What our collocated measurements told us –

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An evaluation of interagency monitoring of protected visual environments (IMPROVE) collocated precision and uncertainty estimates

Nicole P. Hyslop*, Warren H. White

Crocker Nuclear Laboratory, University of California, One Shields Avenue, Davis, CA 95616, USA

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"**...** For most species, the collocated precisions are worse than the precisions predicted by the reported uncertainties. These discrepancies suggest that some sources of uncertainty are not accounted for or have been underestimated."

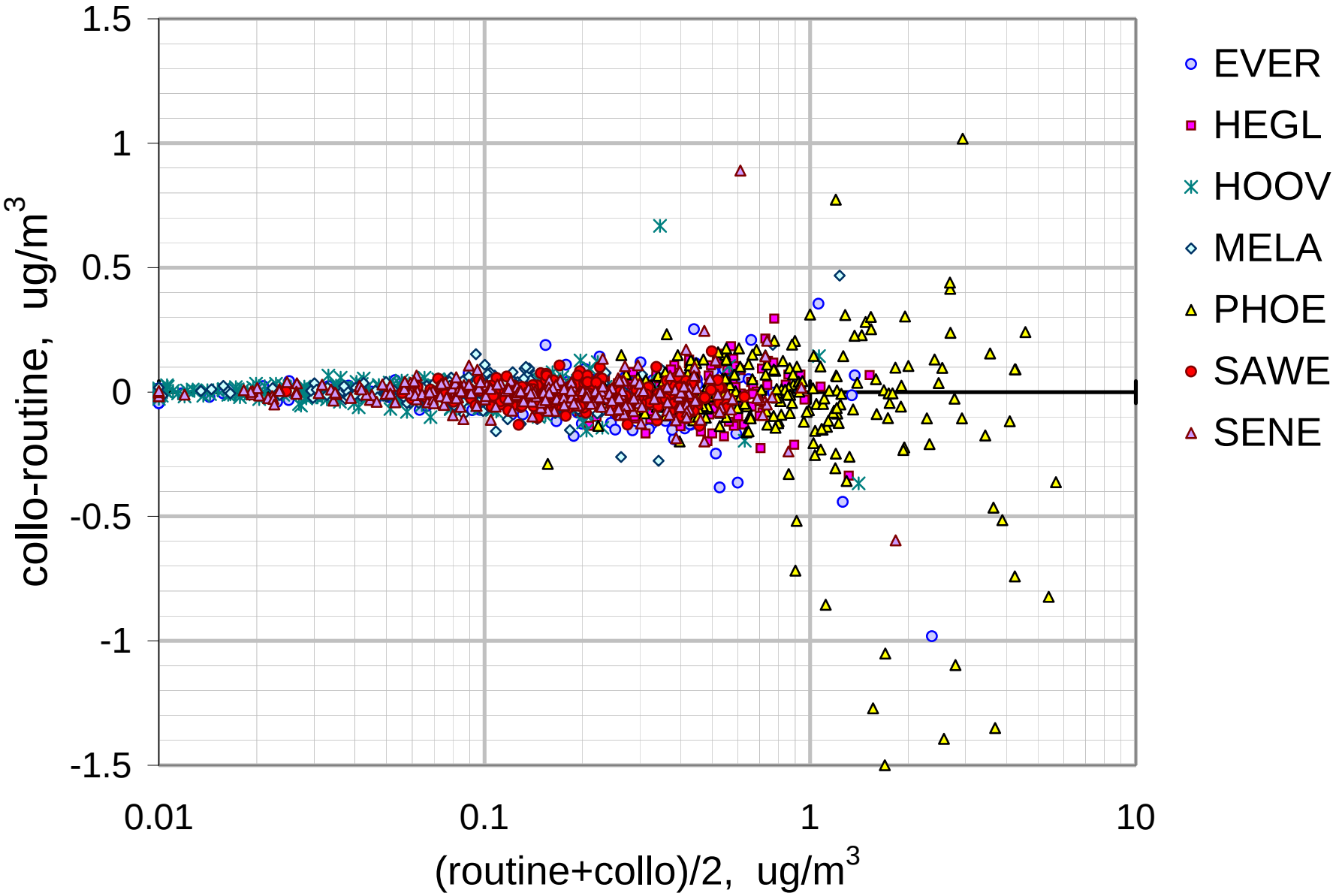
What more our collocated measurements are starting to tell us –

Sampling artifacts are important contributors to this uncounted uncertainty.

Warren H. White, Durango 9/2007

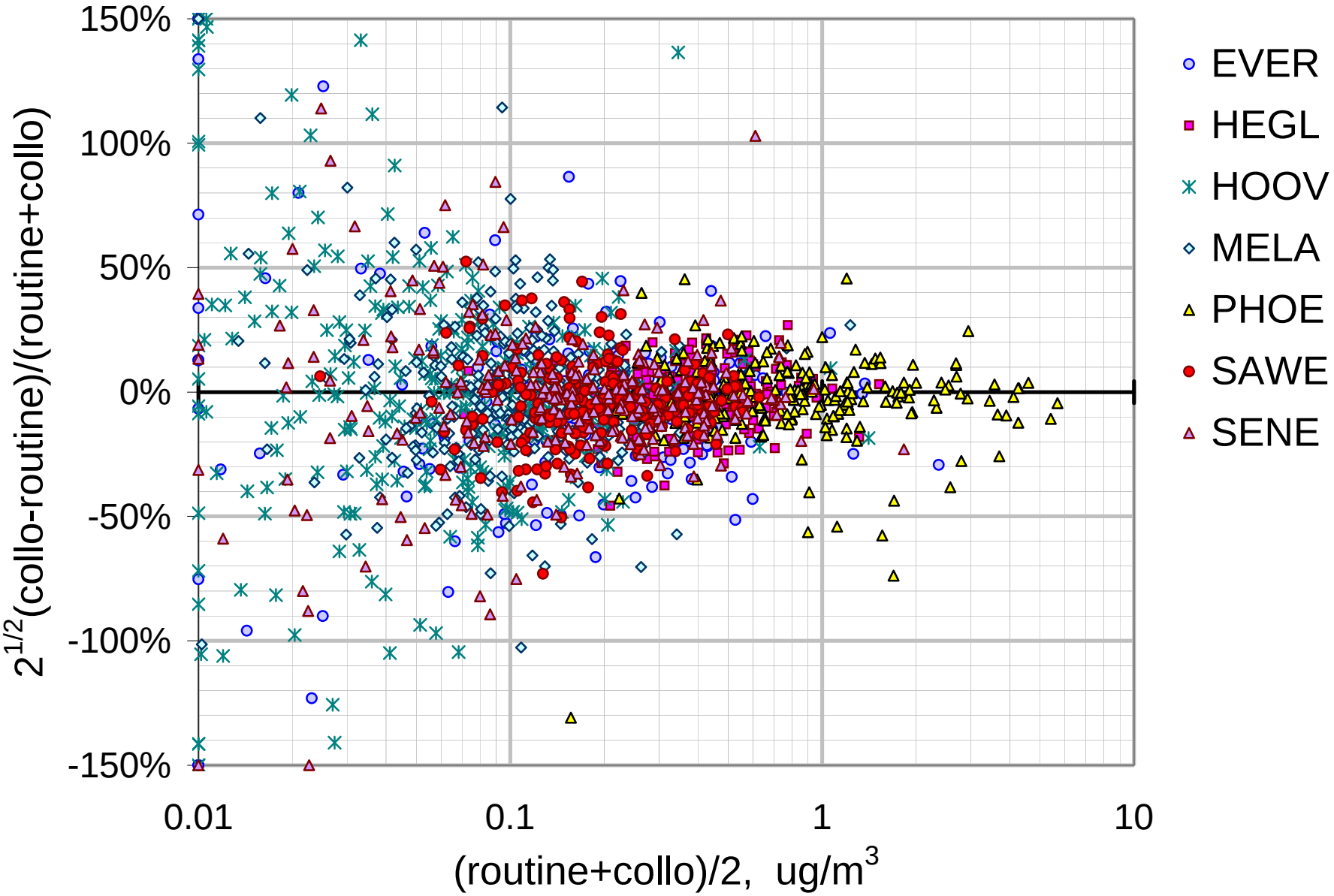
EC

We expect measurements to have larger errors (in ug/m^3) at higher concentrations, …

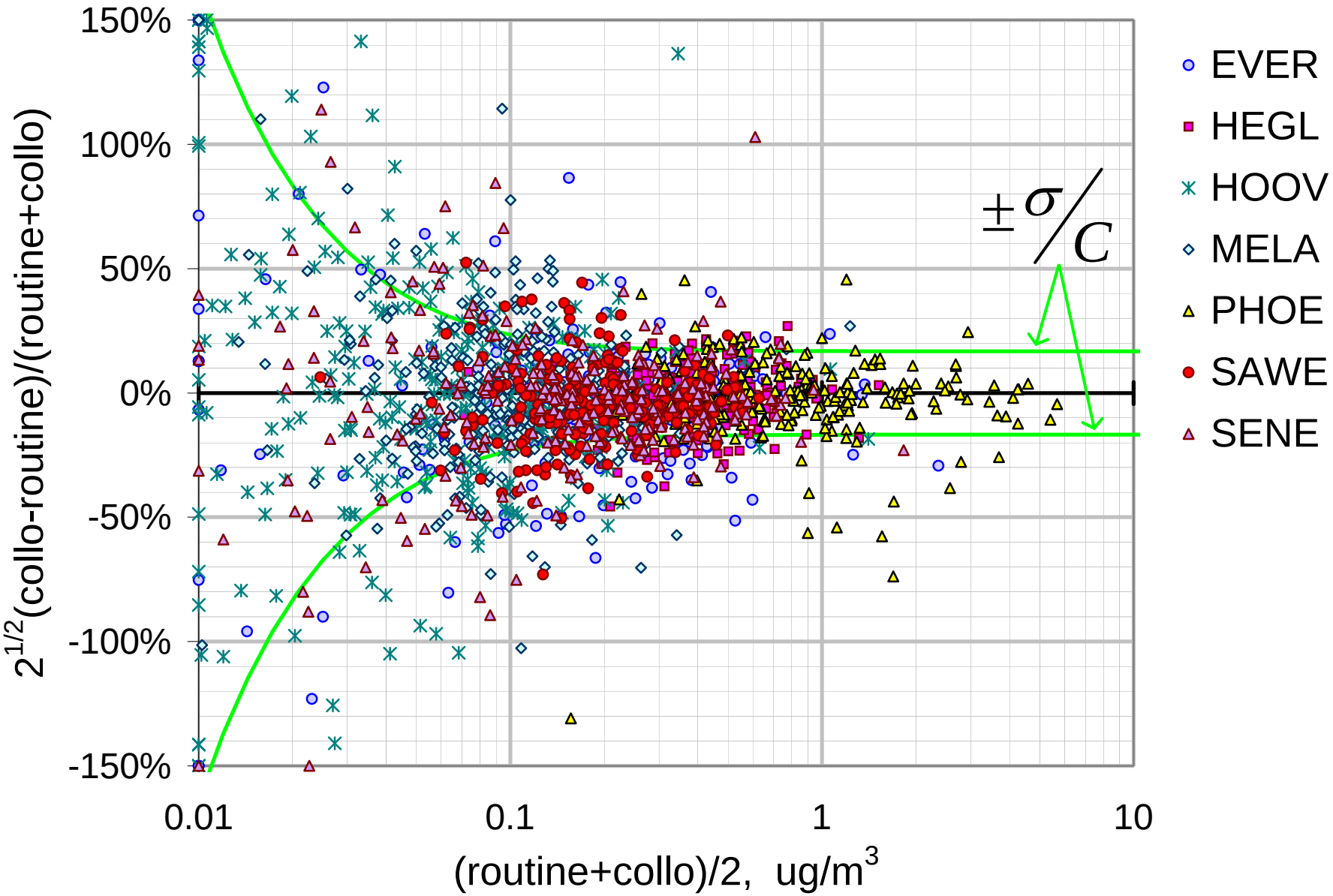


EC

… but we expect their relative errors (in %) to decrease with increasing concentration …



EC … eventually reaching a limiting value of *precision*.



Our reported uncertainties are based on formulas of the general form

$$\sigma = \sqrt{\left(a/V\right)^2 + \left(bC\right)^2},$$

where C and V are the concentration and sample volume.

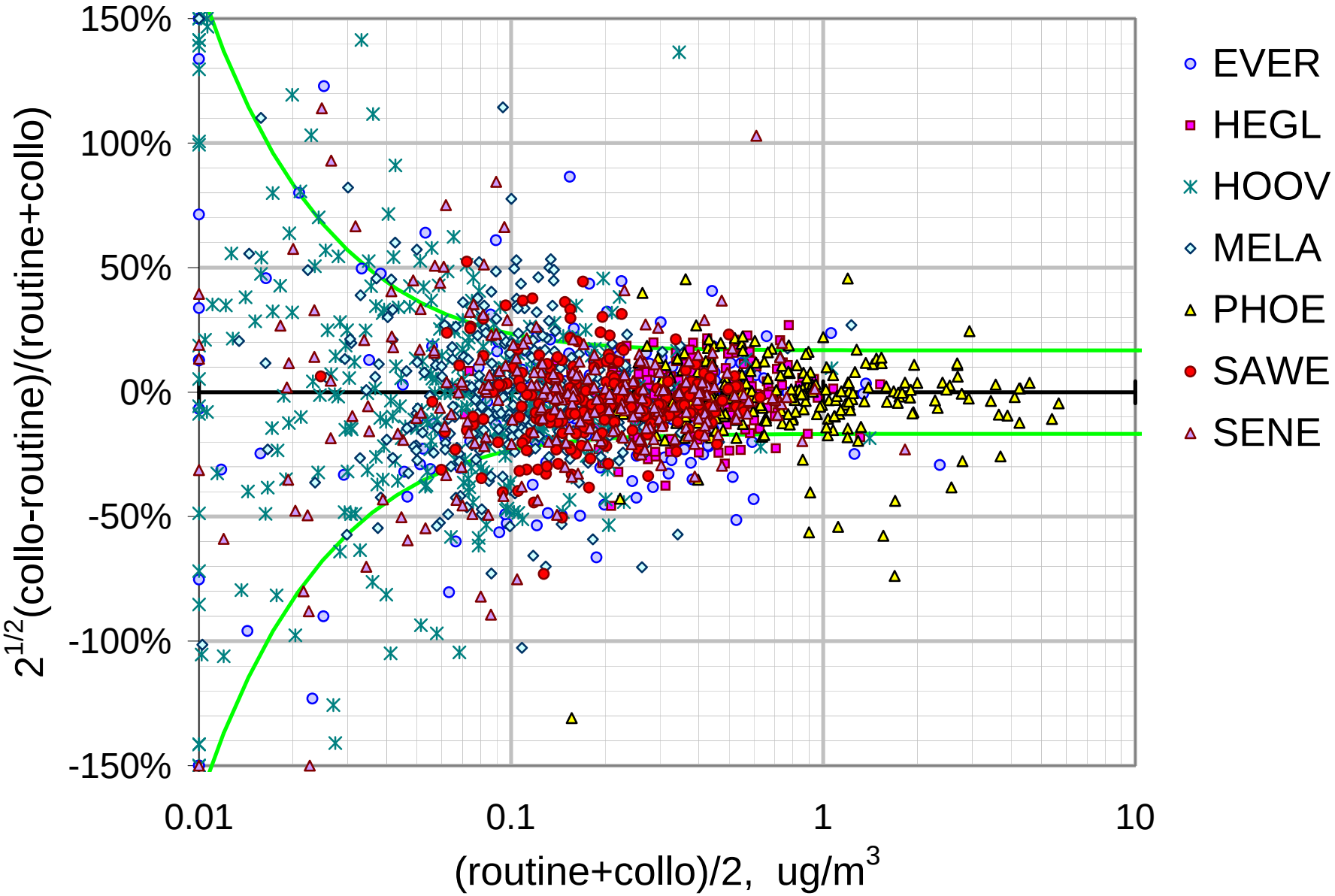
For mass, ions, and carbon, the parameters a and b are constant for all samples in a given month. For XRF elements, b is constant but a may vary slightly from sample to sample.

For all methods, the same parameters a and b are used for all sites. That is,

all samplers are assumed equivalent.

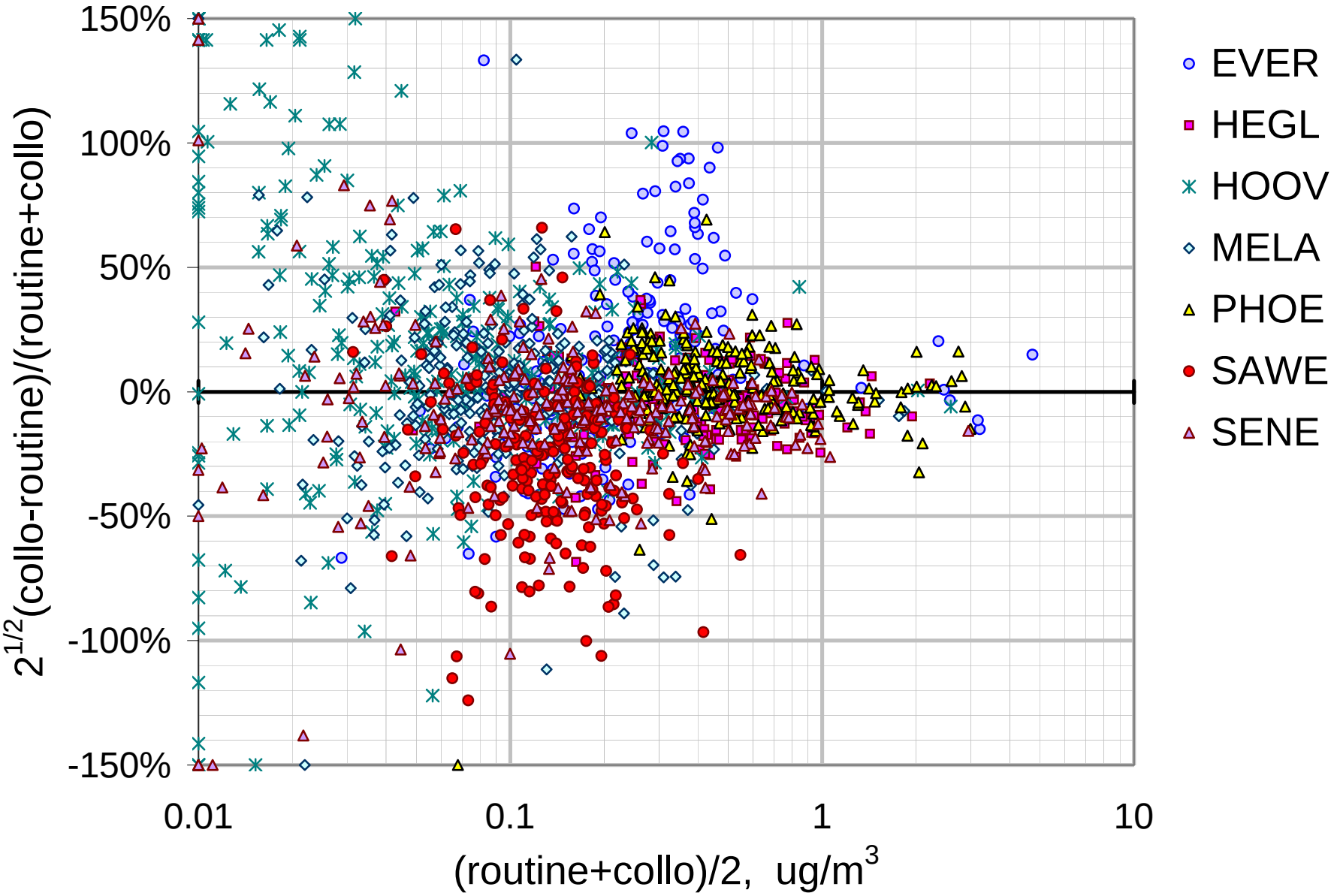
EC

The equivalence of samplers underlies the relevance of a handful of collocations to the full network.



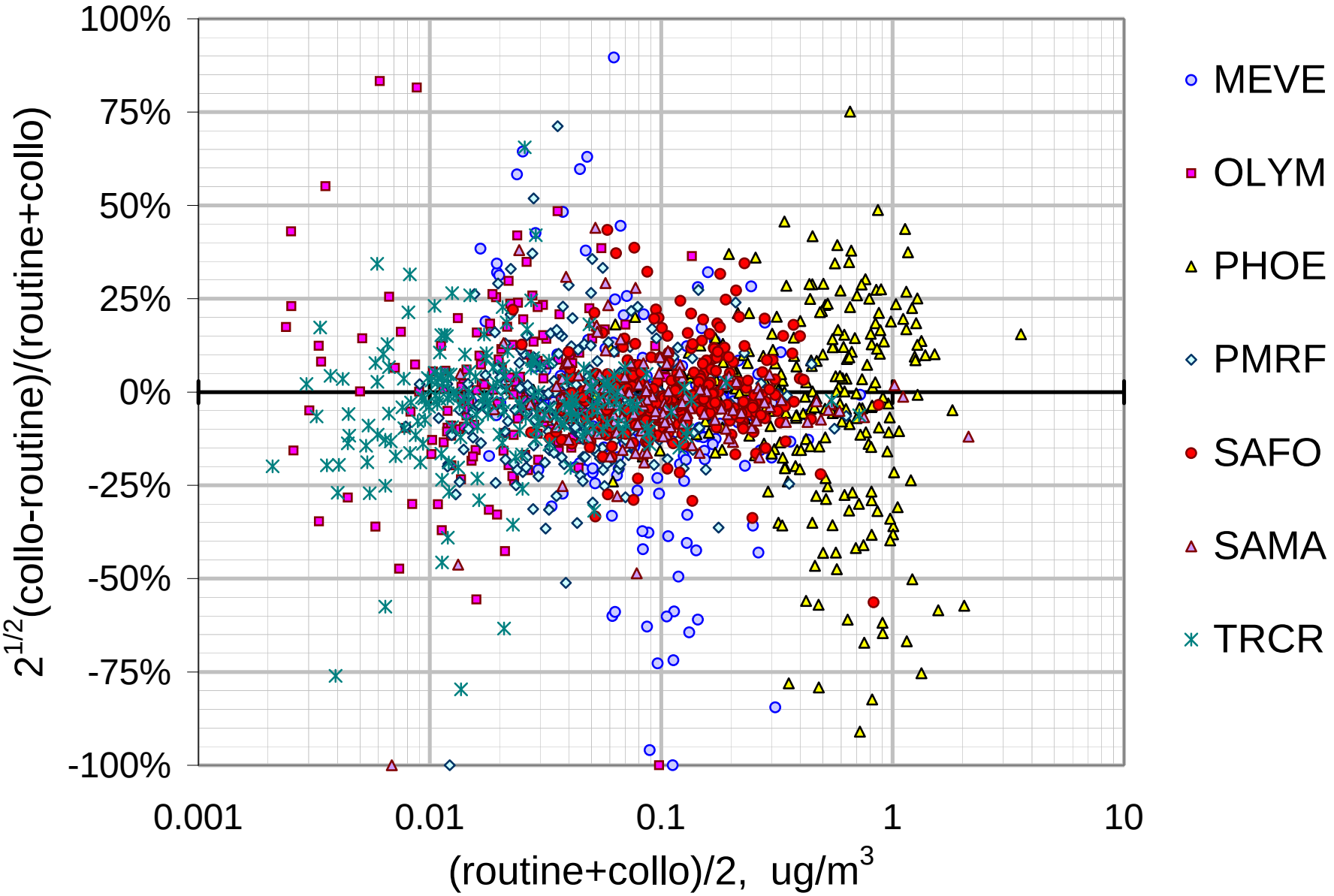
OC2

Unfortunately, equivalence for one species need not guarantee equivalence for another.

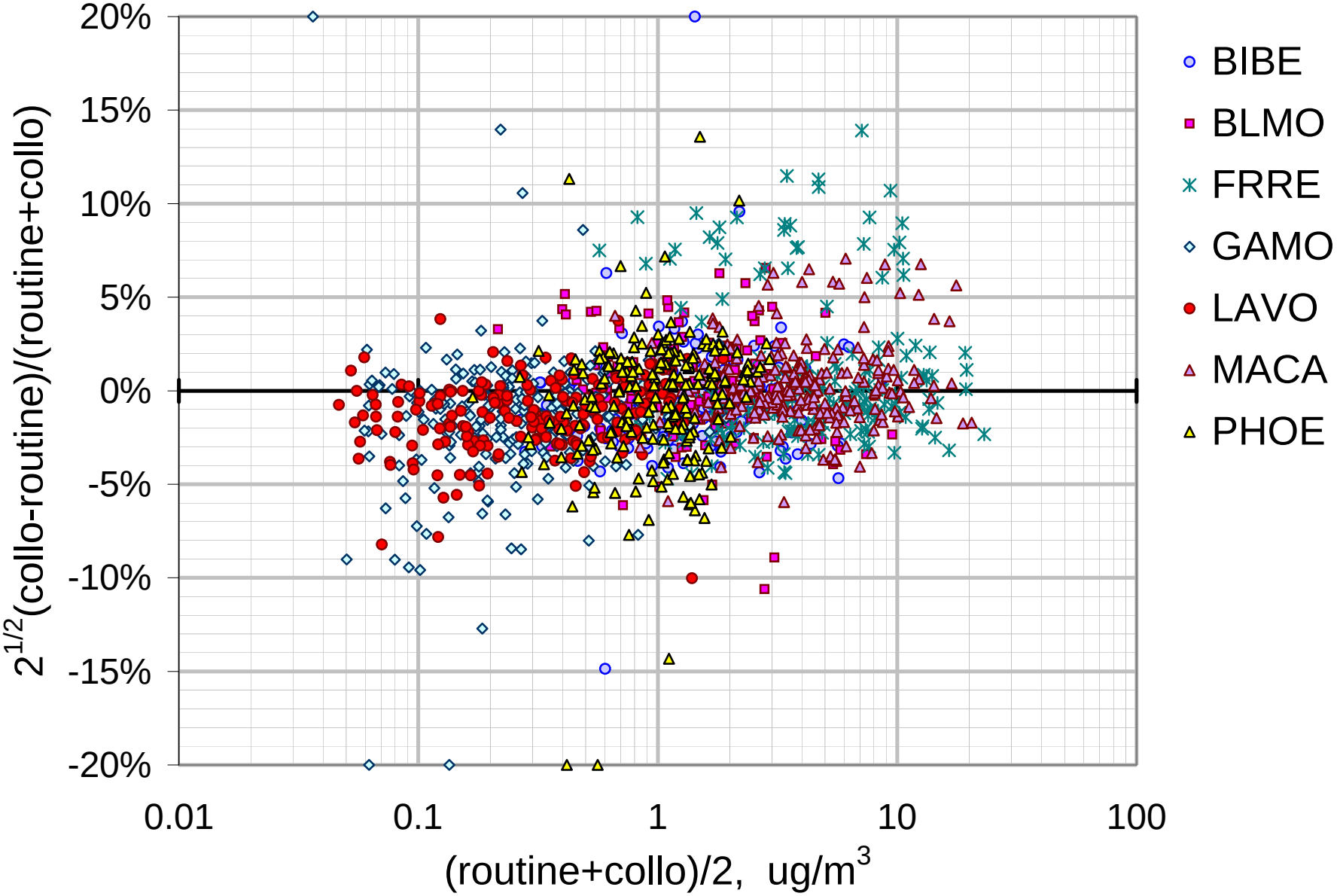


Si

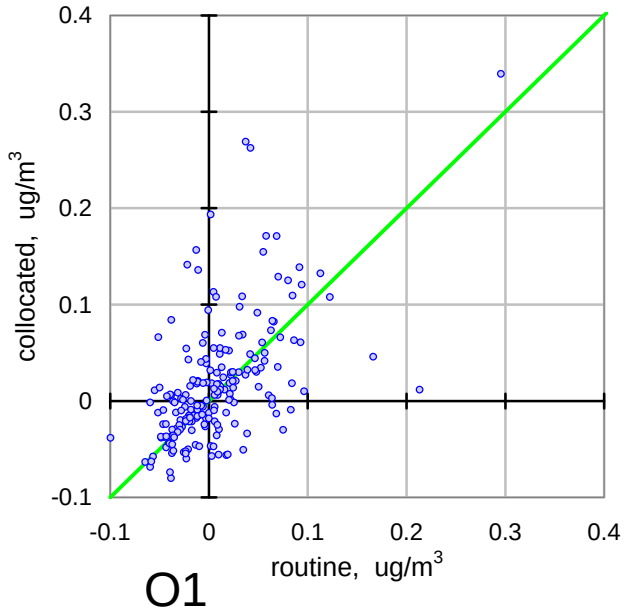
Observed differences in precision are often better associated with sites than with concentrations.



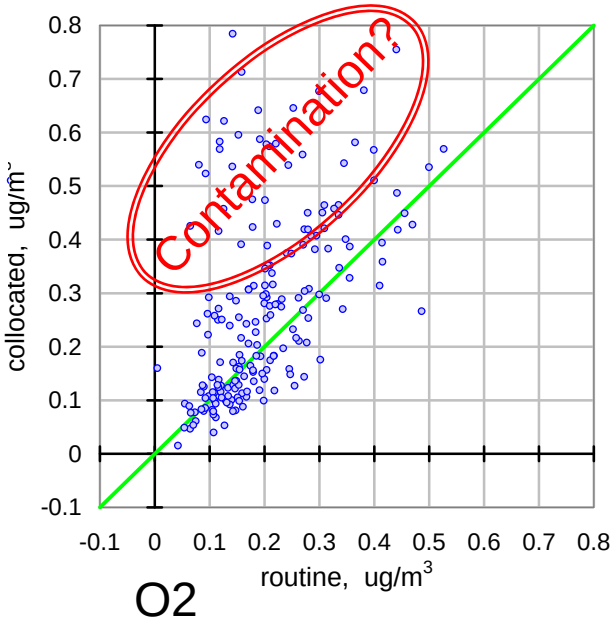
$SO_4^=$ Site-specific uncertainties are observed across all analytical methods.



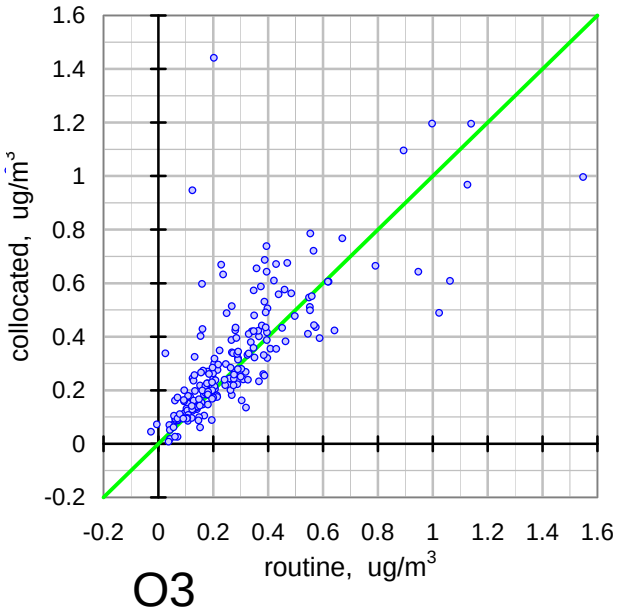
The data suggest various kinds of problems.



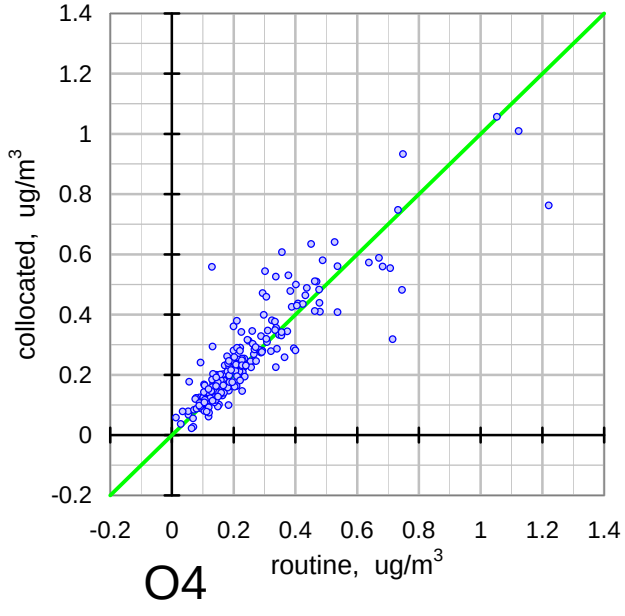
O1



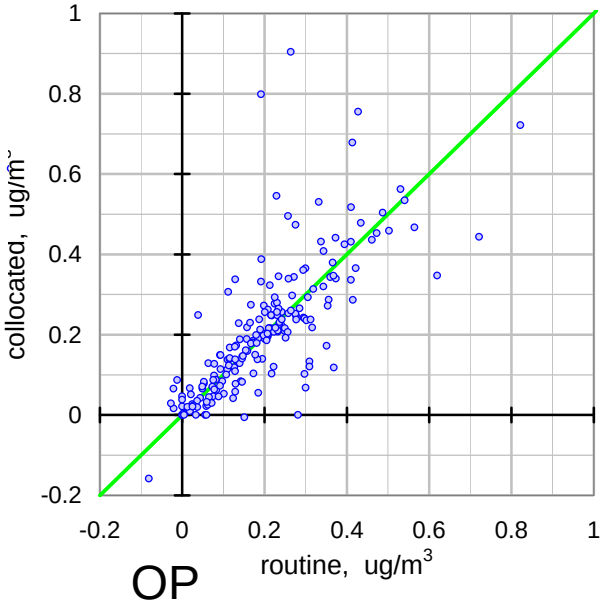
O2



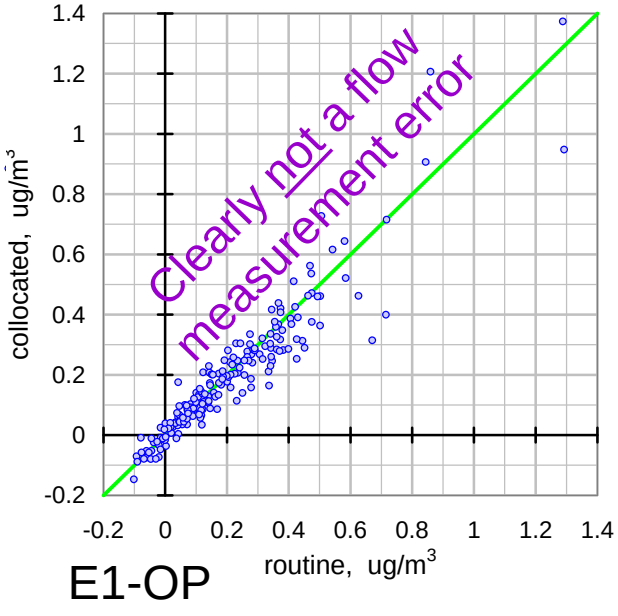
O3



O4



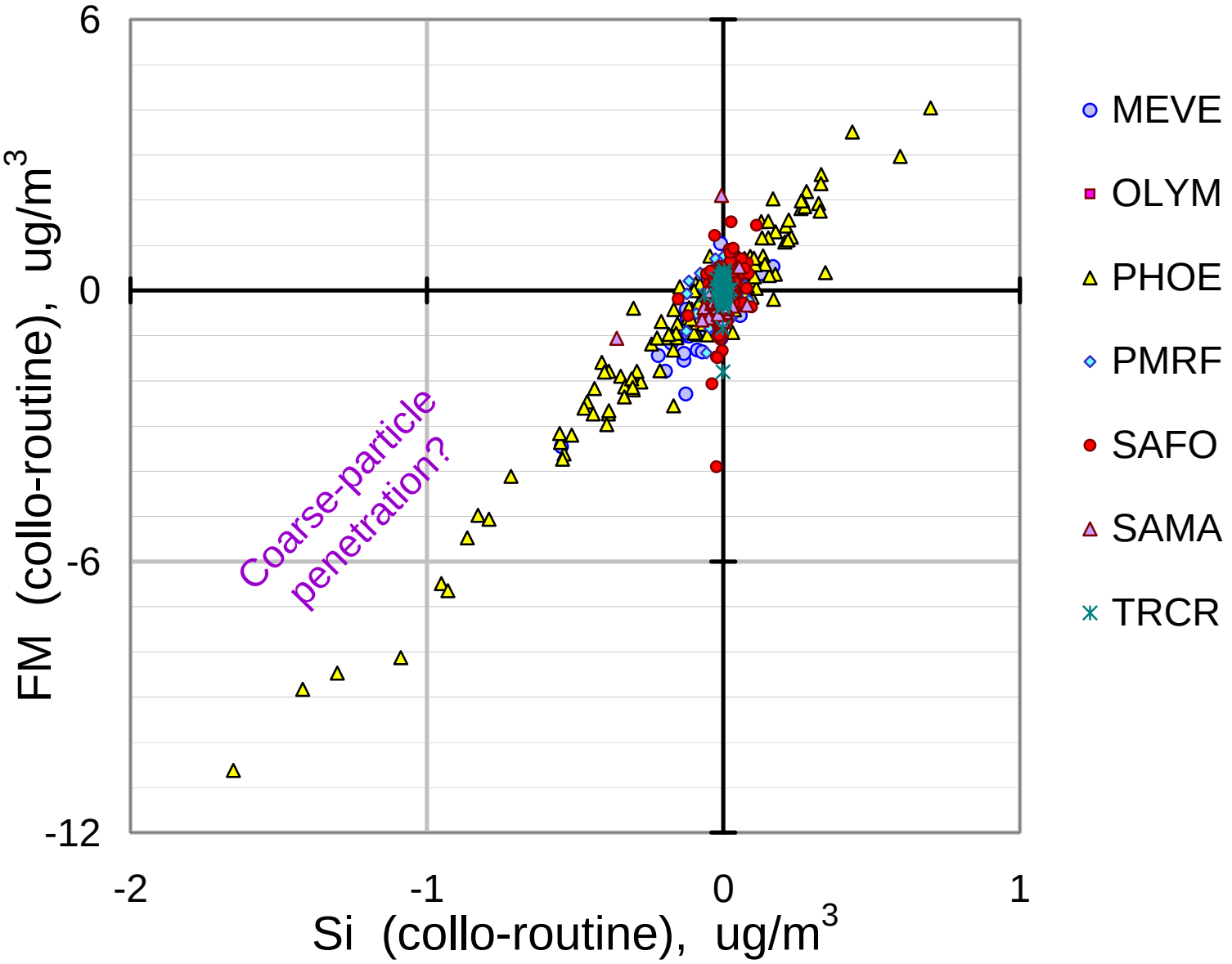
OP



E1-OP

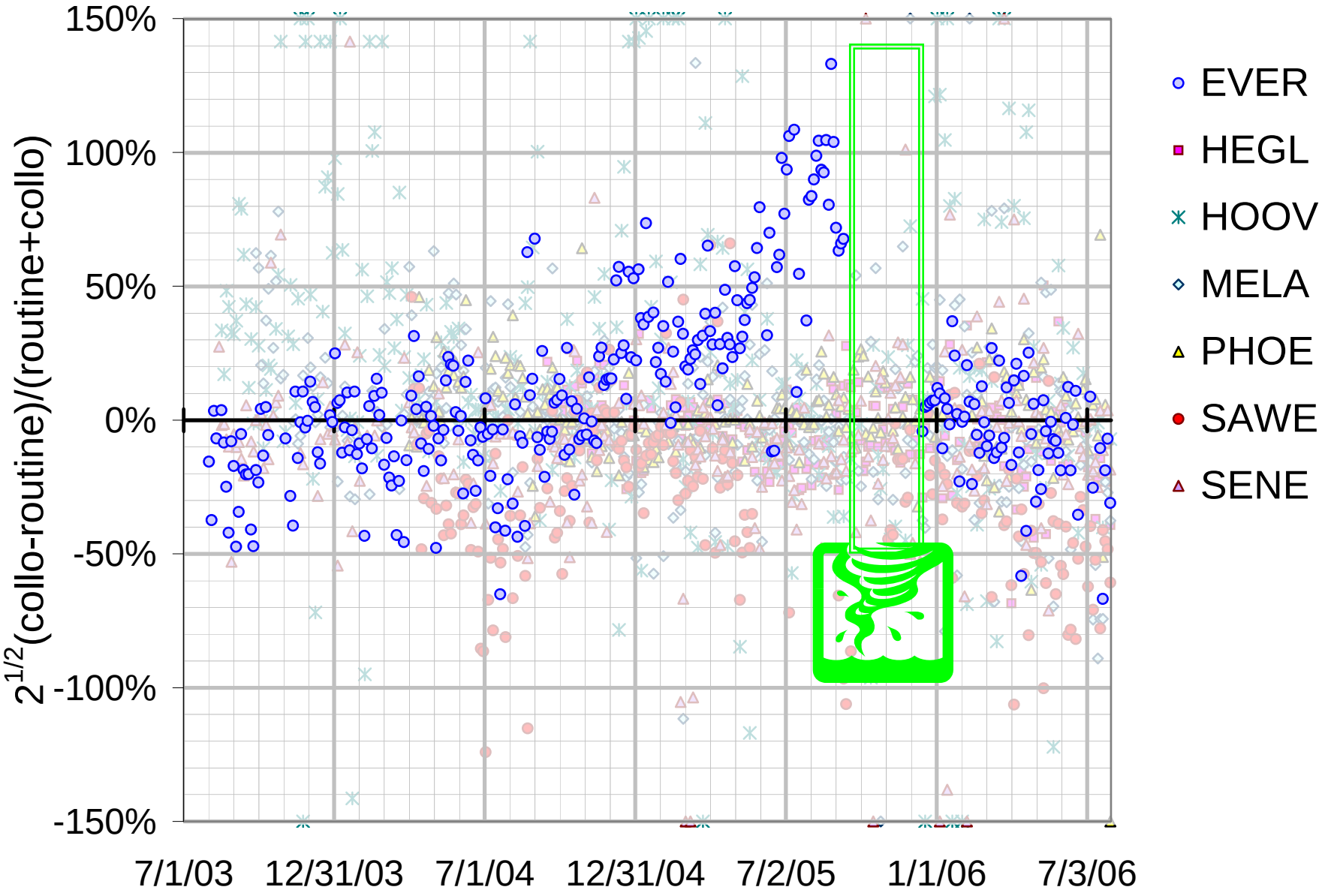
Everglades

The problems are definitely associated with sample collection and not with the analytical determination.



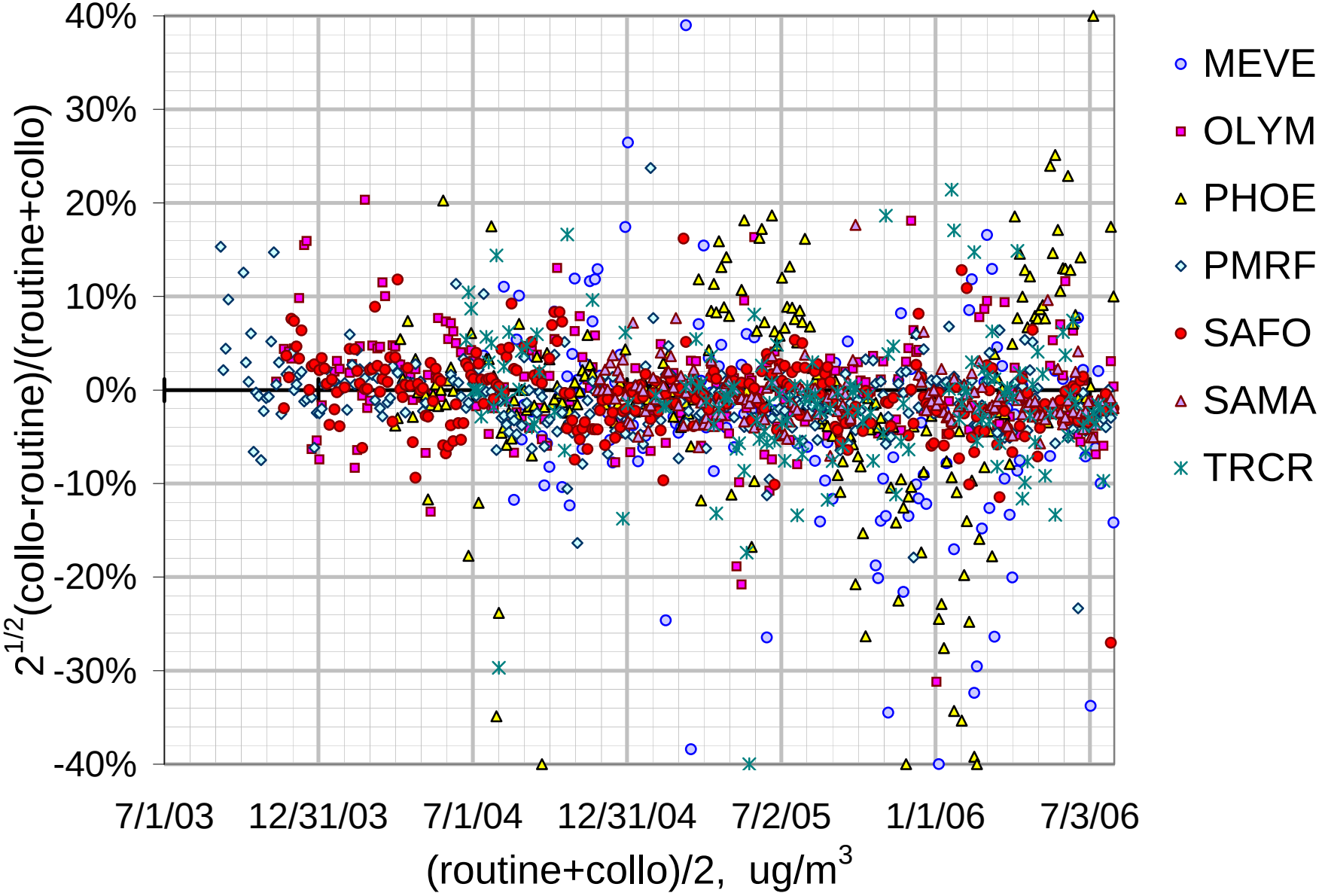
OC2

Diagnosis is complicated by analytical time-lags and “spontaneous remissions”.



MF

Sampling problems are difficult to model statistically – the effect is typically neither bias nor random noise.



$SO_4^=$

As Chuck outlined earlier,
we're actively working on this.