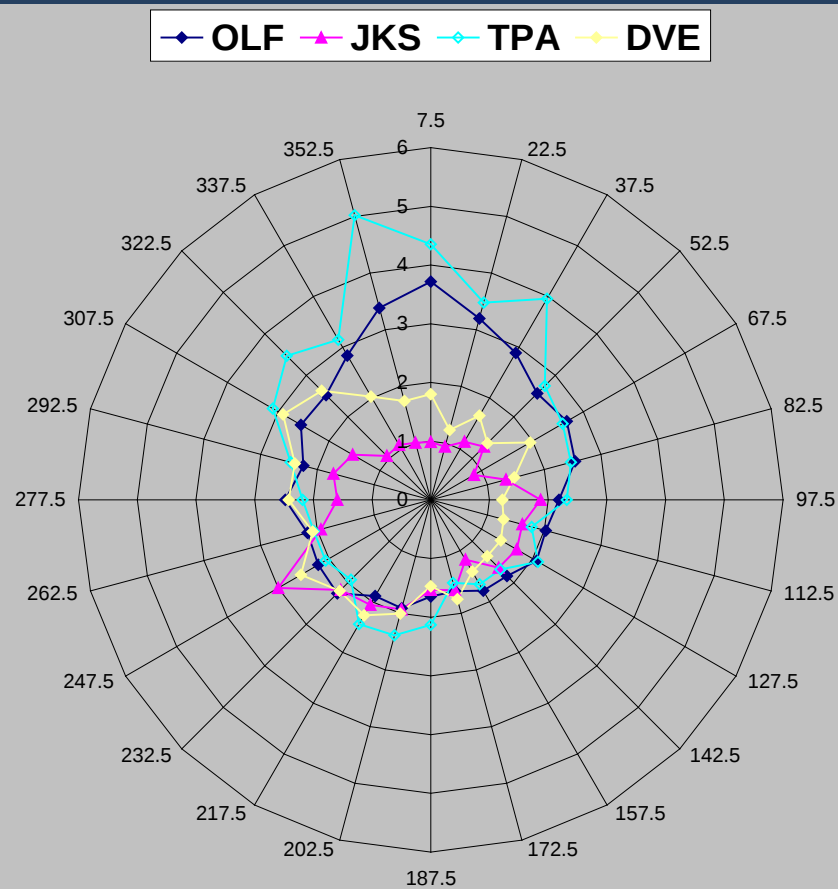
RGM vs. WD (15 deg. Bins)

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Hg_{PM2.5} vs. WD (15 deg. Bins)

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Summary

- SuperSite network fully operational from April 2009 through August 2010 (OLF October 2008)
- Data capture close to target values (85%)
- Data reporting up to date (all data to UM by 3/31/11)
- Atmospheric Hg data show interesting variability as a function of season, hour of day and WD