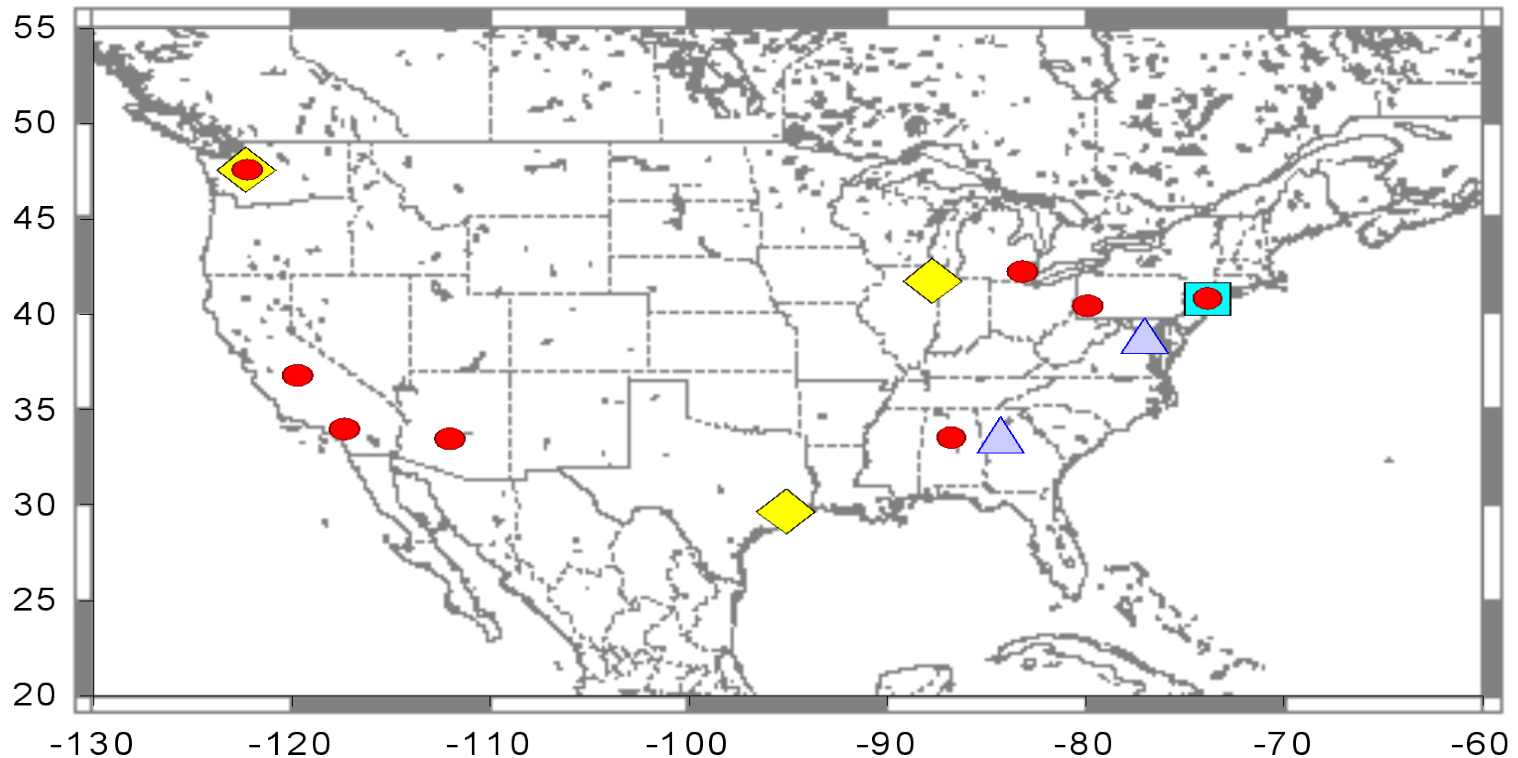# RELATING OC/EC DATA FROM TWO NATIONAL MONITORING NETWORKS

Warren H. White
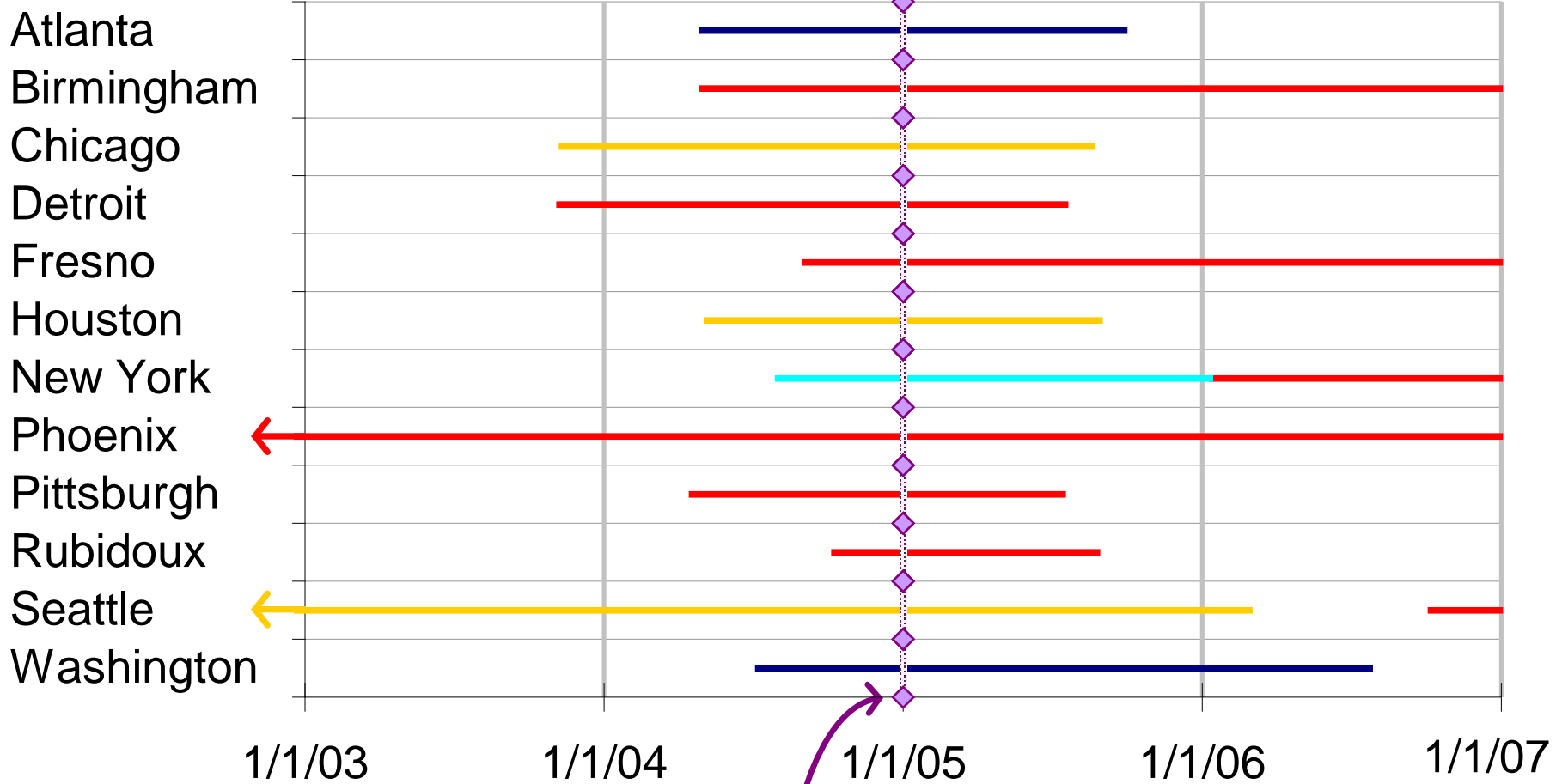
network	artifact convention	sampler	analysis protocol
old CSN (before ~ now)	unadjusted	4 designs	STN NIOSH
new CSN (after ~ now)	adjusted	URG 3000N	IMPROVE_A
'old' IMPROVE (before 1/2005)	adjusted	IMPROVE	IMPROVE
'new' IMPROVE (after 1/2005)	adjusted	IMPROVE	IMPROVE_A

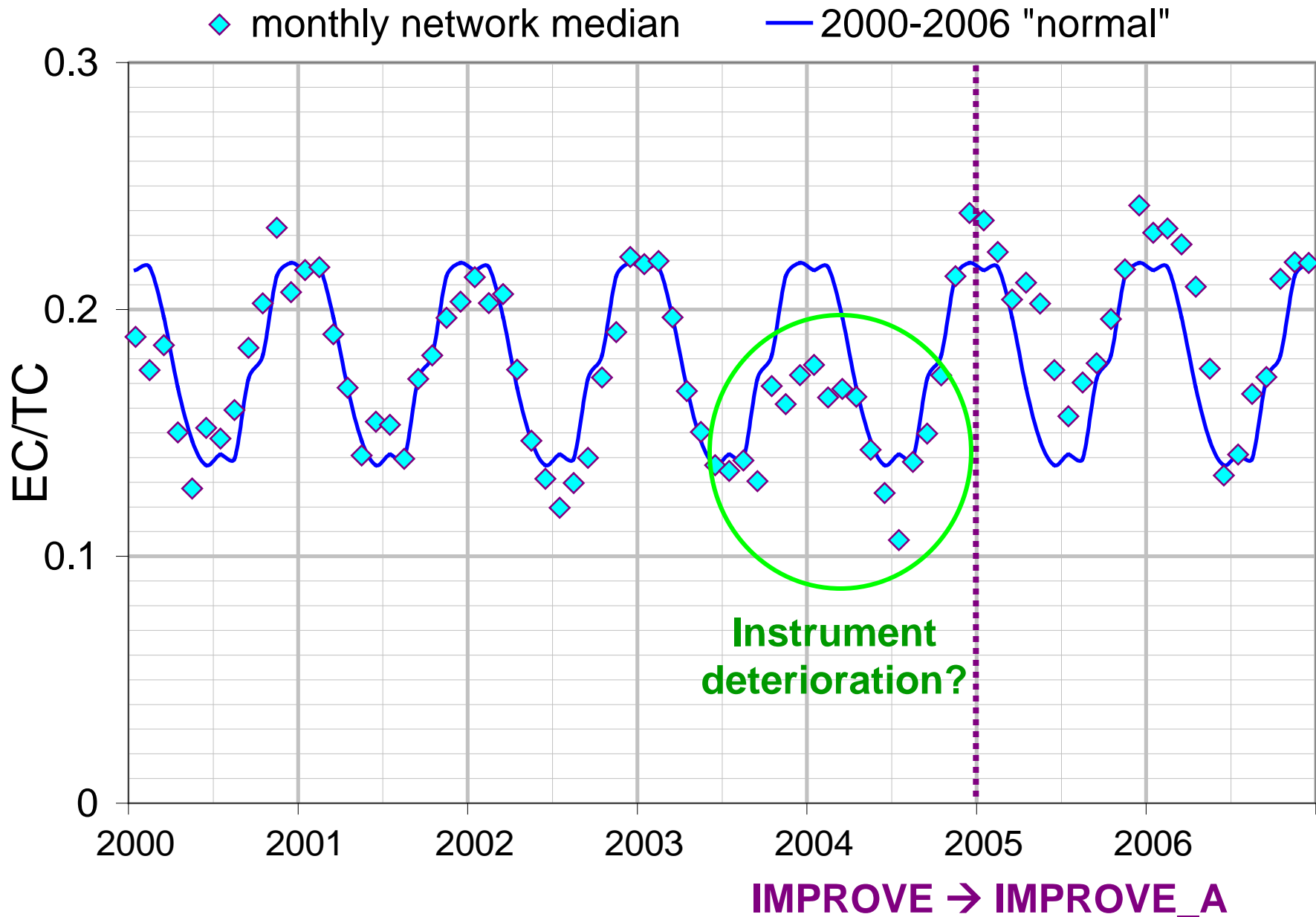# urban collocations of CSN and IMPROVE carbon measurements
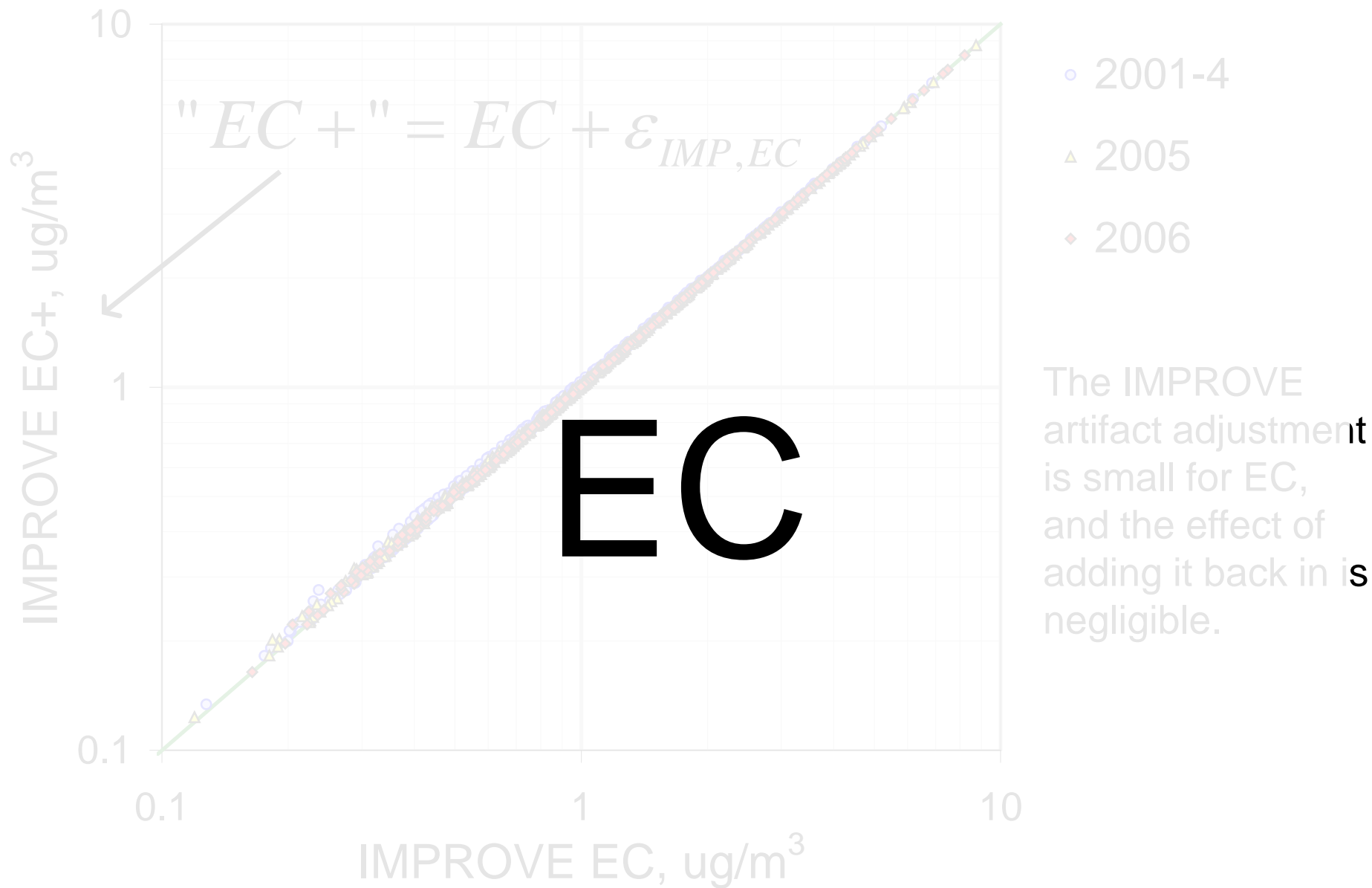
Periods of operation

IMPROVE analytical upgrade

3

◇ monthly network median ——2000-2006 "normal"

Instrument deterioration?

IMPROVE → IMPROVE_A

4

$$"EC+"=EC+\varepsilon_{IMP,EC}$$

IMPROVE EC+, ug/m^3

EC

○ 2001-4

△ 2005

◆ 2006

The IMPROVE artifact adjustment is small for EC, and the effect of adding it back in is negligible.

IMPROVE EC, ug/m^3

Data are from the IMPROVE sites with collocated MetOne samplers.
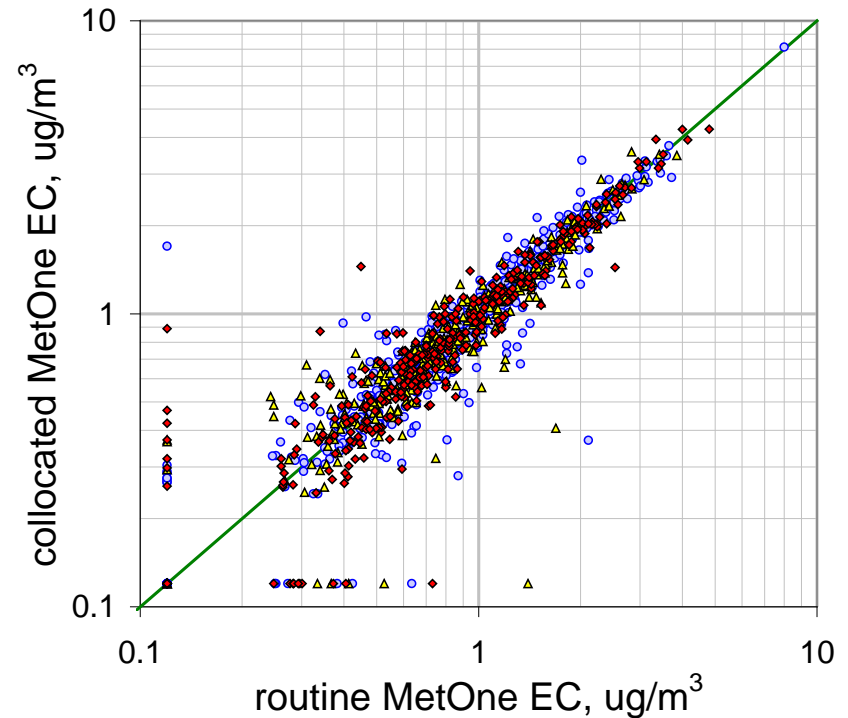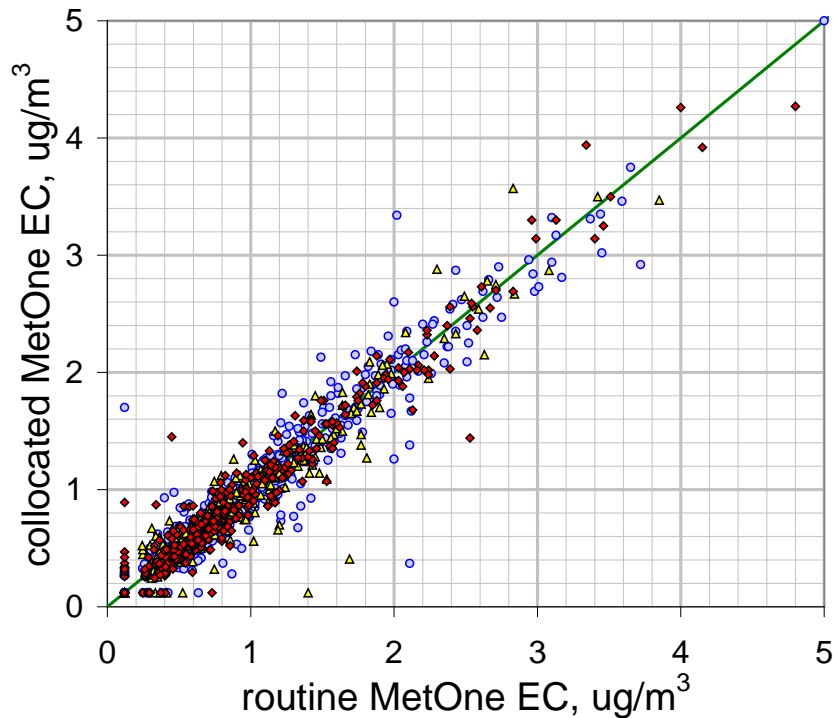
The scatter in the **within-network** comparisons is more uniform in the linear plot, indicating that it reflects additive errors.

Data are from Bakersfield,* Boston,* Cleveland,* New Brunswick* and Rubidoux.   * *Not* collocated with IMPROVE
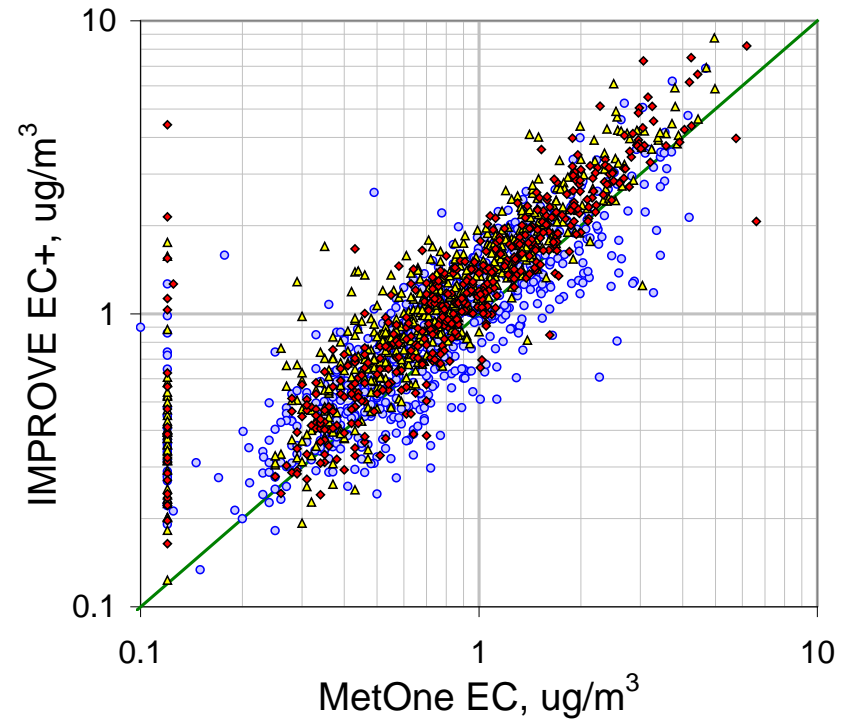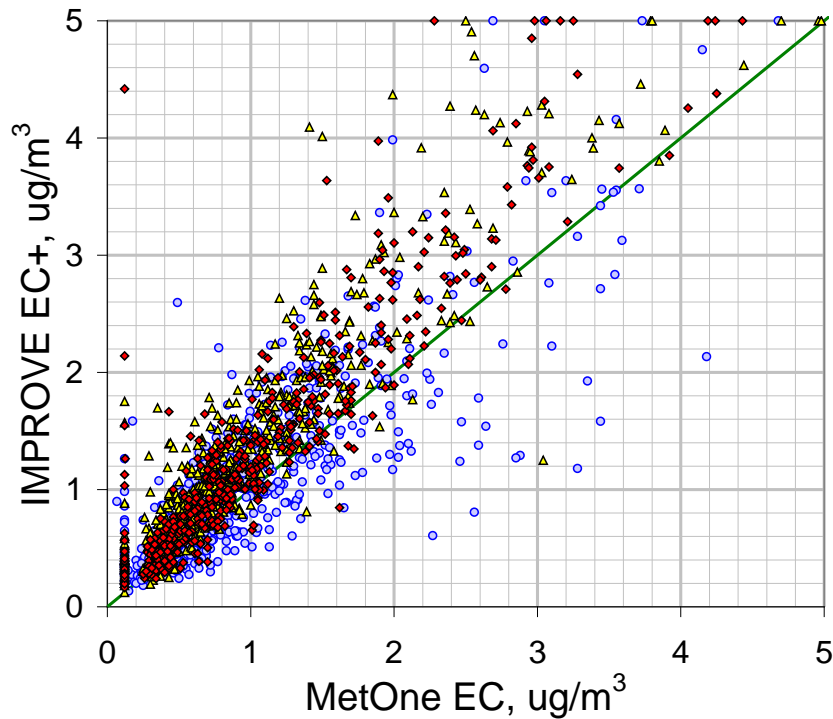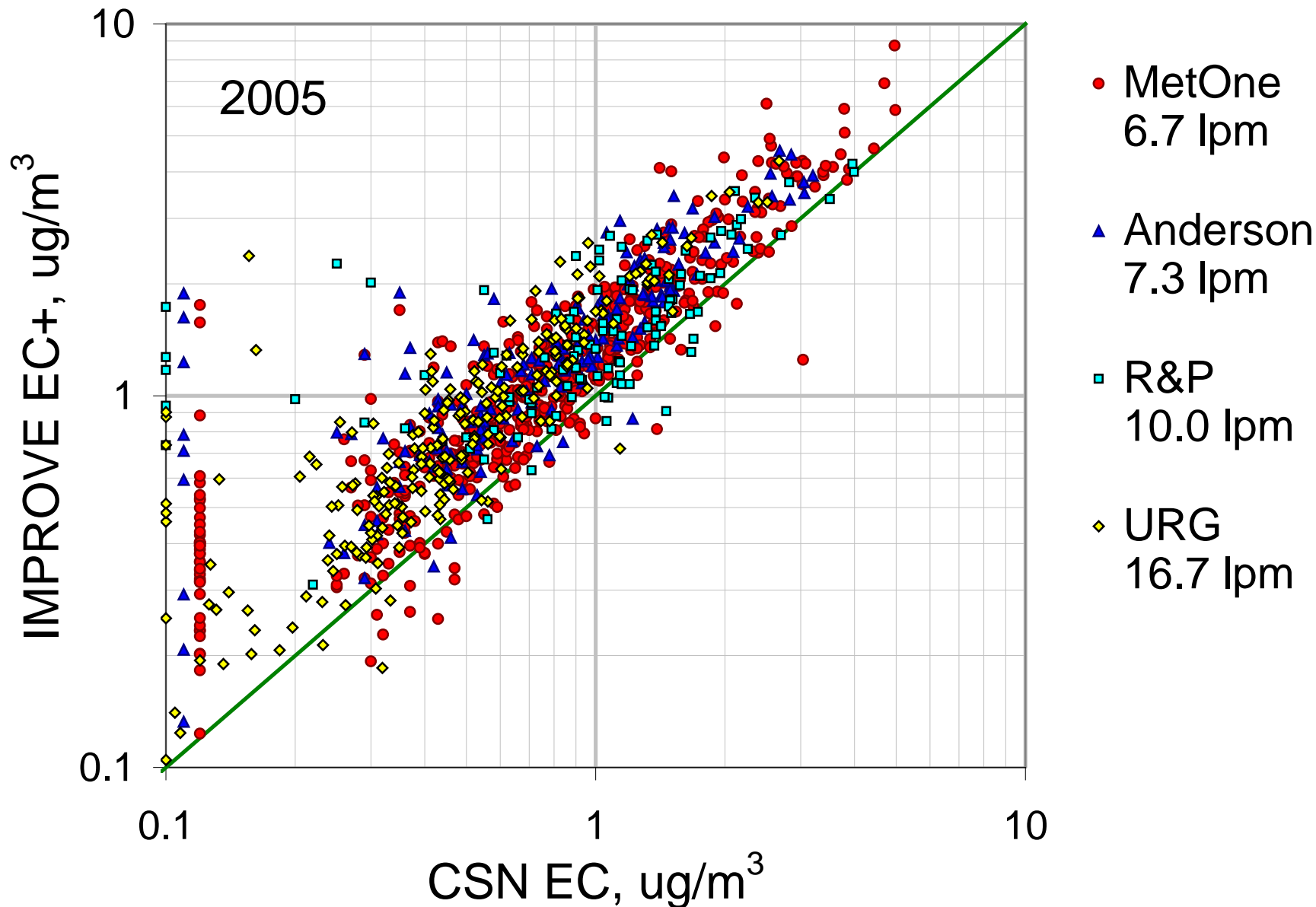
The increased scatter – and bias – in the **cross-network** comparisons are more uniform in the logarithmic plot, indicating that they are dominated by multiplicative errors.
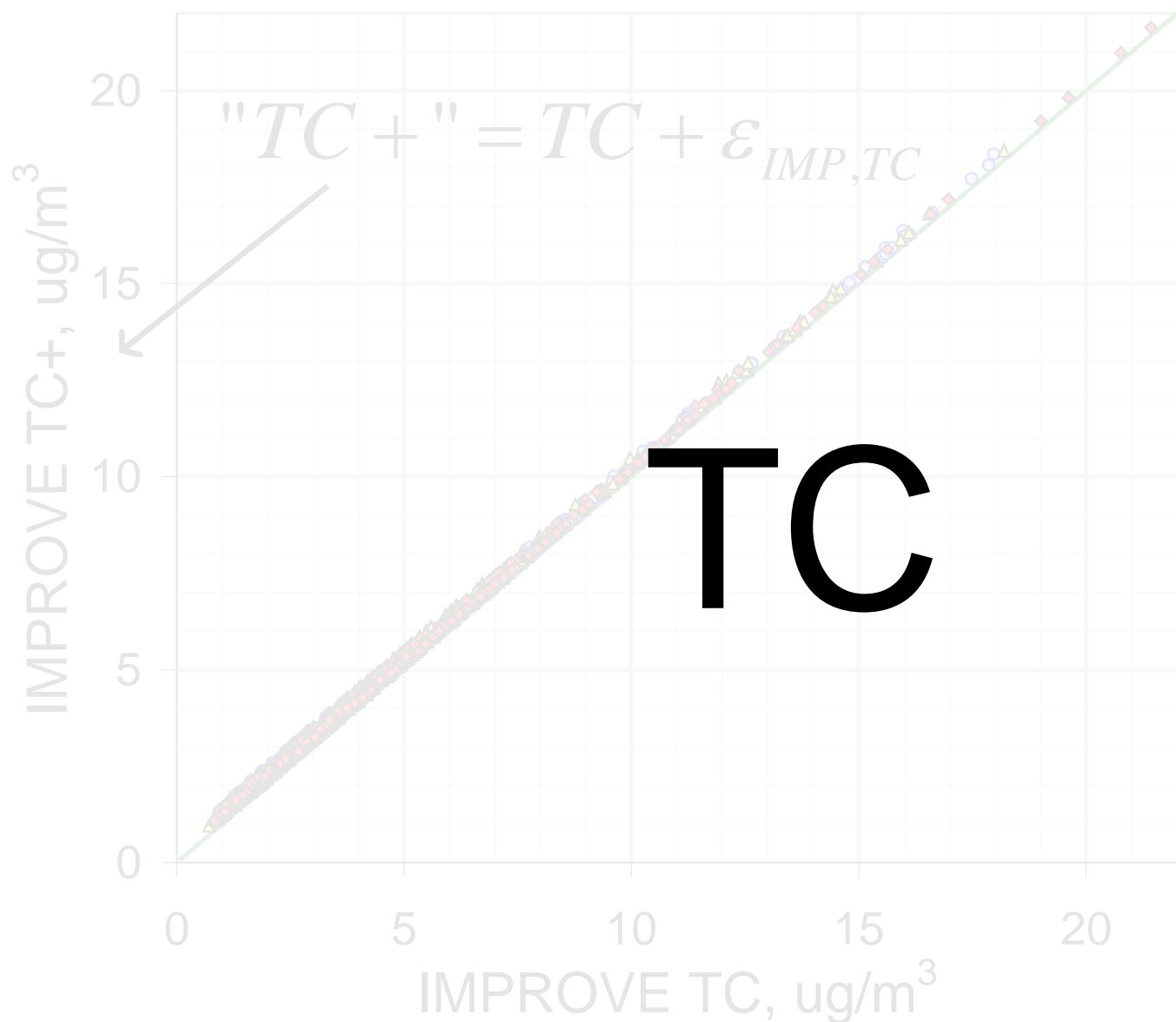
The EC difference between CSN and IMPROVE shows little dependence on the CSN sampler, suggesting that it is mainly analytical.
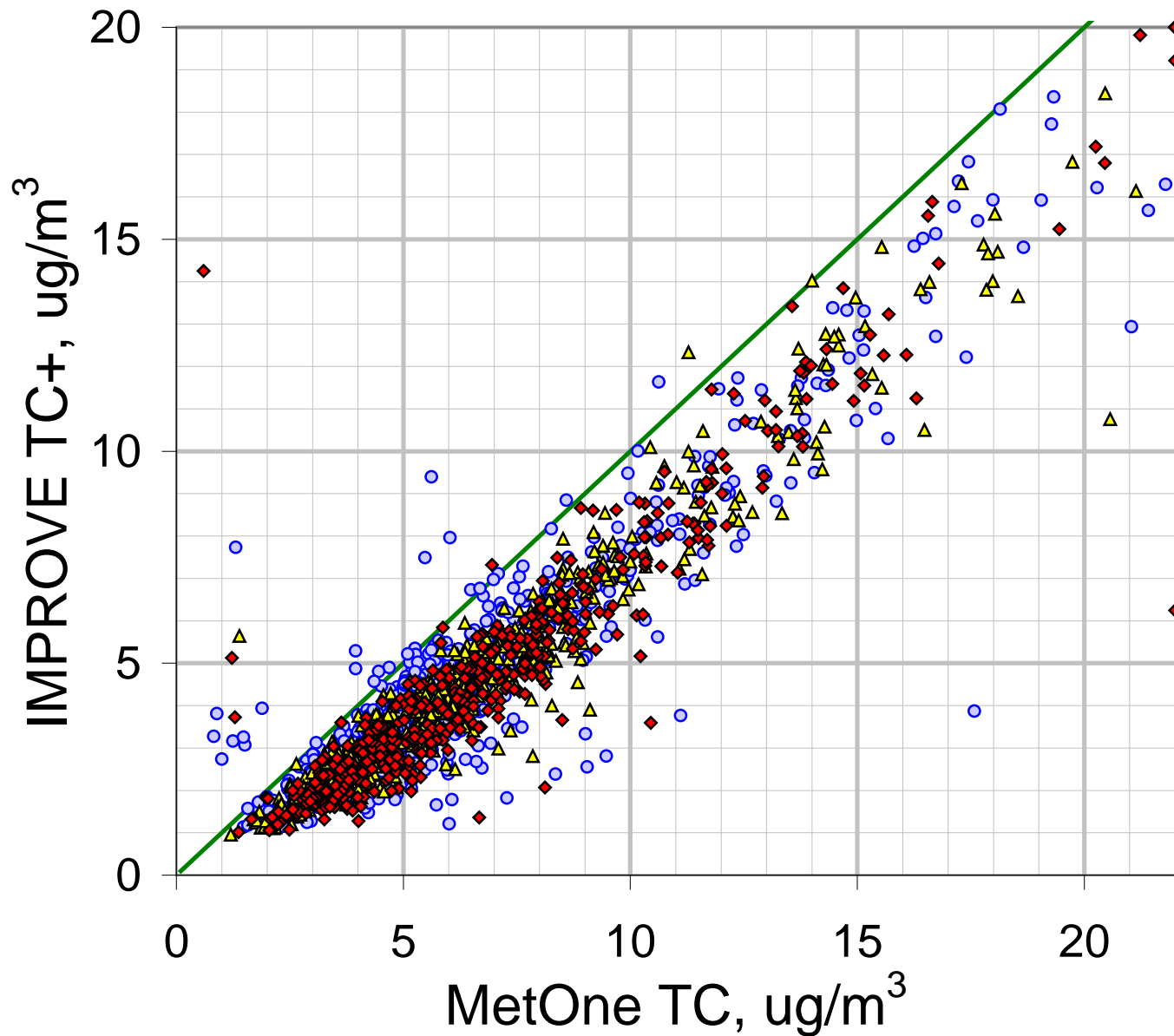
EC – the short story:

- $\varepsilon_{IMP} \cong 0$

- $IMP_{new} \cong \alpha CSN, \quad \alpha > 1$

- $CSN_{\phi} \cong CSN_{\varphi}, \quad \phi \neq \varphi \ samplers$

- $IMP_{new} > IMP_{old}$

$$"TC+" = TC + \varepsilon_{IMP,TC}$$

TC

IMPROVE TC+, ug/m³

IMPROVE TC, ug/m³

2001-4
2005
2006

The difference between CSN and IMPROVE is *not* so much that IMPROVE adjusts and CSN doesn't, as that CSN collects 10x lower sample loadings (ug/cm²), making the effect of CSN's artifact 10x greater (in ug/m³).

Data are from the IMPROVE sites with collocated MetOne samplers. 10

TC, *unlike EC*, showed no clear change in the CSN - IMPROVE bias at the 2005 transition from IMPROVE to IMPROVE_A.

Greater scatter before 2005 reflects poorer CSN imprecision (next slide).
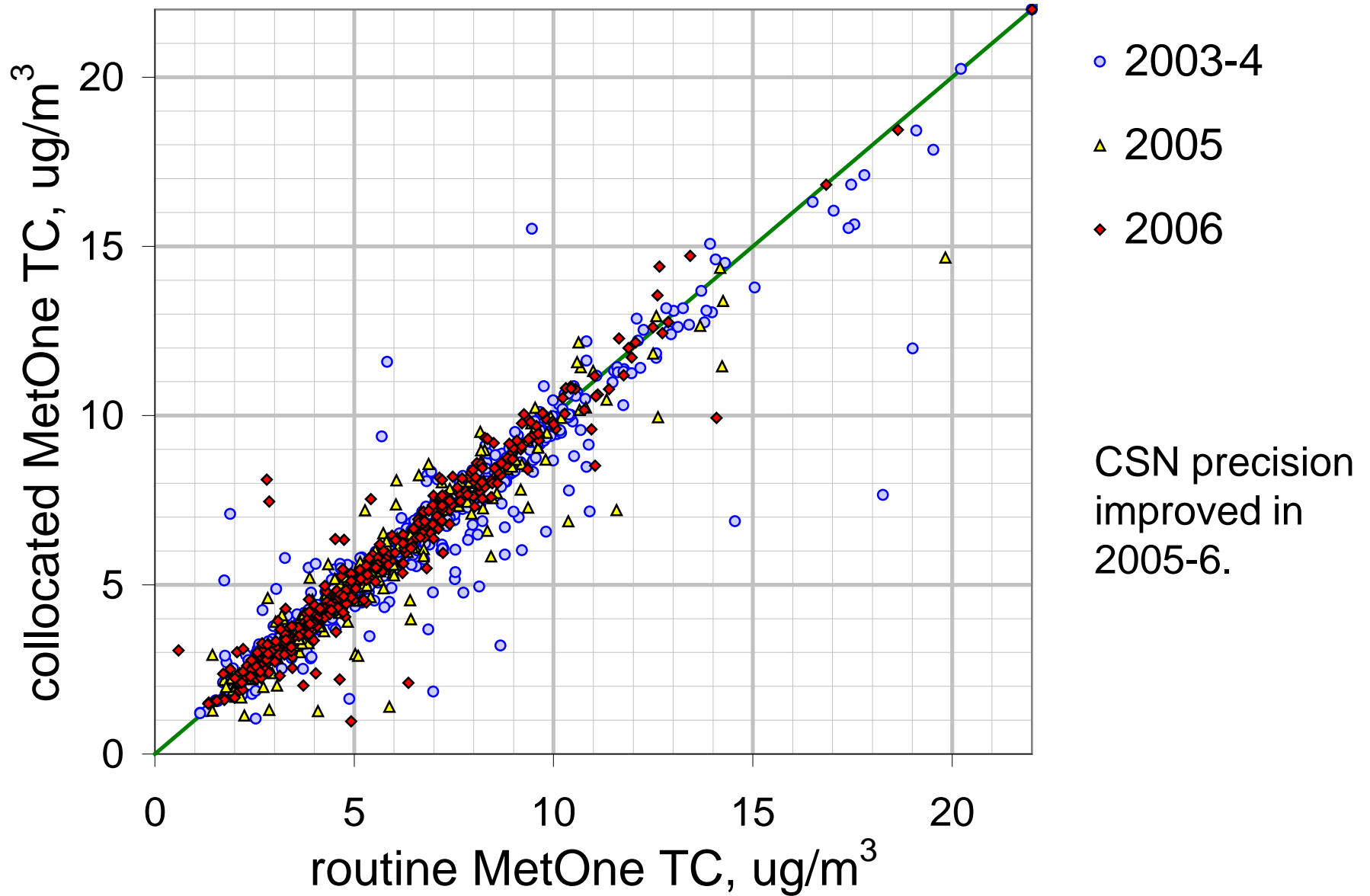
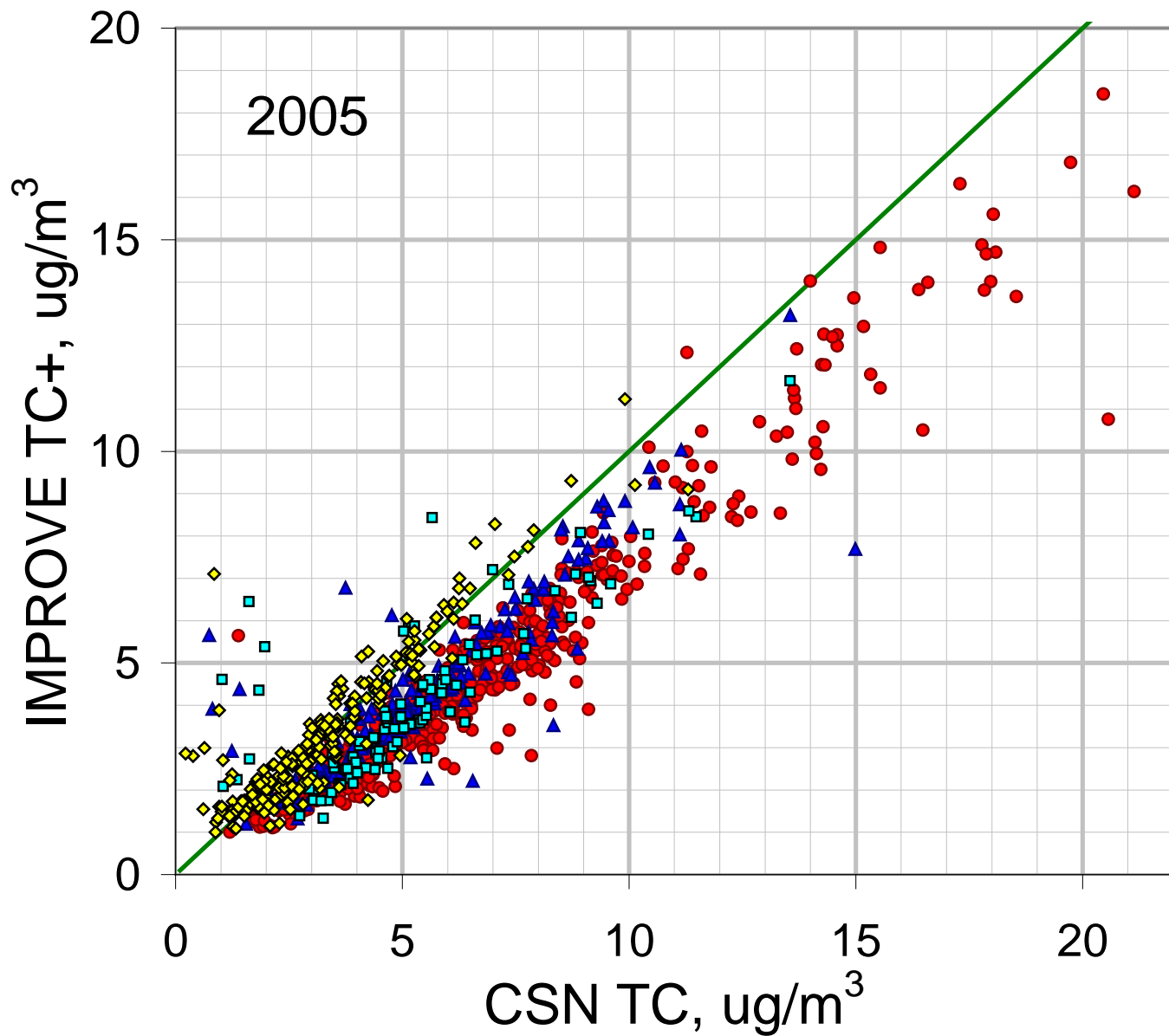Data are from Bakersfield,* Boston,* Cleveland,* New Brunswick* and Rubidoux.   * *Not* collocated with IMPROVE [12]

2005

IMPROVE TC+, ug/m³ (y-axis)
CSN TC, ug/m³ (x-axis)

- MetOne 6.7 lpm
- Anderson 7.3 lpm
- R&P 10.0 lpm
- URG 16.7 lpm

For TC, *unlike EC*, different CSN samplers show different biases relative to IMPROVE.

13

TC – the short story:

- $\varepsilon_{IMP} \cong 0$

- $IMP_{new} \cong \lambda\left(CSN - \theta\right), \quad \lambda < 1, \ \theta > 0$

- $IMP_{new} \cong IMP_{old}$

- $CSN_{\phi} \neq CSN_{\varphi}, \quad \phi \neq \varphi \ samplers$

- $CSN \ precision \ has \ improved \ over \ time$

EC/TC

collocated MetOne   EC/TC

routine MetOne   EC/TC

0   0.1   0.2   0.3   0.4   0.5

0   0.1   0.2   0.3   0.4   0.5

○ 2003-4

△ 2005

♦ 2006

$TC_{rout} \geq 3$ ug/m^3
and
$TC_{collo} \geq 3$ ug/m^3

Recall that the collocated imprecision of each fraction was greater before 2005.

Data are from Bakersfield,* Boston,* Cleveland,* New Brunswick* and Rubidoux.   * **Not** collocated with IMPROVE [15]

Chart legend:
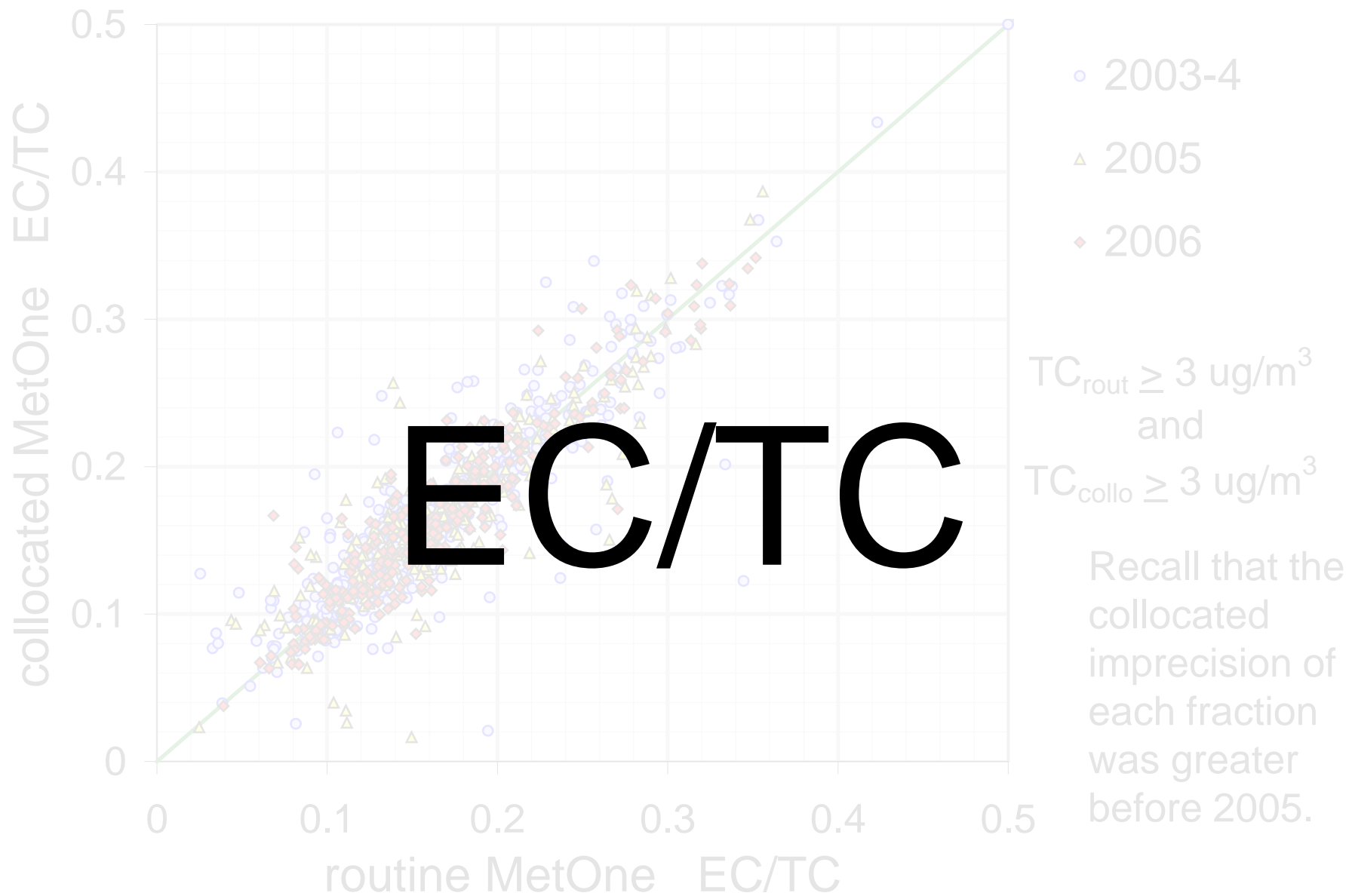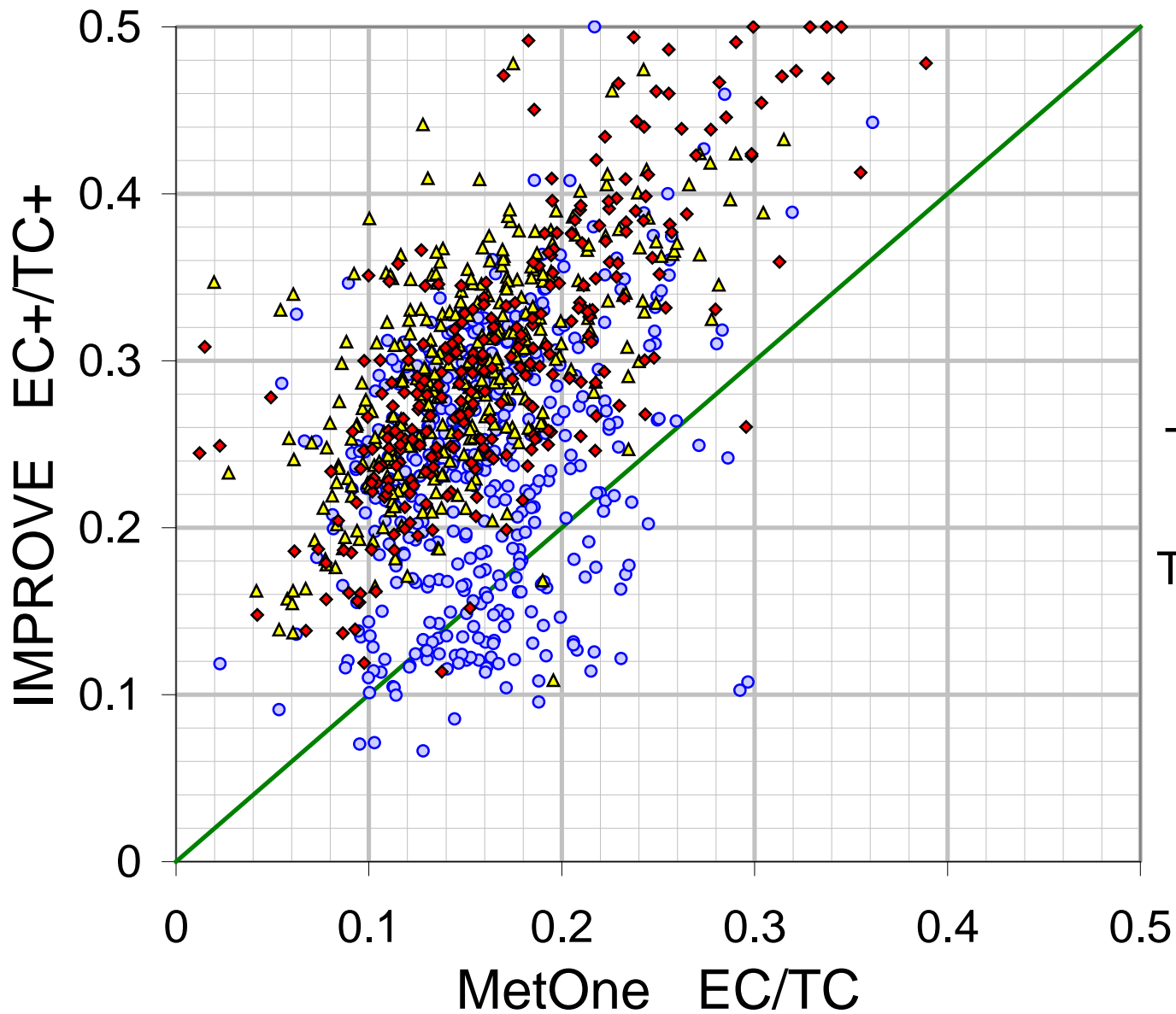- ○ 2001-4
- △ 2005
- ◆ 2006

$TC_{CSN} \geq 3$ ug/m^3
and
$TC_{IMP}+ \geq 3$ ug/m^3

The effect of the 2005 IMPROVE → IMPROVE_A transition is evident.

X-axis: MetOne EC/TC
Y-axis: IMPROVE EC+/TC+

EC/TC – the short story:

1-D concentrations (EC, TC) translate between the networks better than 2-D composition (EC/TC) does.