

Evaluating CarboEurope/IMECC-quality control activities

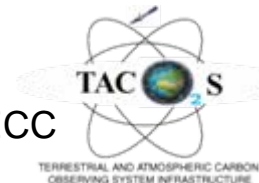
Do intercomparison results help us to further improve our measurements?

Armin Jordan, MPI for Biogeochemistry, Jena, Germany

with collaboration of:

B. Steinberg, W. A. Brand, M. Rothe (MPI), I. Levin, C. Facklam, S. Hammer, M. Sabasch (UHEI)
M. Schmidt, M. Delmotte, M. Ramonet, P. Ciais (LSCE/CEA), R.E.M. Neubert, H.A.J. Meijer (CIO)
R. L. Langenfelds, C. E. Allison, L.P. Steele, R.J. Francey (CMAR), T. Machida, H. Mukai (NIES)
T. Conway, P. Novelli, B. Hall, B. Vaughn (NOAA/GMD), D. Worthy, M. Ernst, L. Huang (EnCan), A.
C. Manning, A. Etchells (UEA)

and R.J. Francey (CMAR) as senior scientific advisor of IMECC



intercomparison activities

Sausage flasks



bimonthly since 2002
8 long-term partners

Grapefruit flasks



monthly since 2005
4 long-term partners

cucumber cylinders



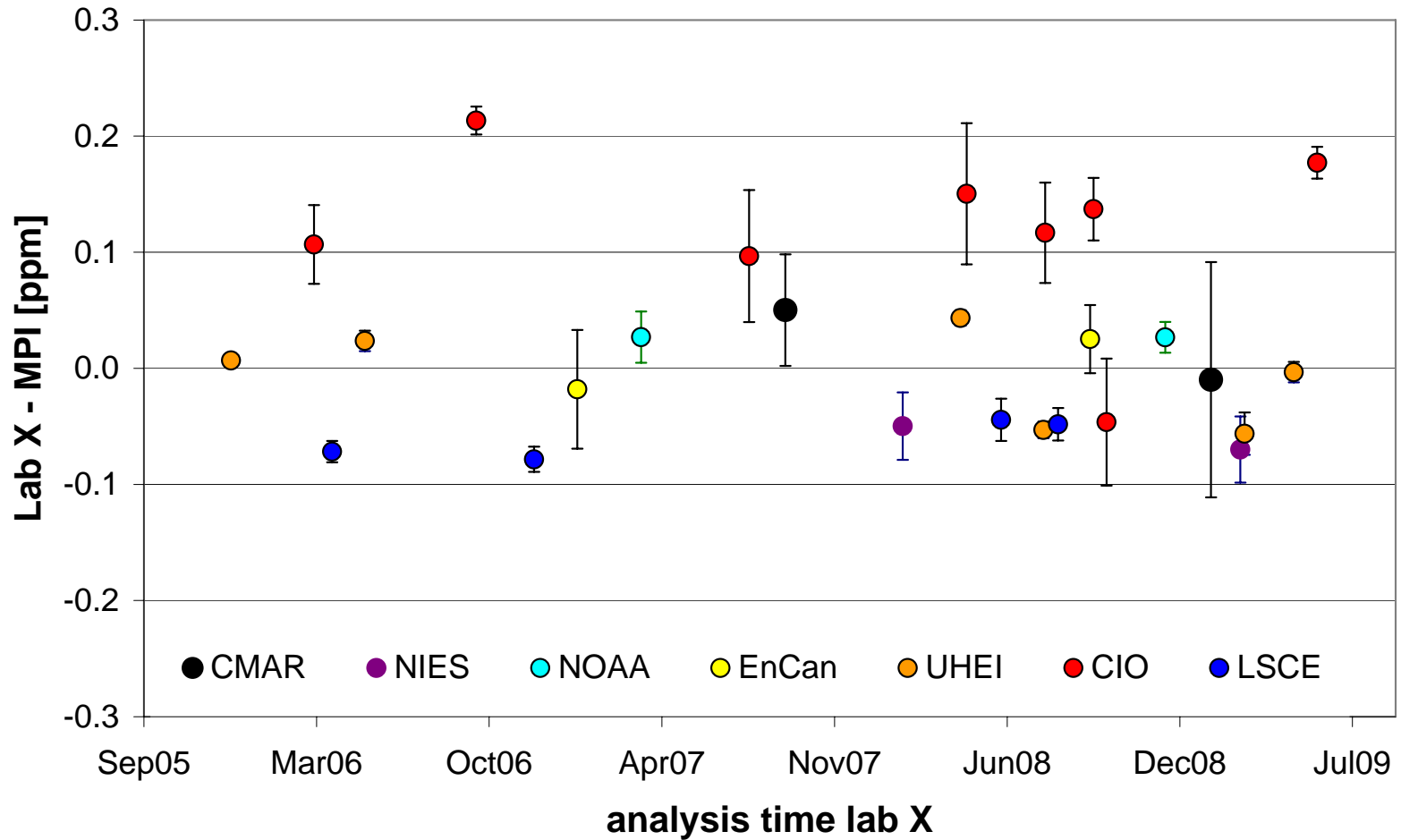
restart 2007, 7 loops
32 participants

Loflo ICP

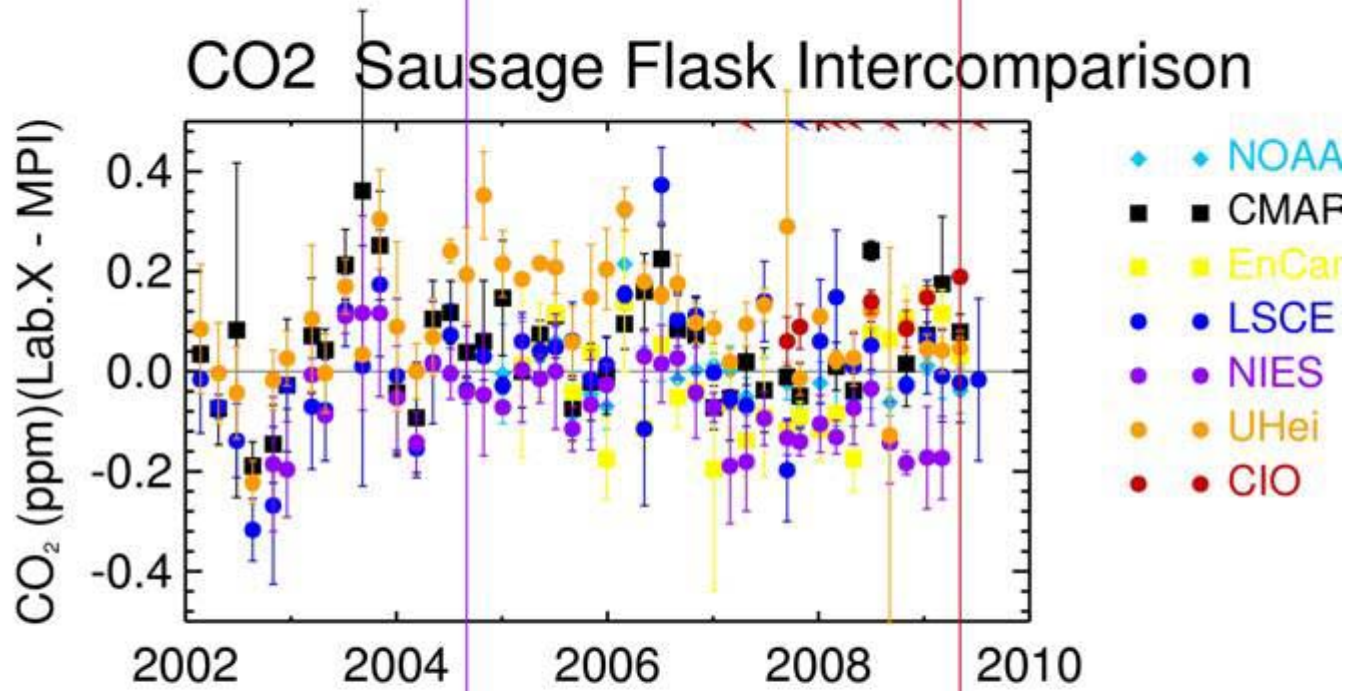


start 2007
3-4 times/yr
LSCE/CSIRO

CO₂ comparability of "Cucumber" results

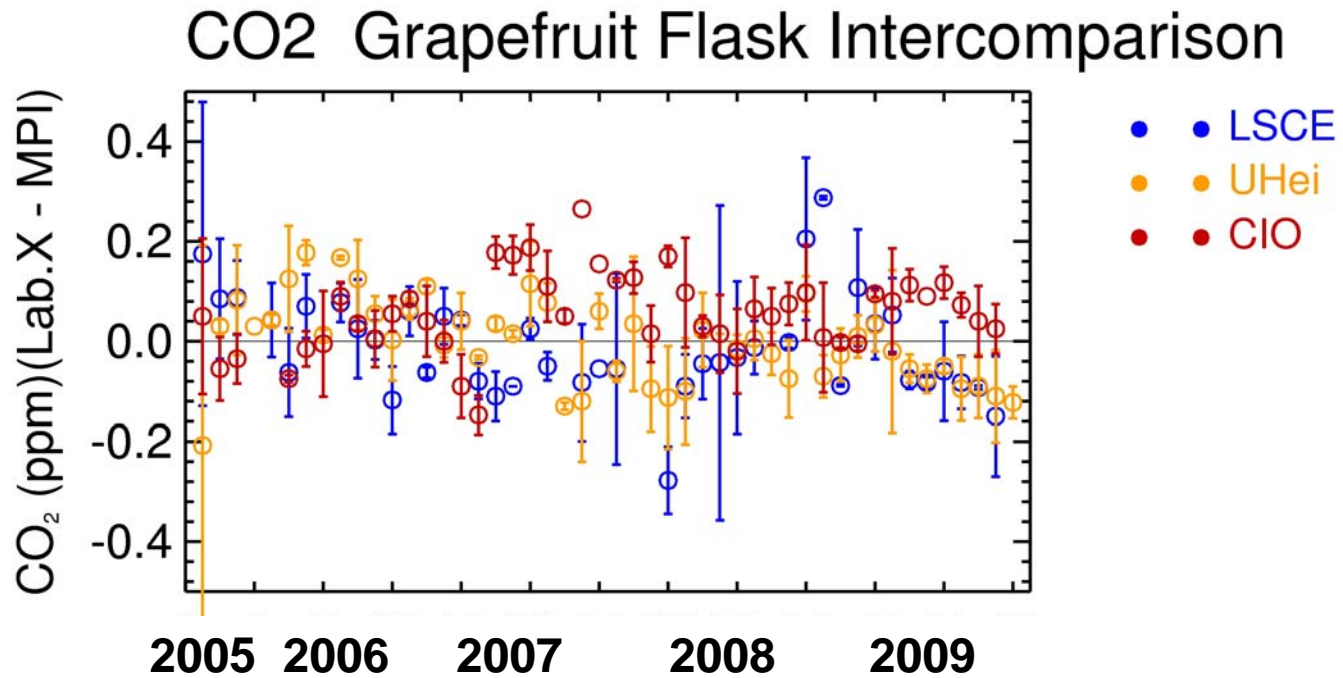


CO₂ comparability of "Sausage" results



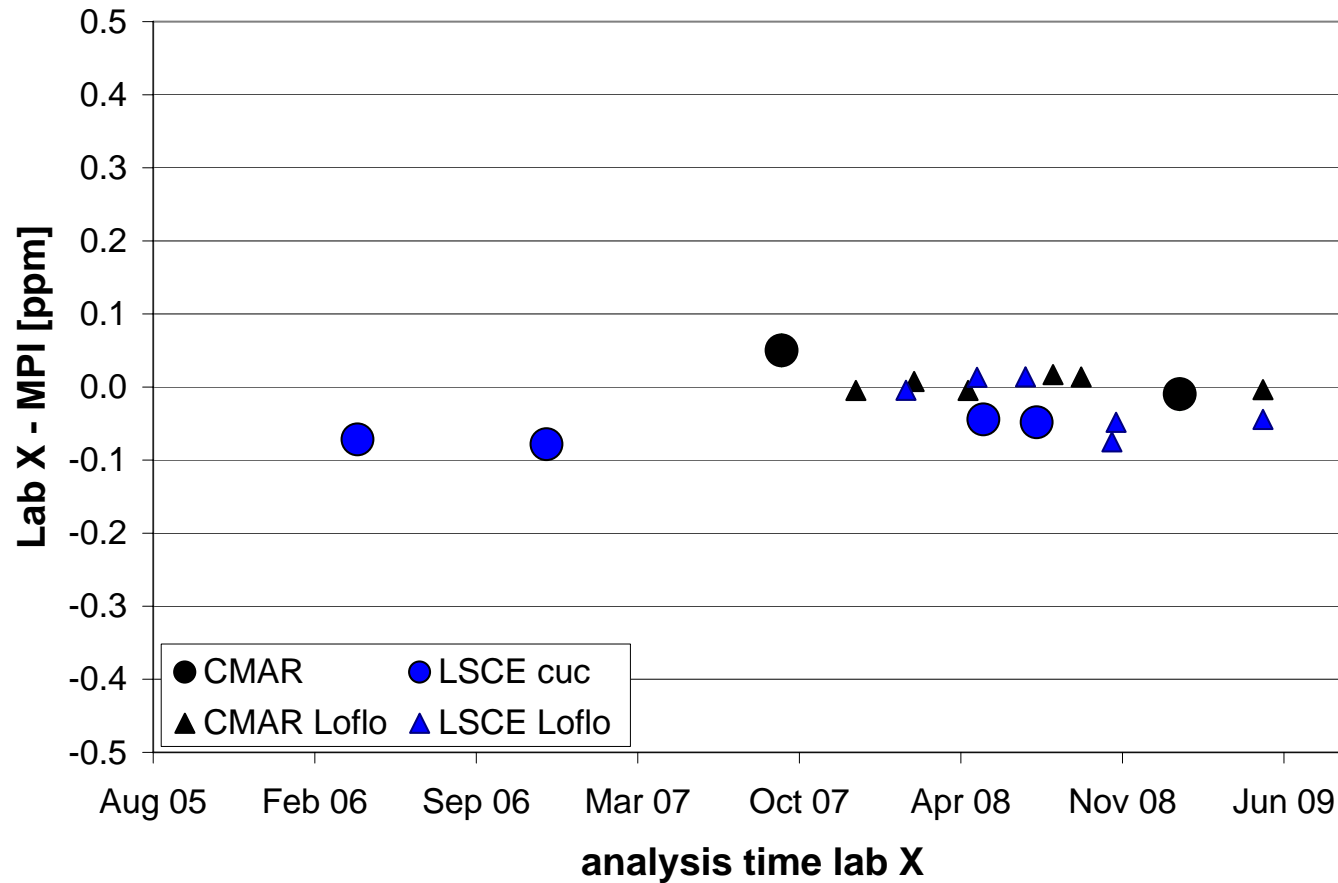
August 24, 2009

CO₂ comparability of "Grapefruit" results



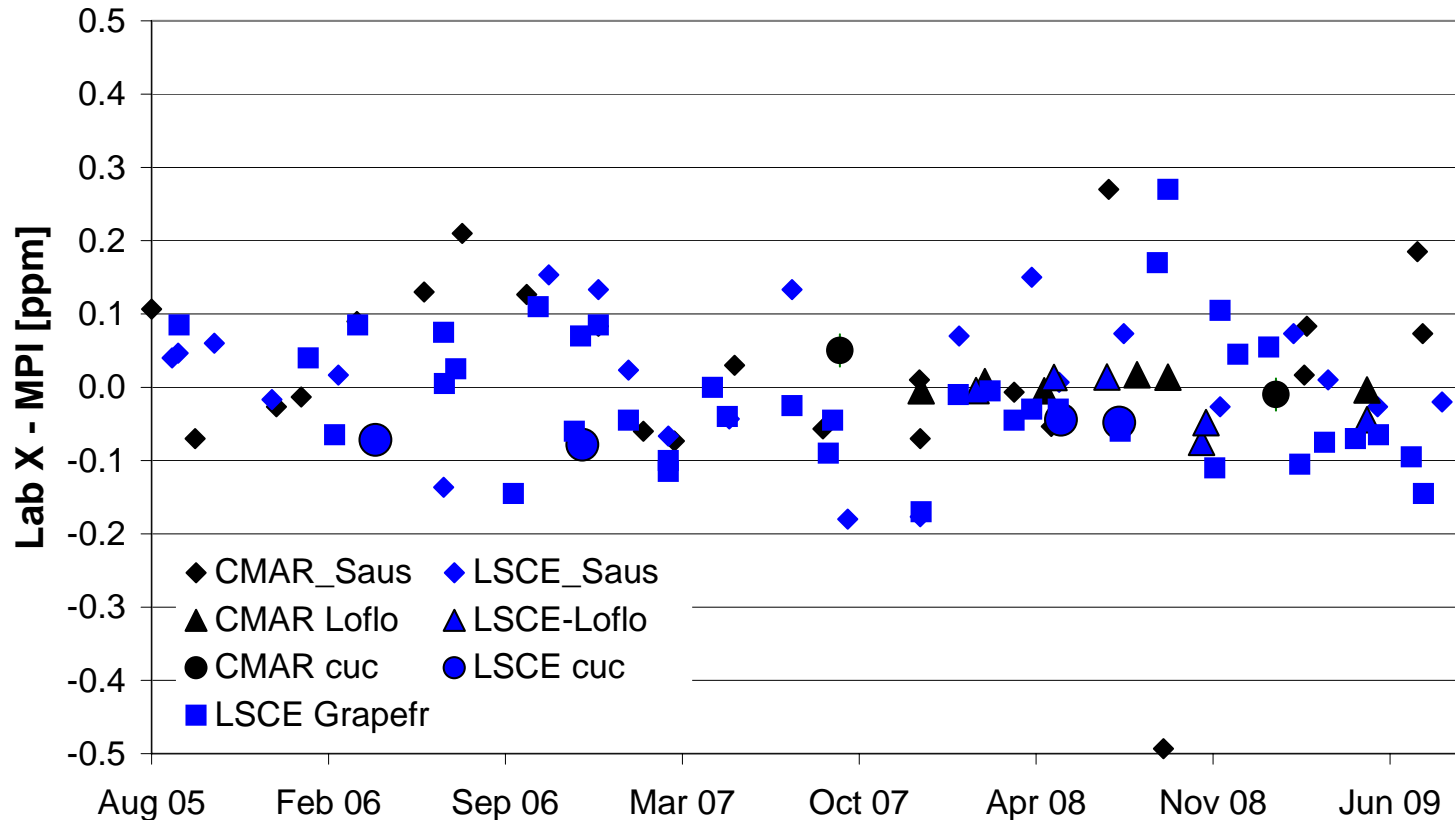
September 3, 2009

CO₂ comparability of high pressure cylinders CMAR , LSCE, MPI



very stable offsets - adequate to apply correction term?

CO₂ comparability of flasks CMAR , LSCE, MPI

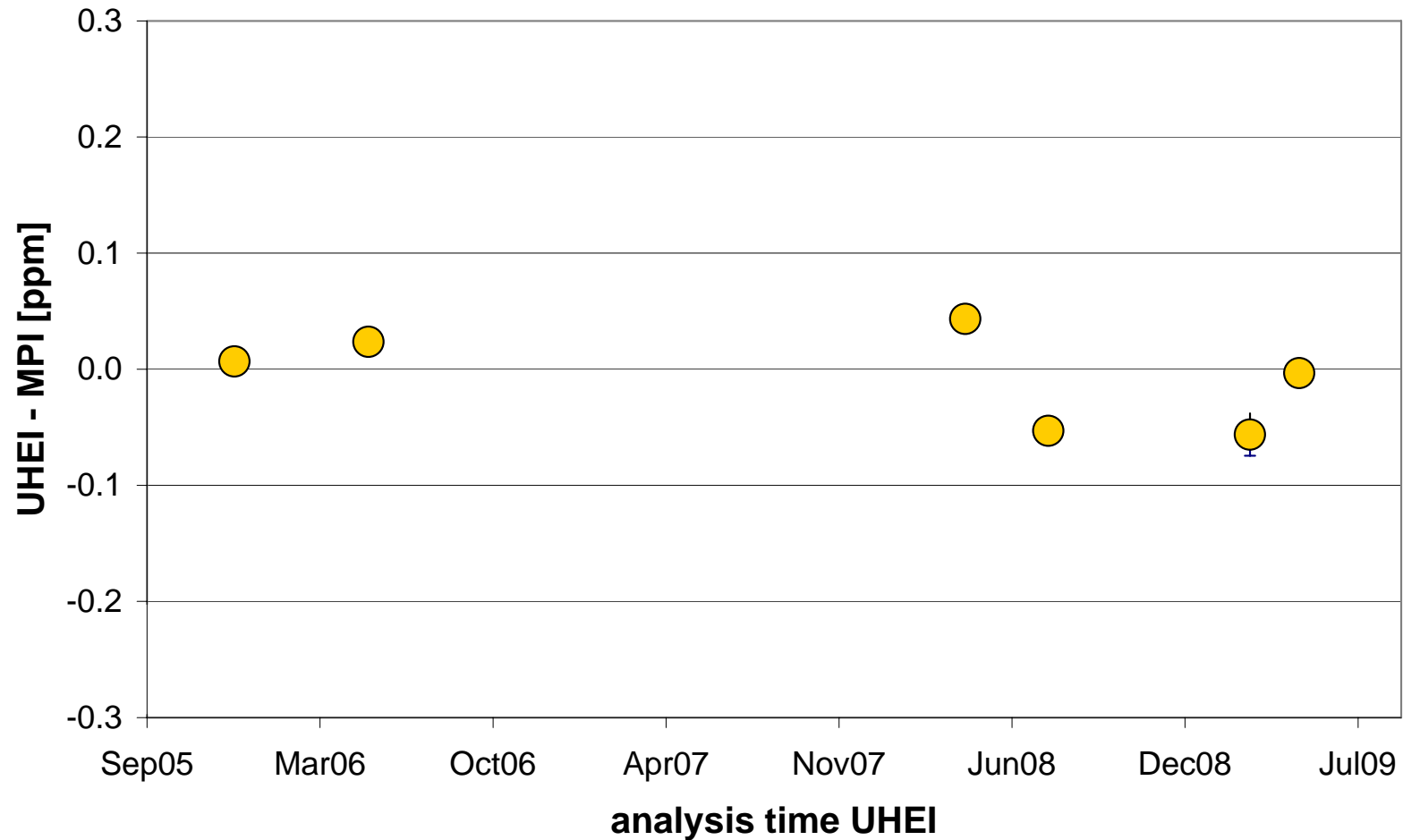


flask ICP offsets less constant

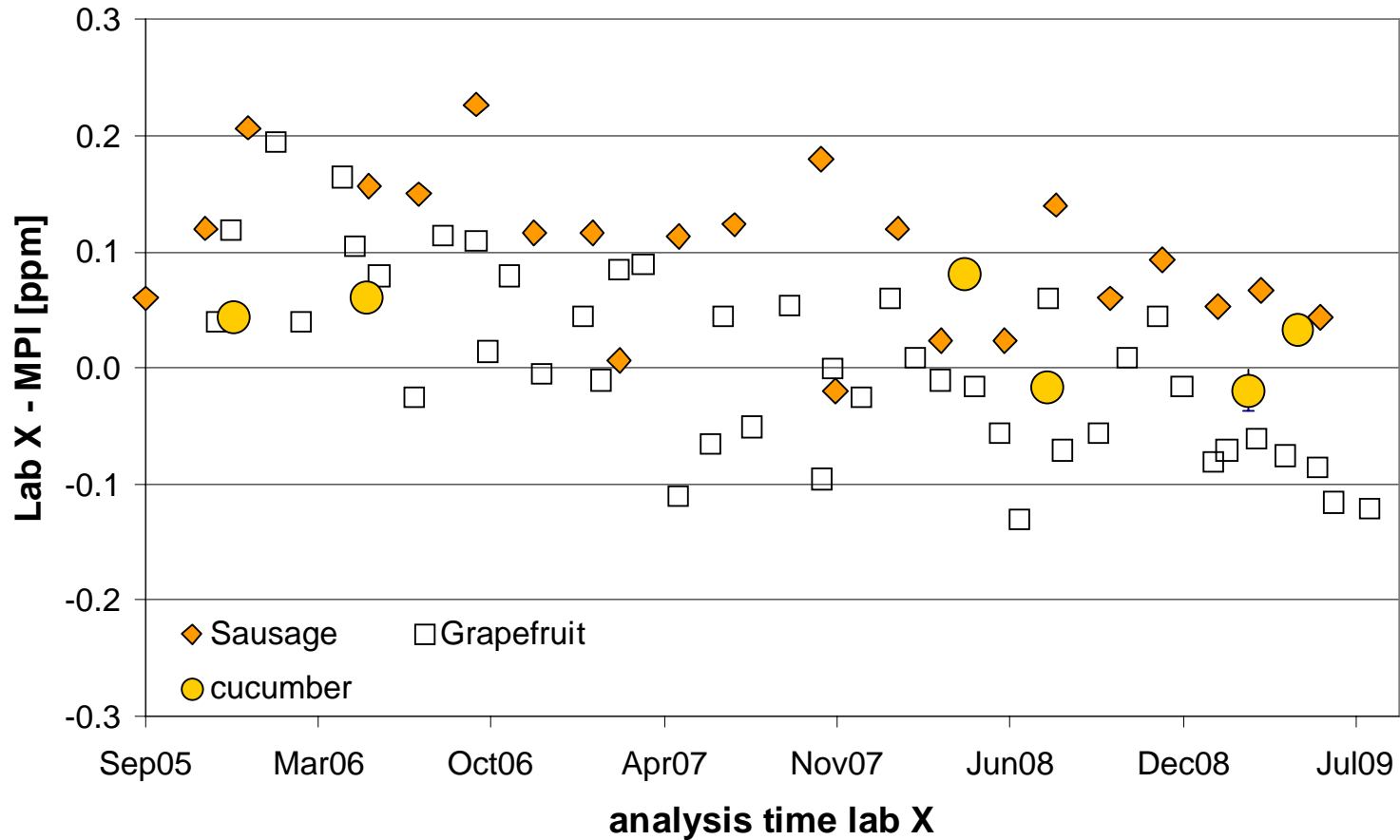
different systems involved: $GC_{MPI} - Loflo_{MPI} = 0.037$ ppm

→ ICPs show only agreement of the very systems that are compared

CO₂ comparability of high pressure cylinders UHEI, MPI

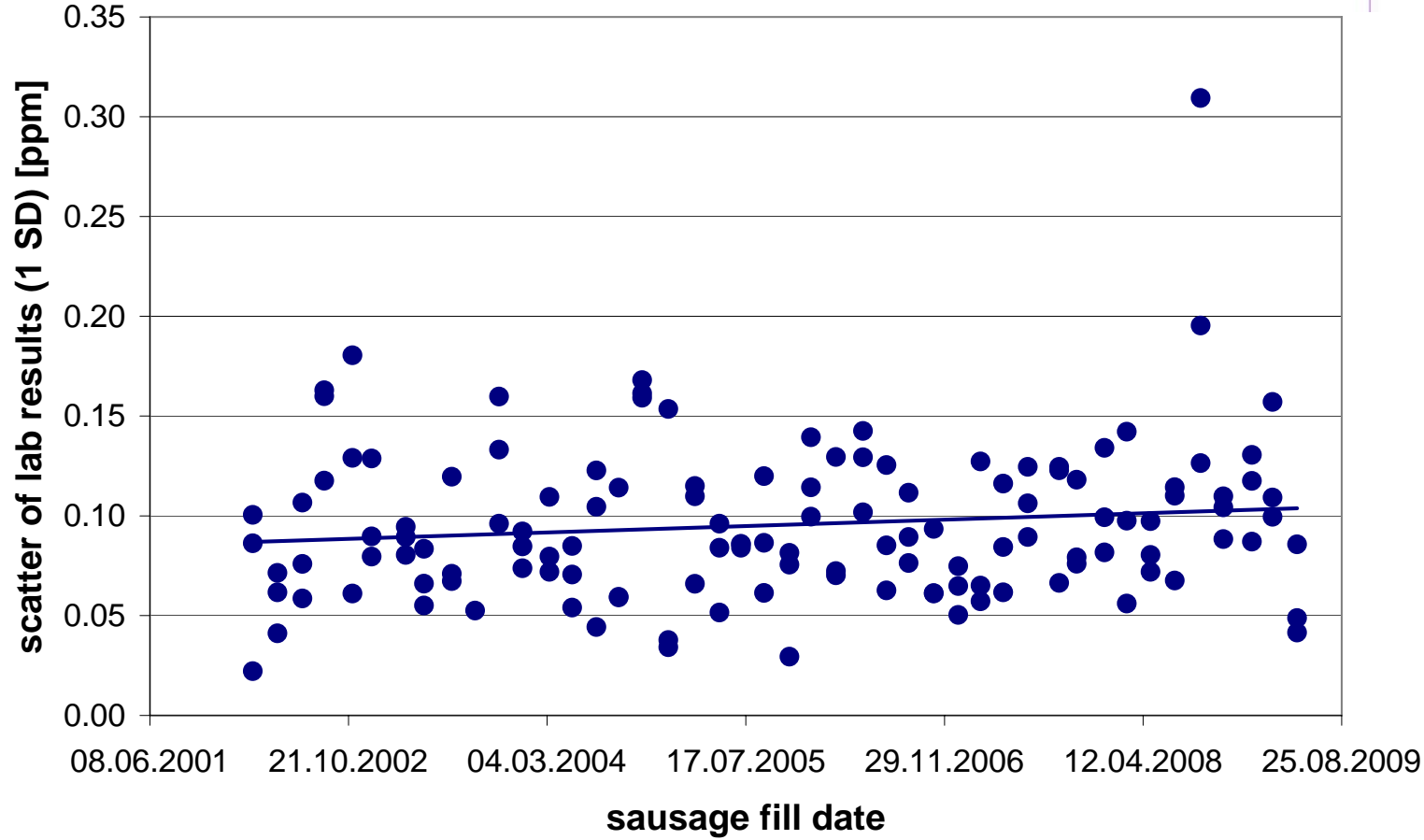
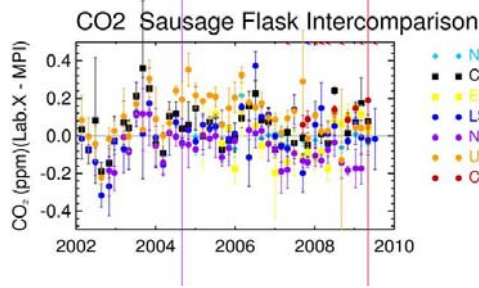


CO₂ comparability UHEI-MPI: Cucumber, Sausages, Grapefruits



Discrepancy in Sausage/Grapefruit-Offsets:
Sausage-Grapefruit = 0.1 ppm

Have we improved over the recent years?



Annual mean CO₂ offsets (vs MPI)

Laboratory	ICP exercise	2002	2003	2004	2005	2006	2007	2008	2009
UHEI	Sausage	-0.04	0.13	0.16	0.17	0.17	0.08	0.08	0.05
	Grapefruit				0.10	0.12	-0.02	0.01	-0.08
	Cucumber				0.01	0.02		0.00	-0.03
LSCE	Sausage	-0.17	0.02	-0.01	0.03	0.06	-0.04	0.05	0.01
	Grapefruit				0.02	0.05	-0.06	0.02	-0.06
	Cucumber					-0.08		-0.05	
	Loflo							-0.02	-0.04
CIO	Sausage						0.04	0.09	0.17
	Grapefruit				-0.06	0.02	0.15	0.02	0.05
	Cucumber					0.12	0.10	0.09	0.18
NOAA	Sausage				0.00	0.05	-0.02	-0.04	0.00
	Cucumber						0.03	0.03	
CMAR	Sausage	-0.11	0.11	0.03	0.03	0.10	-0.04	-0.08	0.10
	Cucumber						0.05		-0.01
	Loflo						0.00	0.01	0.00
NIES	Sausage	-0.19	-0.01	-0.05	-0.04	0.01	-0.13	-0.11	-0.16
	Cucumber							-0.05	-0.07
EnvCan	Sausage				0.04	-0.02	-0.08	-0.02	0.11
	Cucumber							-0.02	0.03

CO₂ conclusions

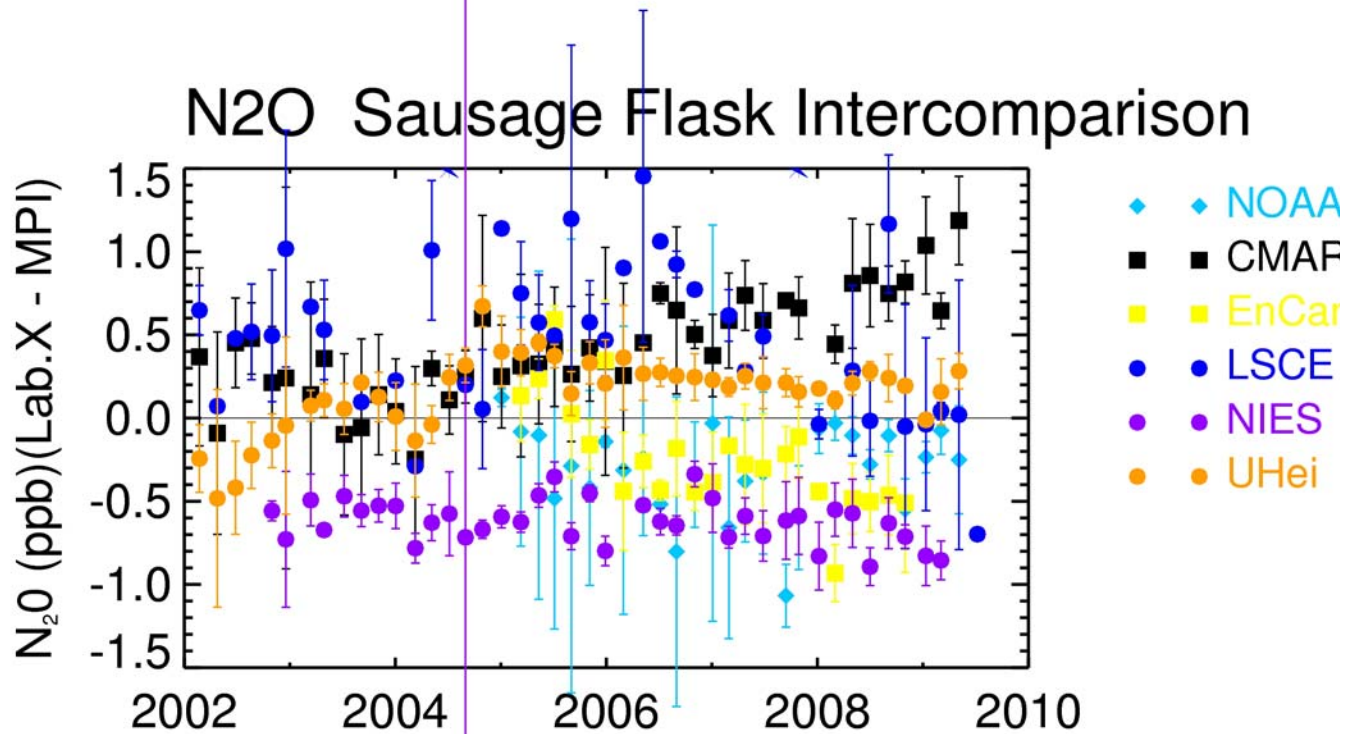
what do the intercomparison data tell us?

- ICP results reflect the comparability of individual systems at different labs
- allow to identify systematic deviations including calibration
- participation of many labs enables diagnose for problems at single sites
- small inconsistencies in different ICPs help to spot analytical issues that might have been missed otherwise

where are we?

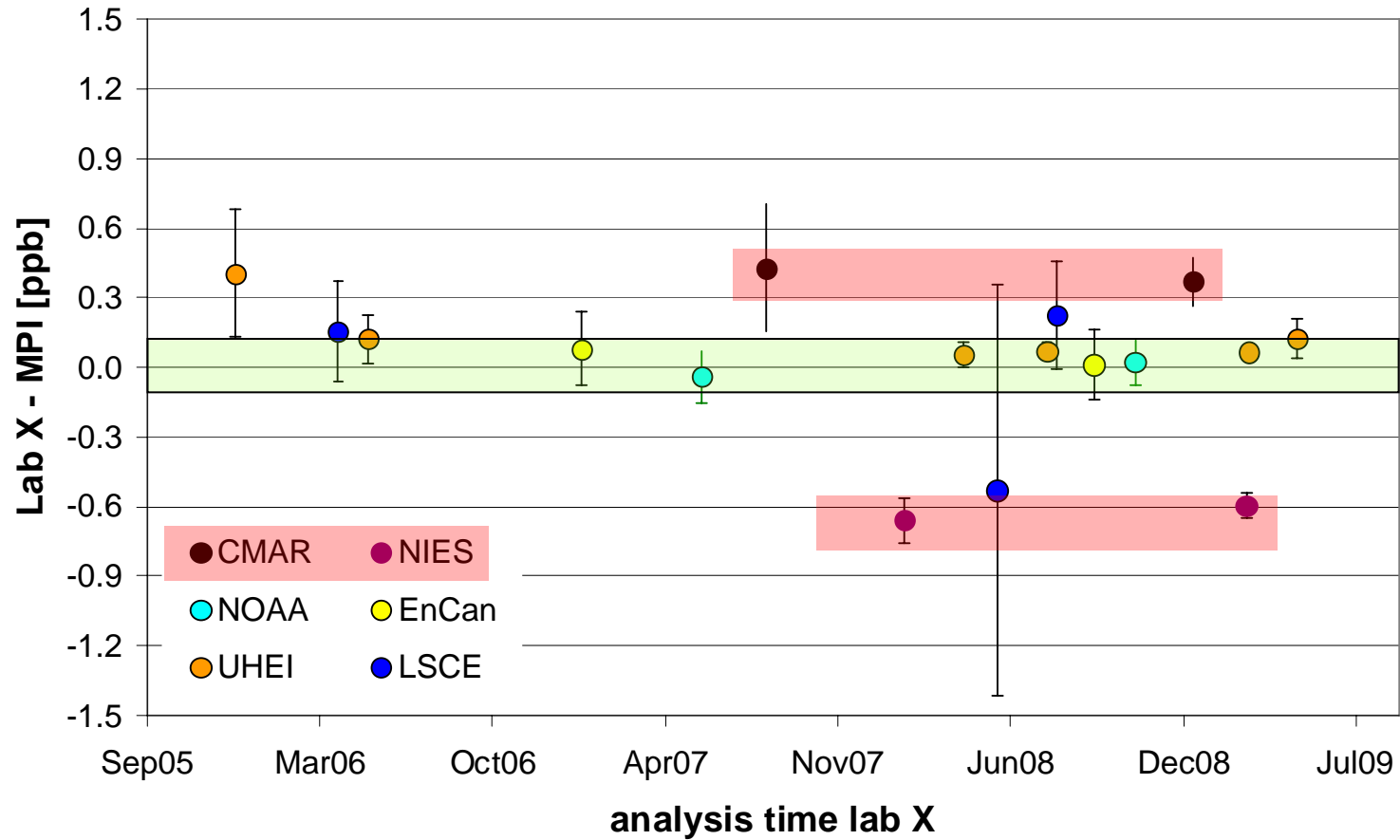
- not too bad for CO₂
- comparability stable, but not improving
- disclosed CO₂ measurement offsets have motivated to look after scales

How about non-CO₂ gases?

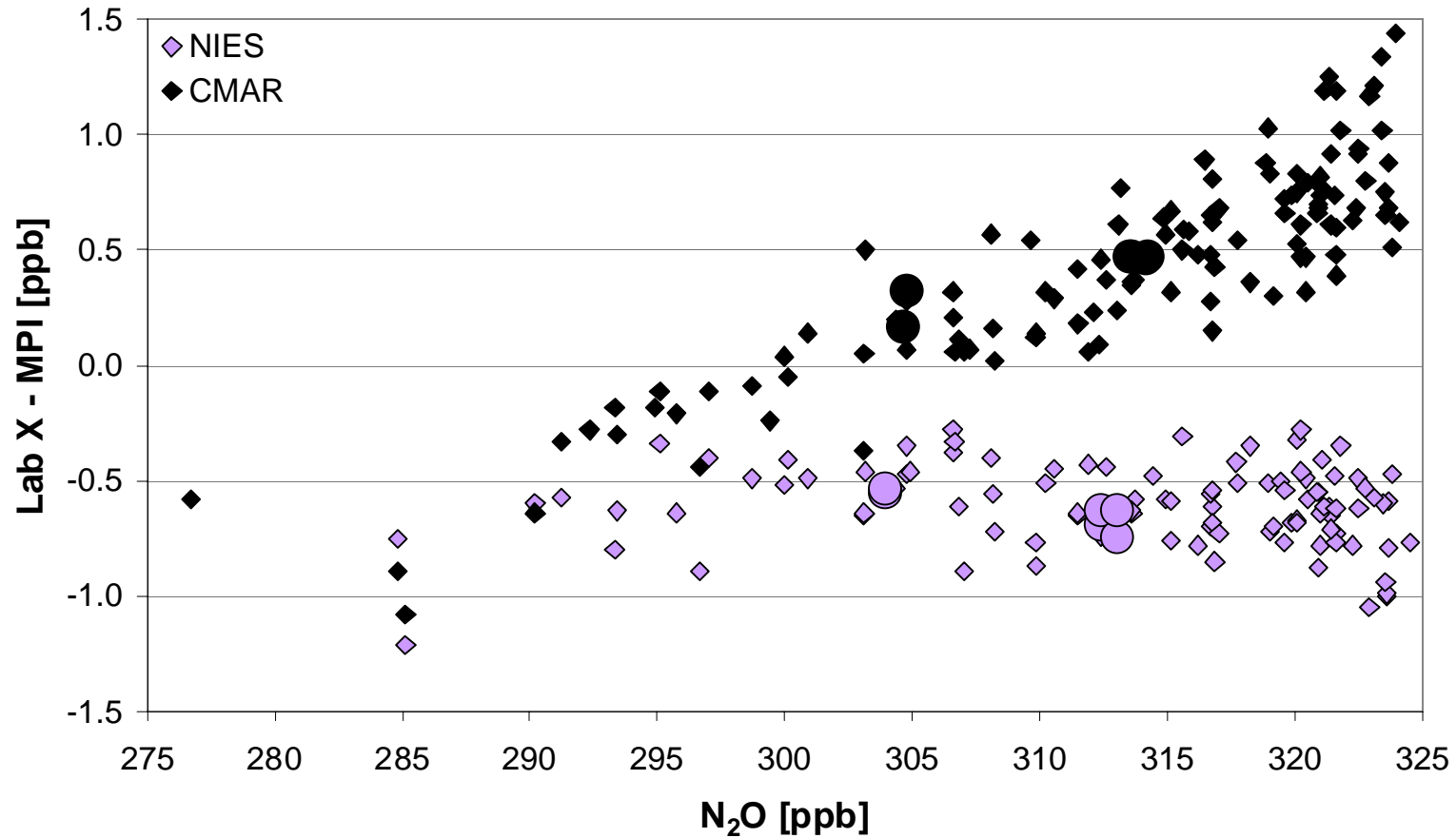


August 24, 2009

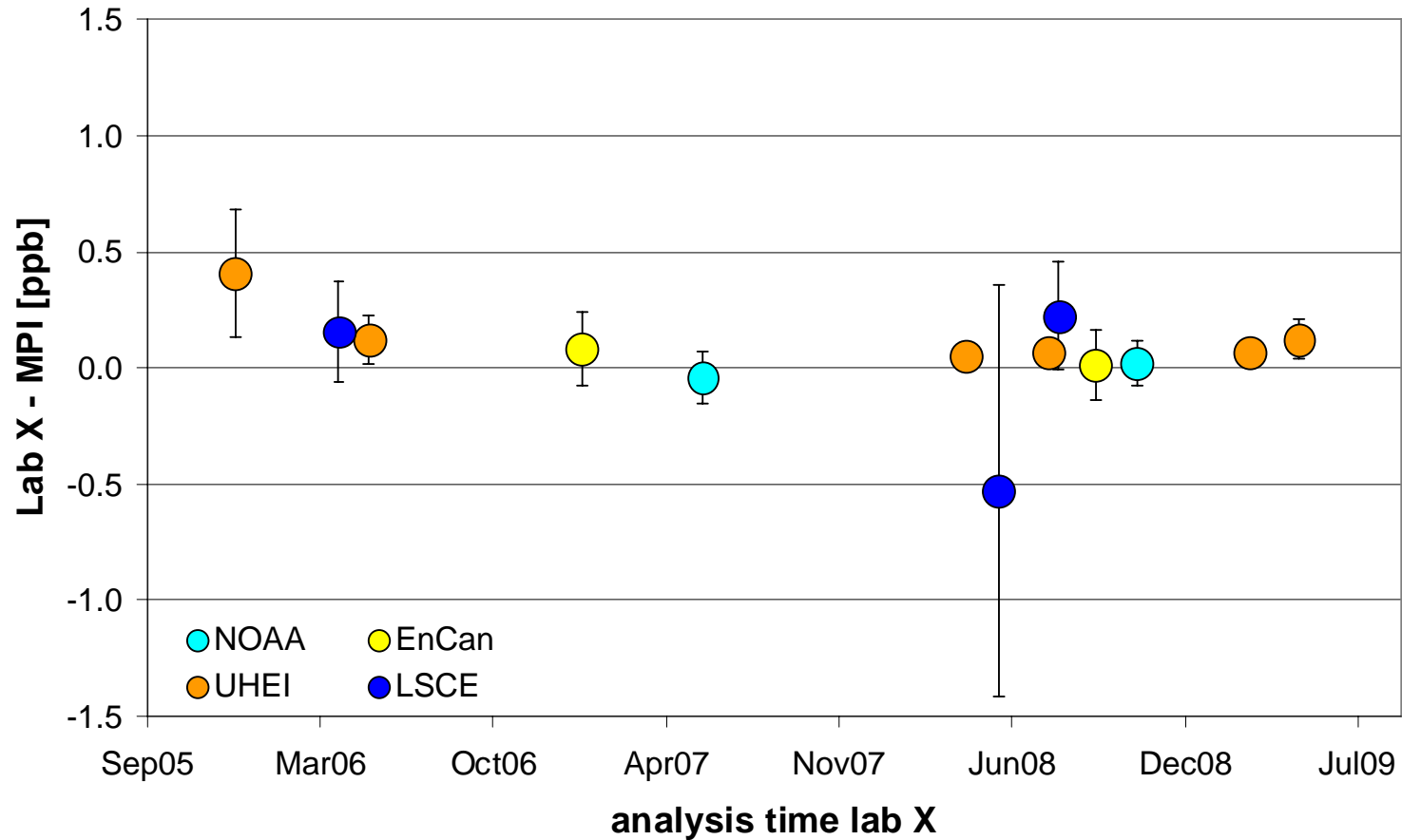
N₂O comparability of "Cucumber" results



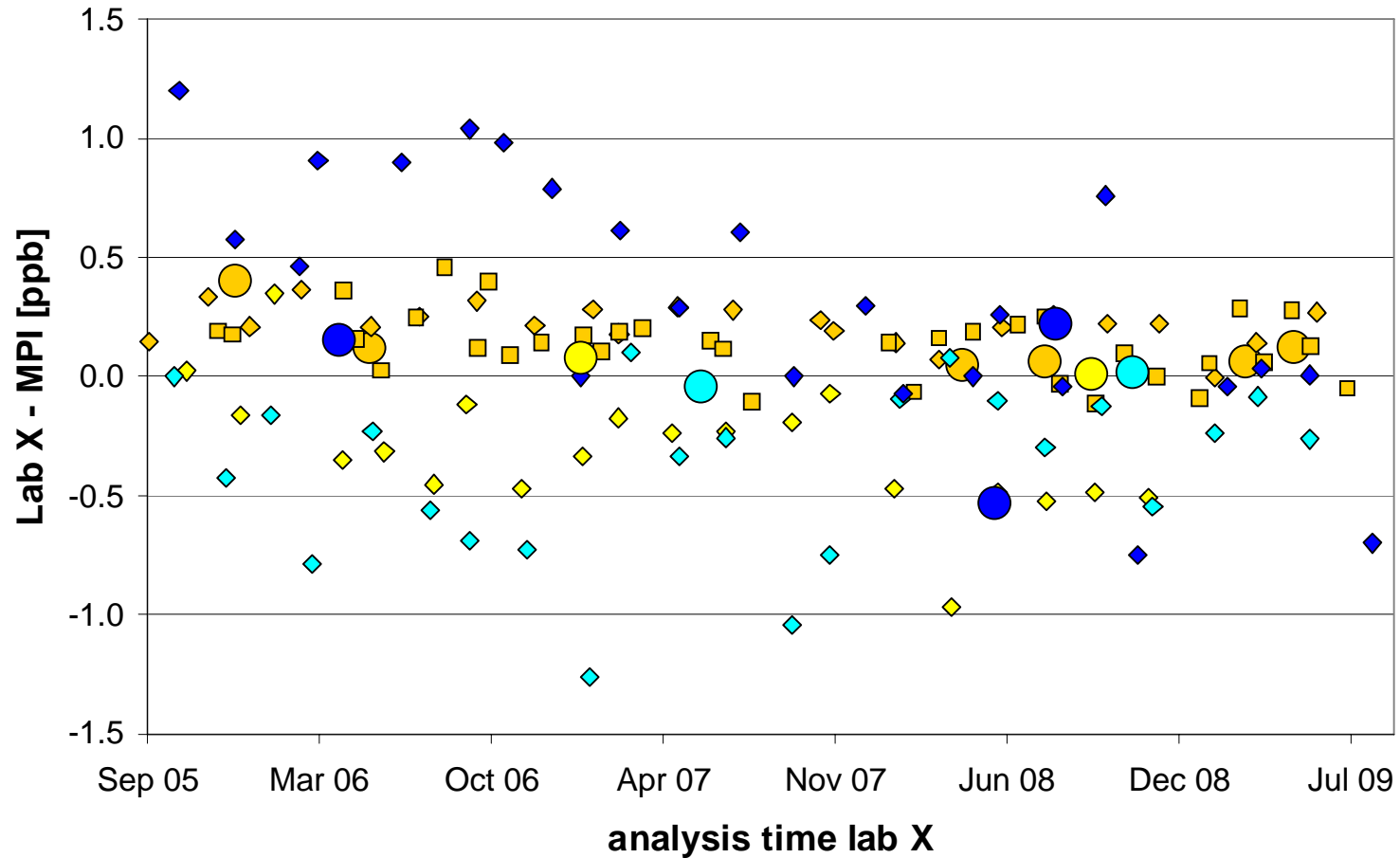
N₂O comparability: non-WMO calibration scales



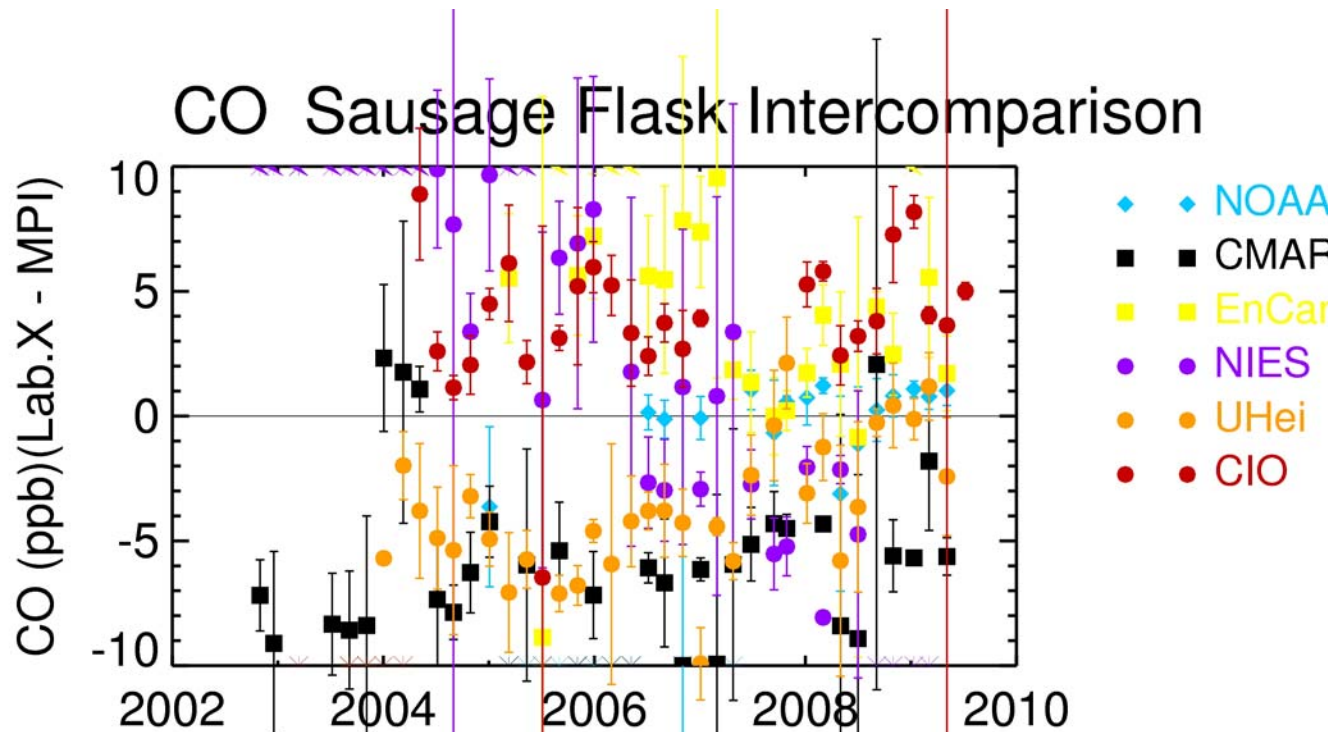
N₂O comparability: WMO calibration scale



N₂O comparability: WMO calibration scale

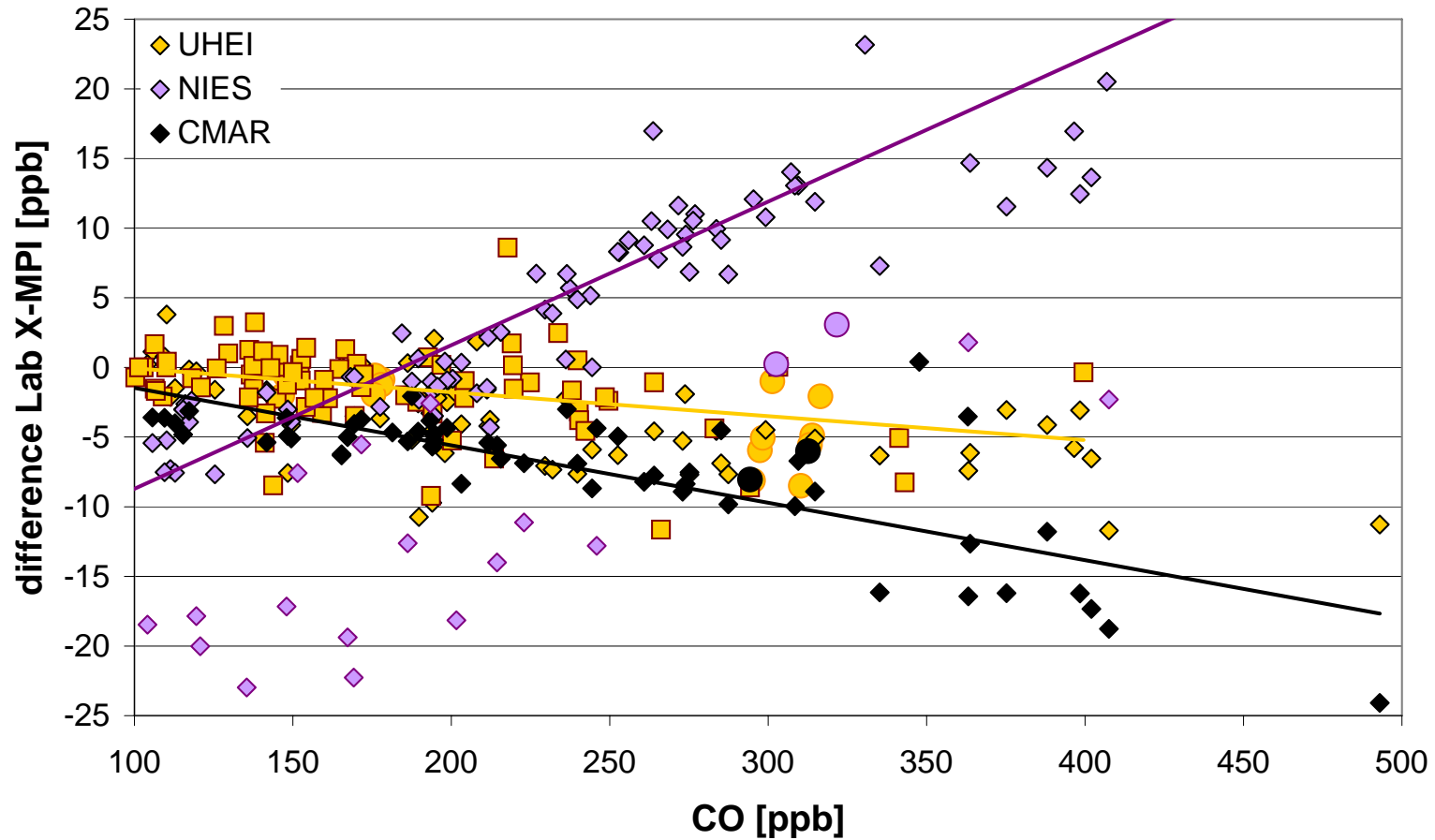


CO comparability of "Sausage" results

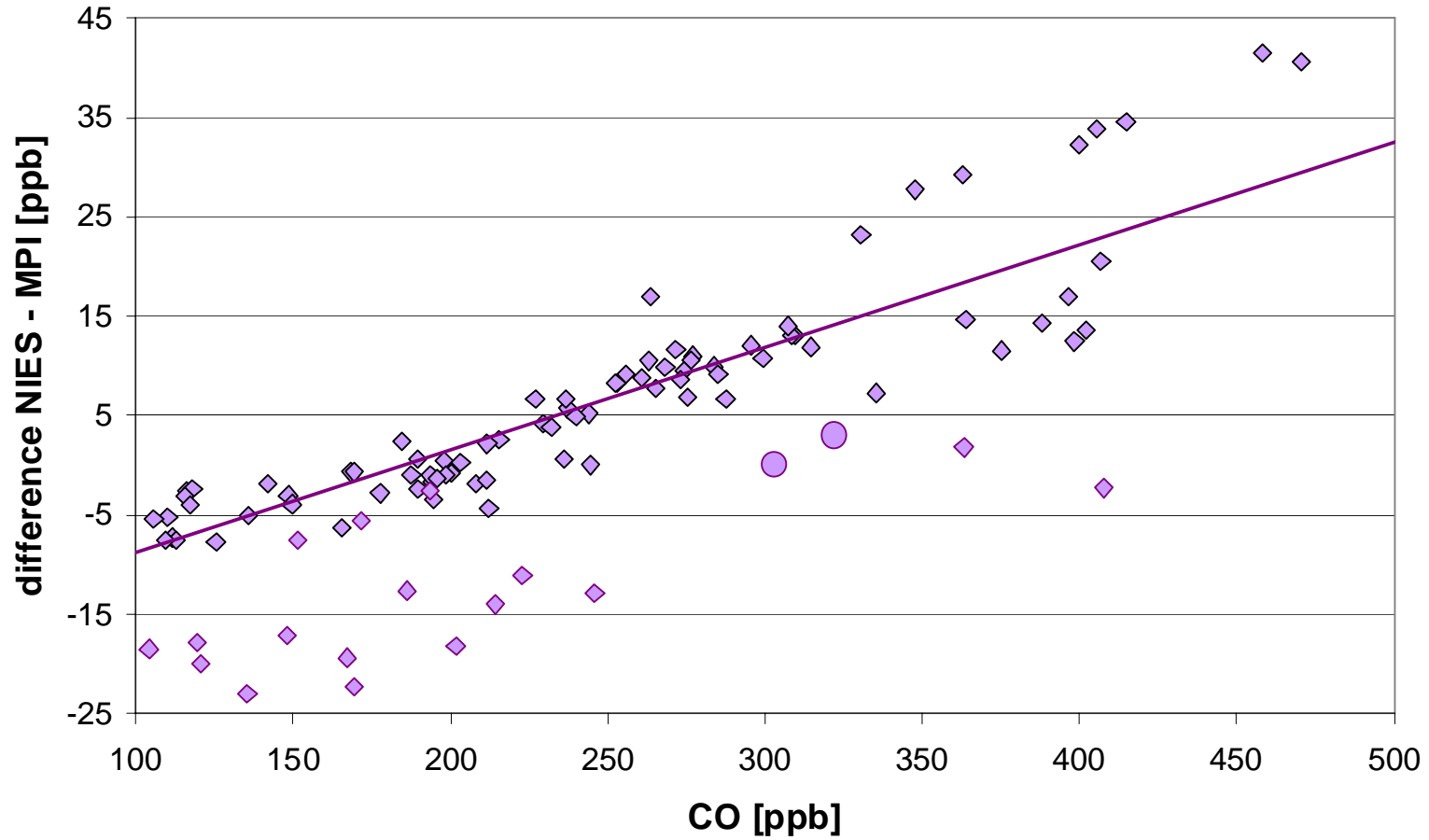


August 24, 2009

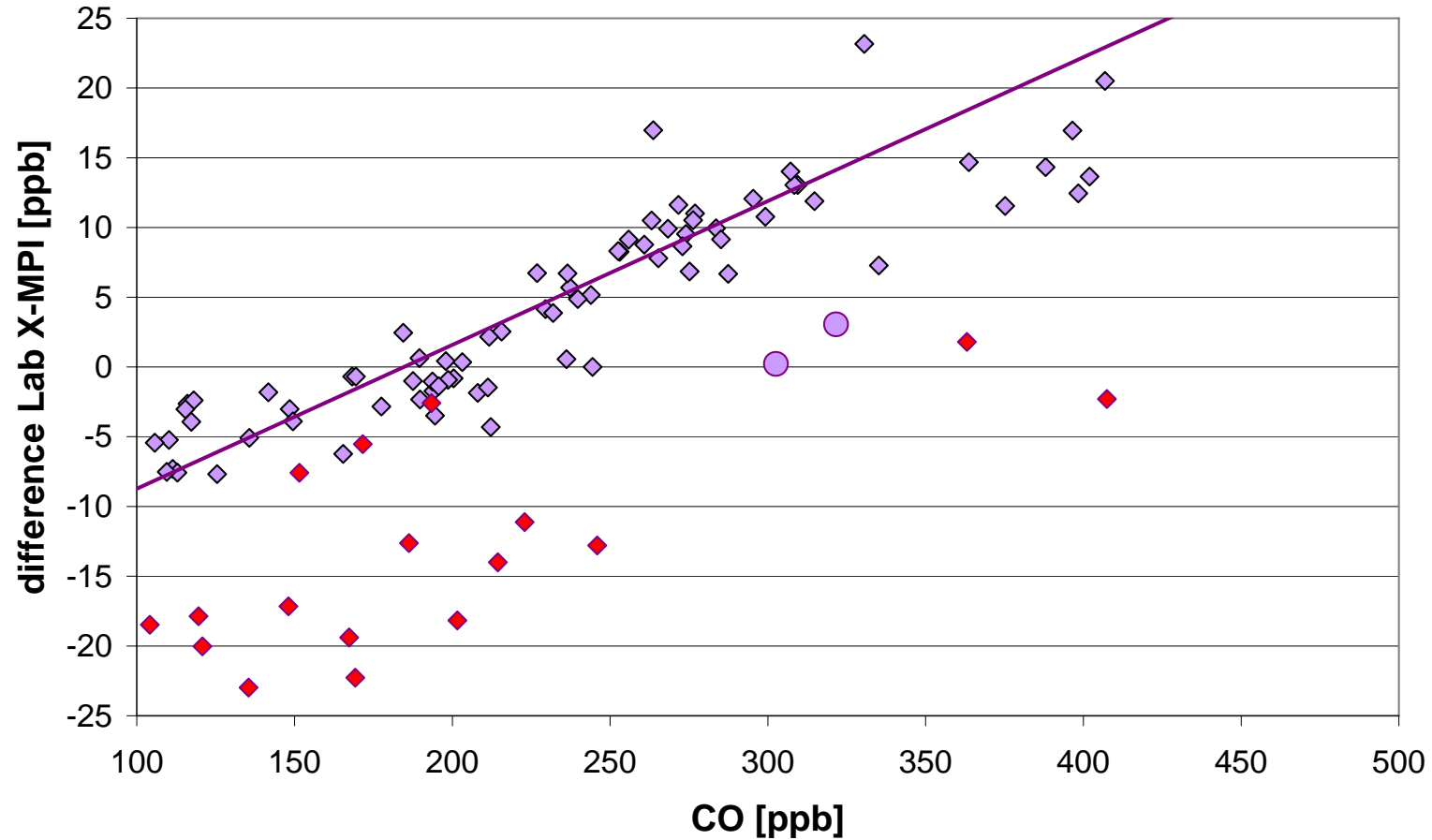
CO: various independent calibration scales



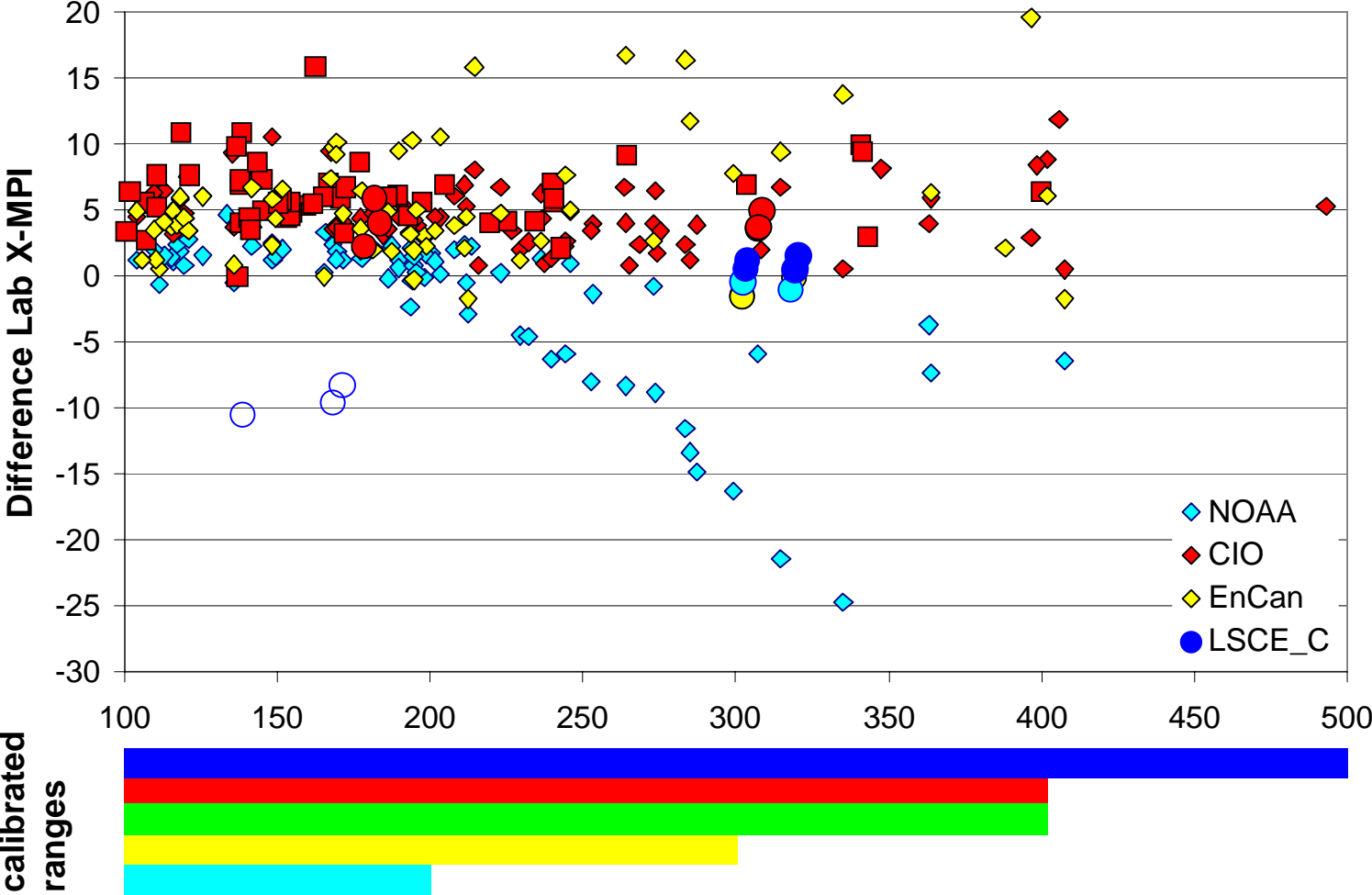
CO: scales



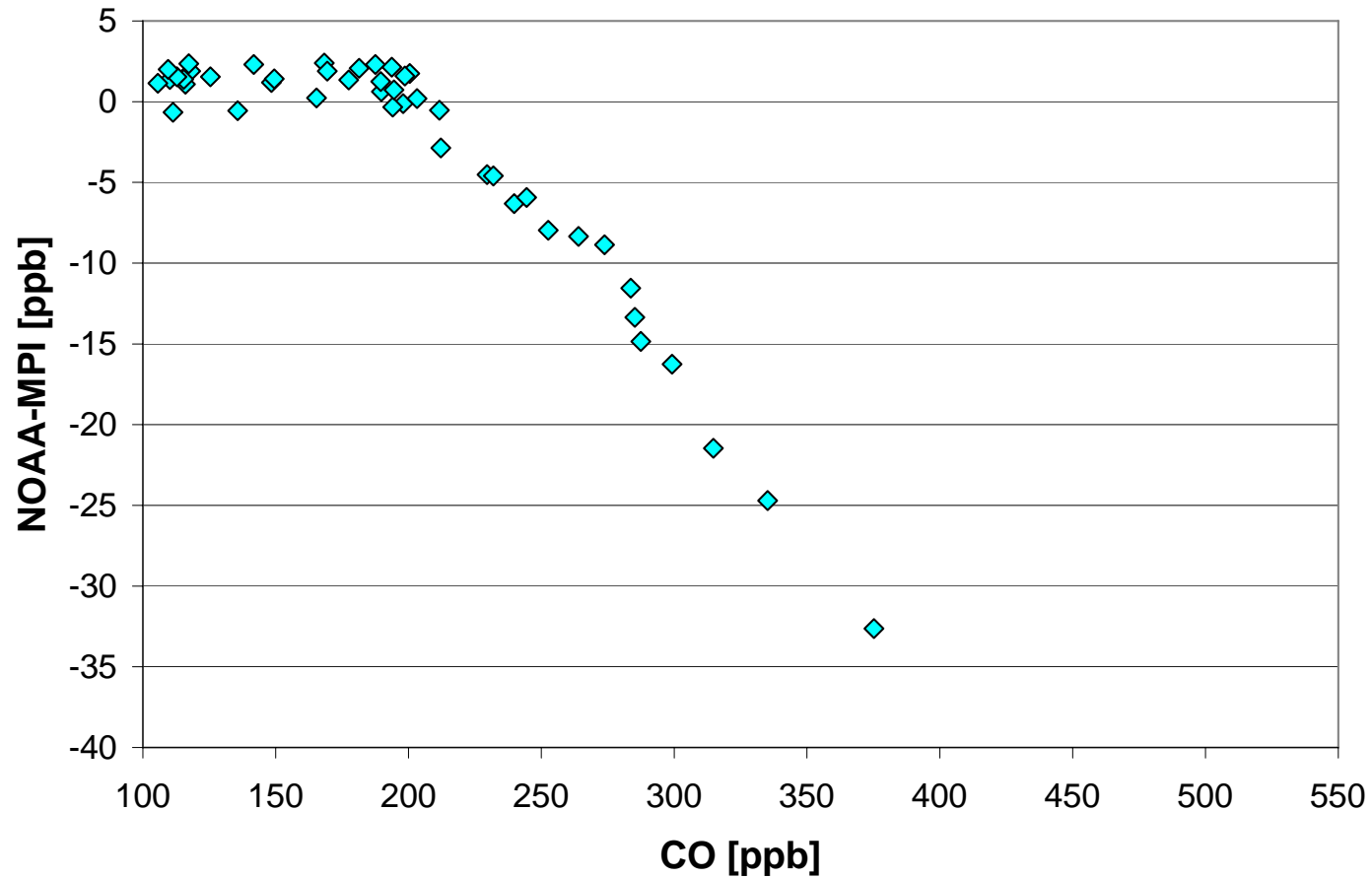
CO disturbance by drifting working standard



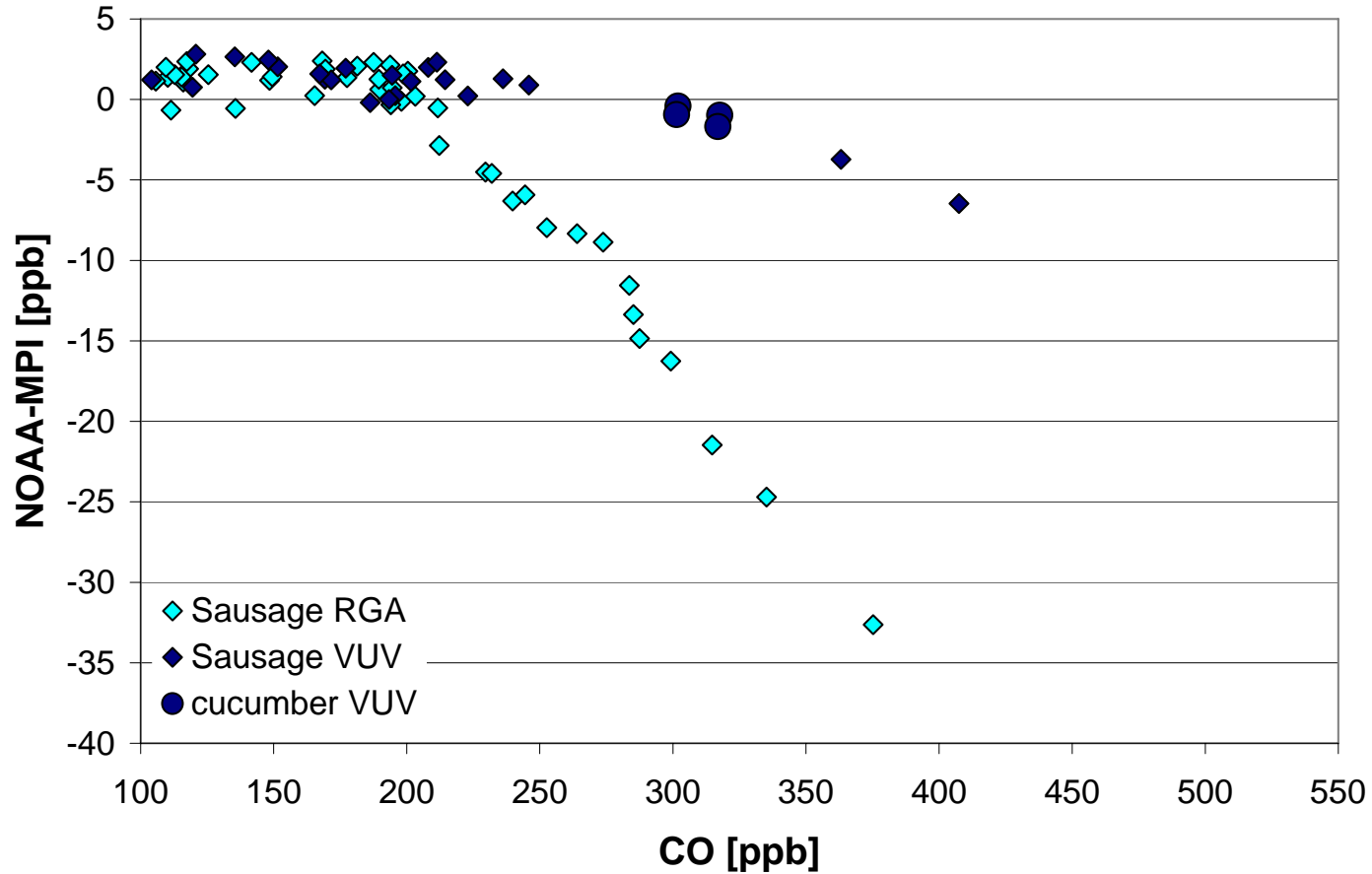
CO: NOAA calibration scales



CO: influence of instrument linearity



CO: influence of instrument linearity



Conclusions

where are we we?

- comparability of N_2O , CO , H_2 much worse than for CO_2 or CH_4
- other tracers did not receive that much focus in consequence look worse

do we know the limiting factors?

- N_2O : instrumental performance, calibration scale
- CO : instrument non-linearities, calibration scale, standard drifts
- single ICP point in time cannot represent the comparability over longer periods of time

what would improve the usefulness of the ICP

- , more rigid flagging
- additional meta data information
e.g. calibration range, working standard changes

Final remarks

1. ICP results only help if they are paid attention to
2. ICP results will only be taken notice of if they are updated regularly
3. ICP results can be updated regularly only if data is made available in the accepted format

Thanks to all who contribute
to this common effort!