

TEMPORAL PATTERNS IN EC/OC EDGES

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KNOWN'S OR WHAT I AM TOLD

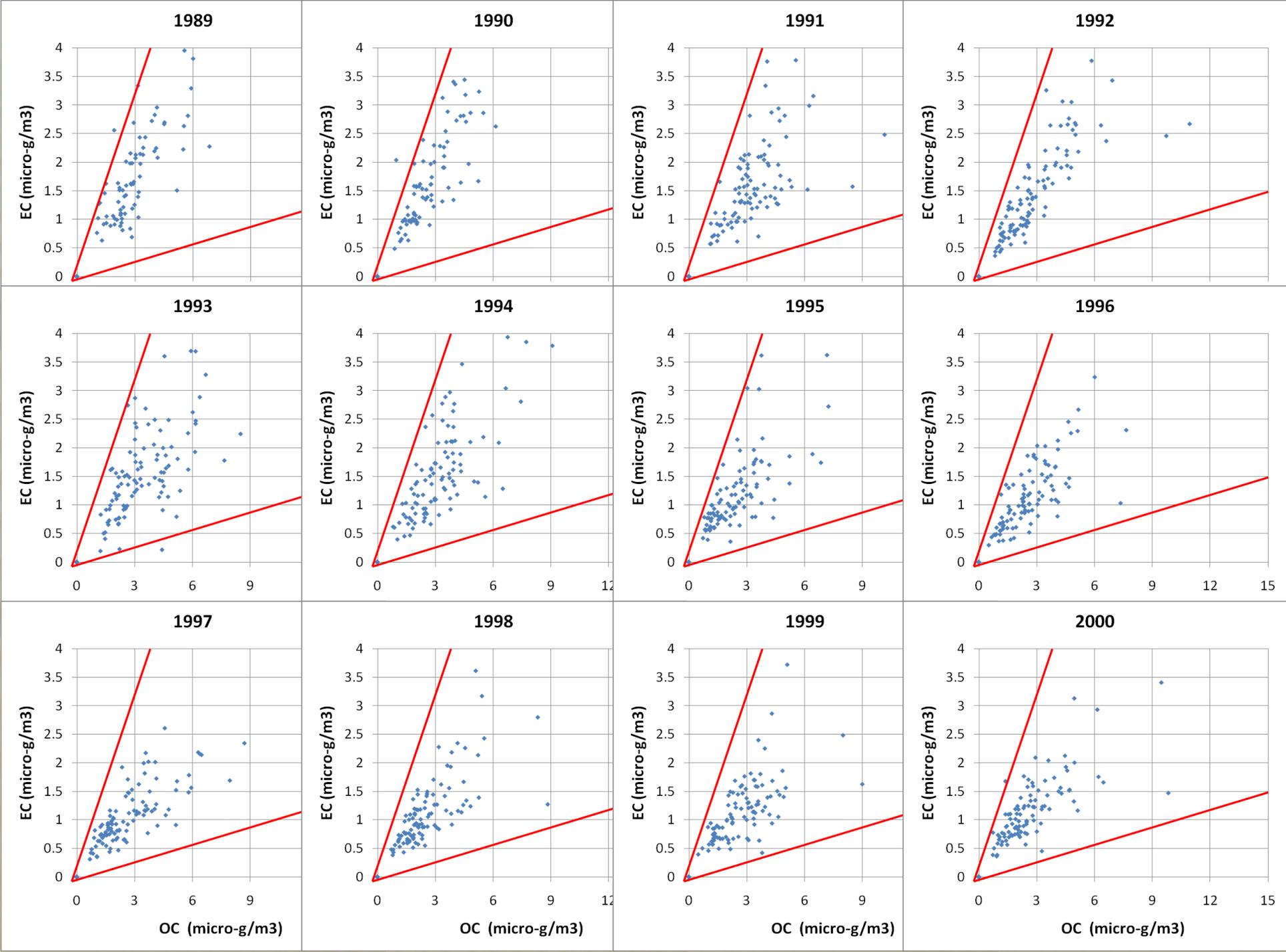
1. TC filter analysis is stable, reproducible and has no temporal biases
2. In 2005 IMPROVE moved to new TOR analyzers. After extensive testing, DRI has shown that the new TOR analyzers produce equivalent EC/OC splits as a properly operating old analyzer.
 1. The EC/OC shift from 2004 to 2005, noted by Warren, are possibly due to the analyzers used prior to 2005 degrading over time.
3. The average TC concentrations (particularly winter) have generally decreased at IMPROVE sites since 1990
4. The average EC trends (particularly winter) have also generally decreased at IMPROVE sites and at a higher rate.
 1. Dan Murphy has shown corroborating, independent trends in EC and absorption

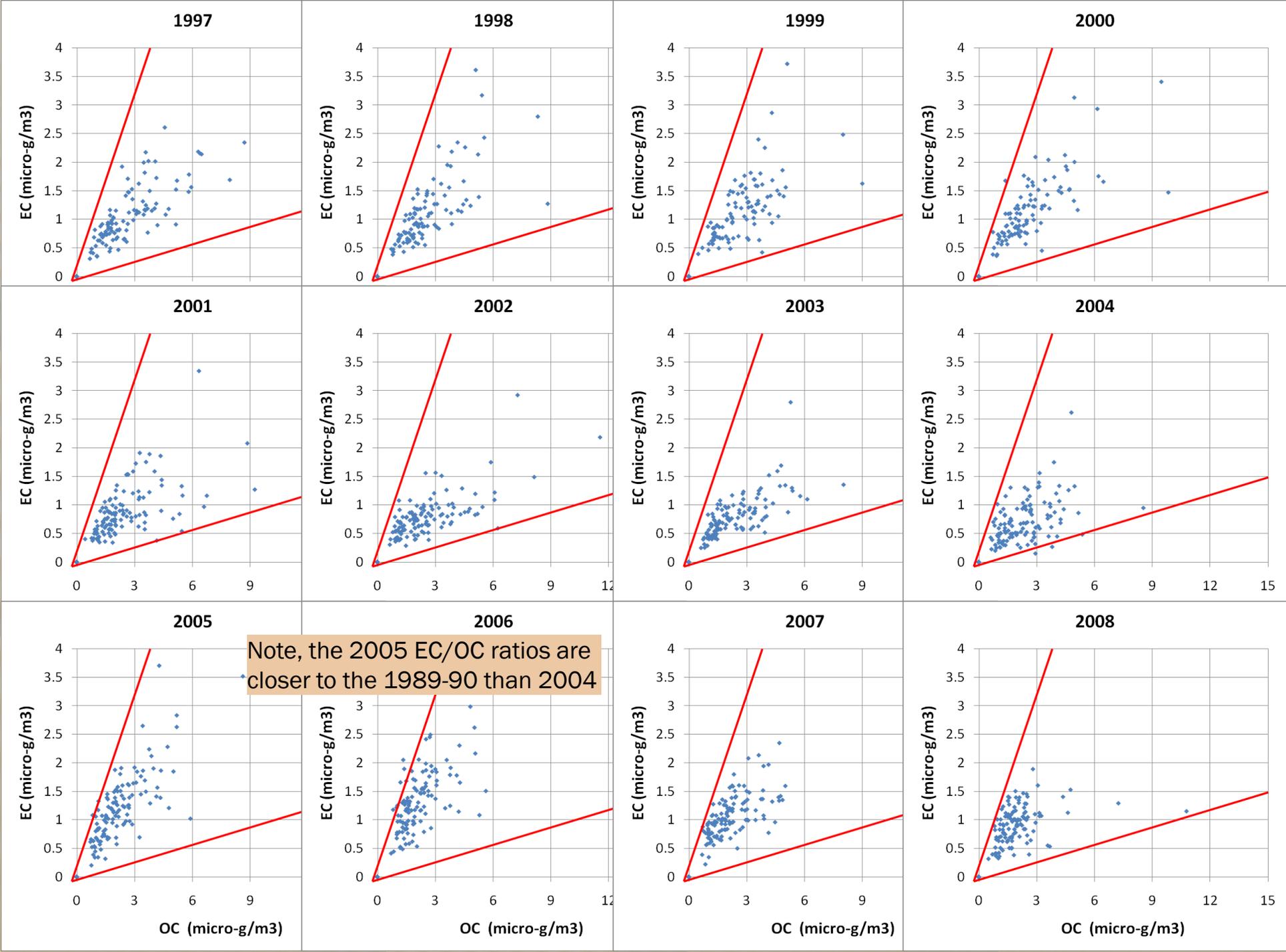
MY INITIAL WORKING ASSUMPTIONS

- ✘ EC/OC ratios from major source categories, e.g. diesel have not appreciably changed over time
- ✘ The highest EC/OC ratios at a given site are due to dominate contributions from a single source type or consistent mixture of sources
- ✘ A long term trend in these EC/OC ratios is an indication of a change in the analyzers as opposed to the atmosphere
- ✘ No doubt there are limits to this hypothesis.

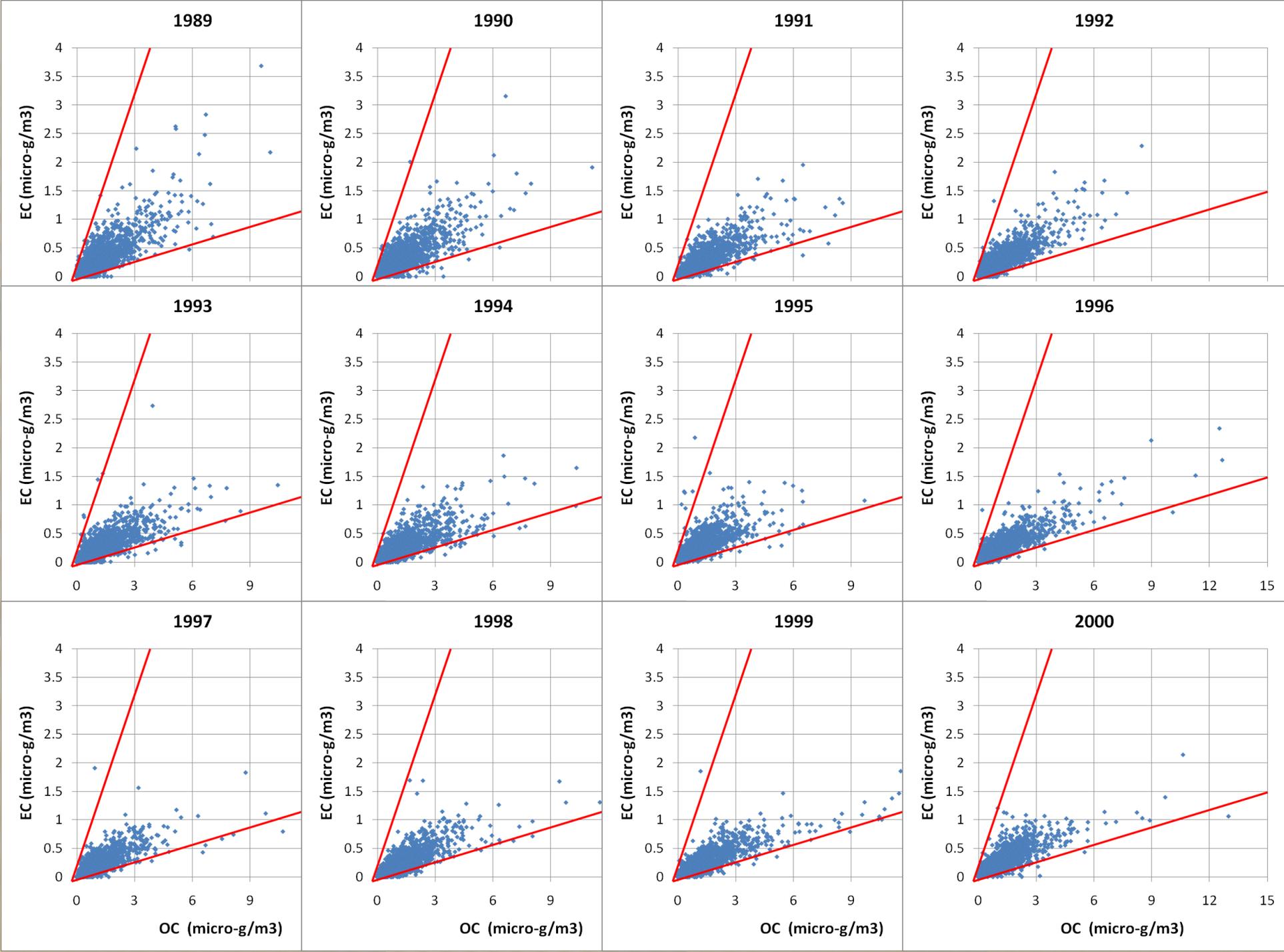
Examination of edges in the EC/OC data and how they change with time

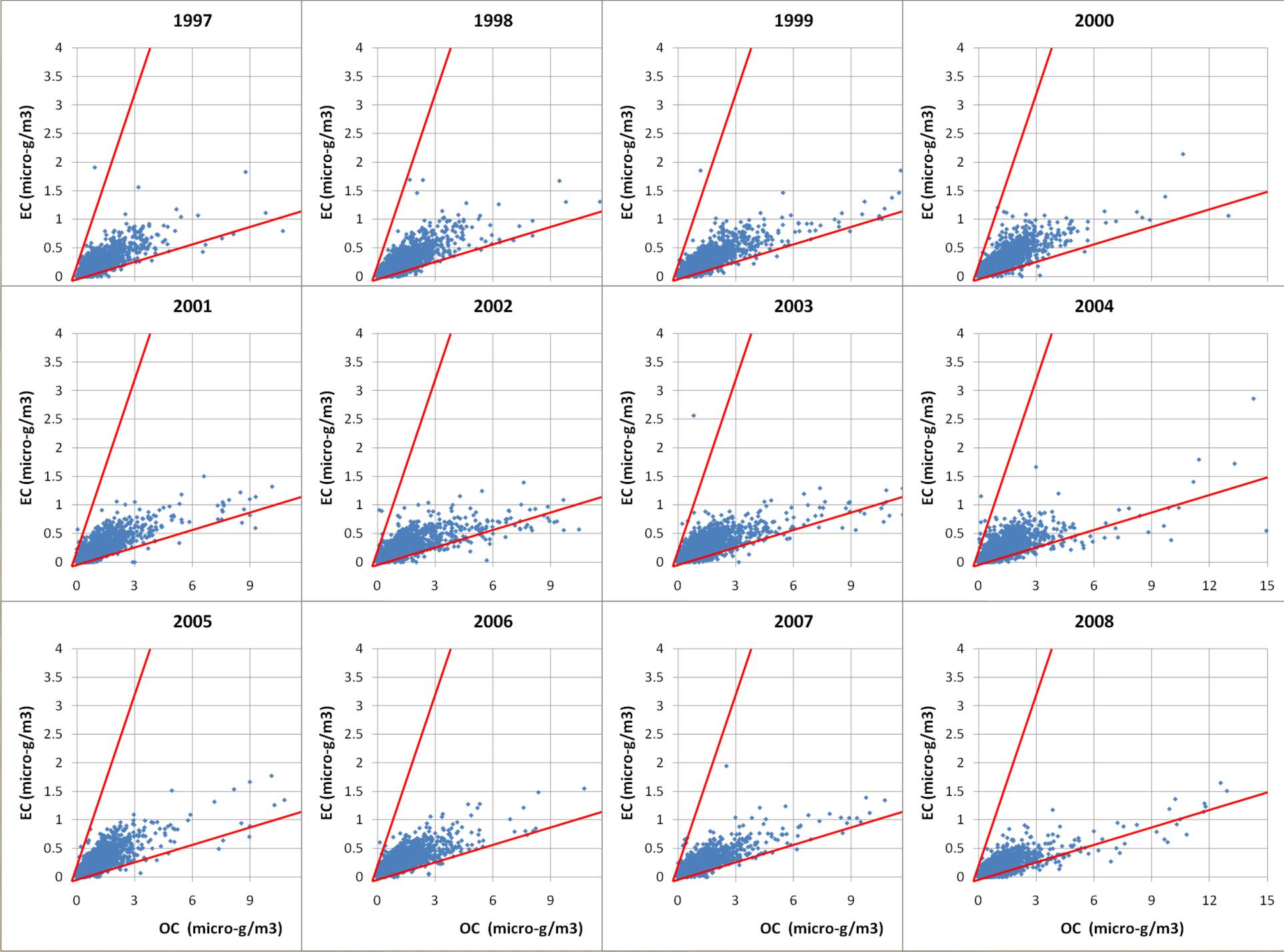
SCATTER PLOTS OF THE WASHINGTON DC EC TO OC





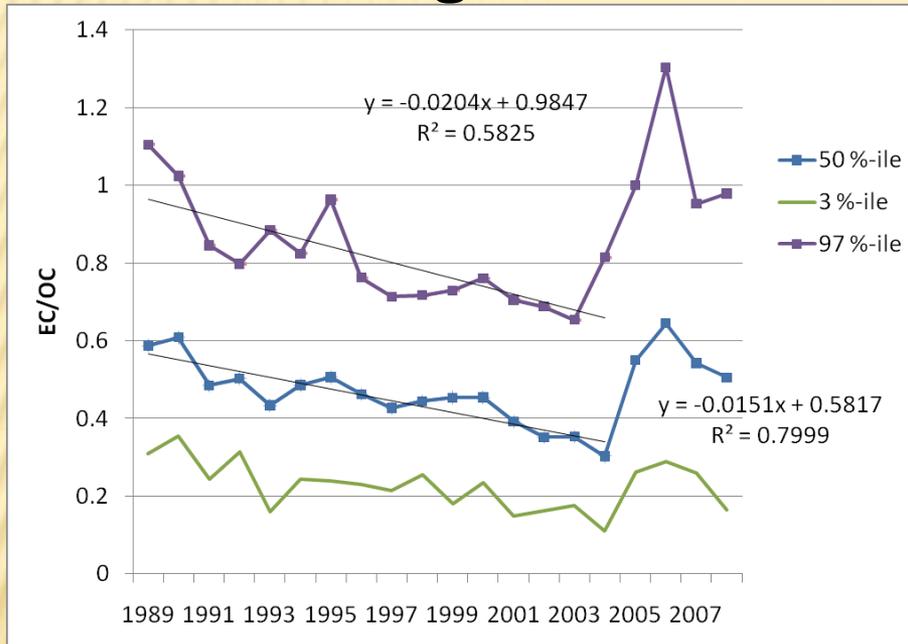
**SCATTER PLOTS OF THE RURAL IMPROVE
SITES THAT OPERATED FROM 1988-2009**



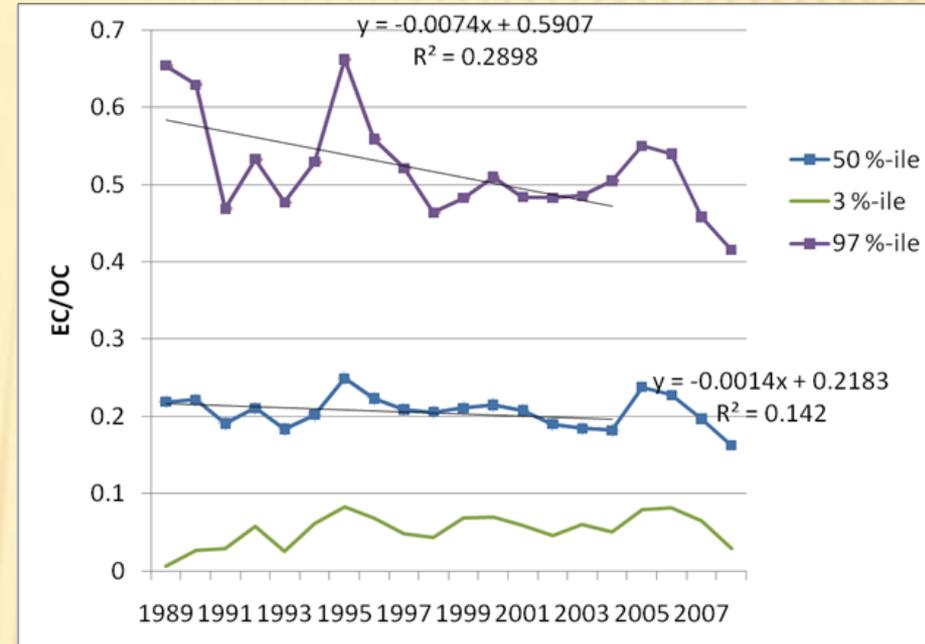


TRENDS IN THE 97TH, 50TH, AND 3RD EC/OC %-ILES

Washington DC



Rural Sites



- ✘ The trend lines are for the years 1989-2004. The 97th and 3rd percentiles are surrogates for the edges of the EC-OC scatter plots.
- ✘ At Washington DC:
 - + There is a significant, near linear, decreasing trend in the EC/OC ratio from 1989 – 2004 for the edges and median EC/OC values
 - + In 2005, when new analyzers used, the EC/OC ratios returned to the 1989-90 levels
 - + EC/OC ratios in 1995 are higher than previous and post years and for the 97th percentile, it is similar to the 1989-90 and 2005 levels.
- ✘ These trends are less discernable at the rural sites

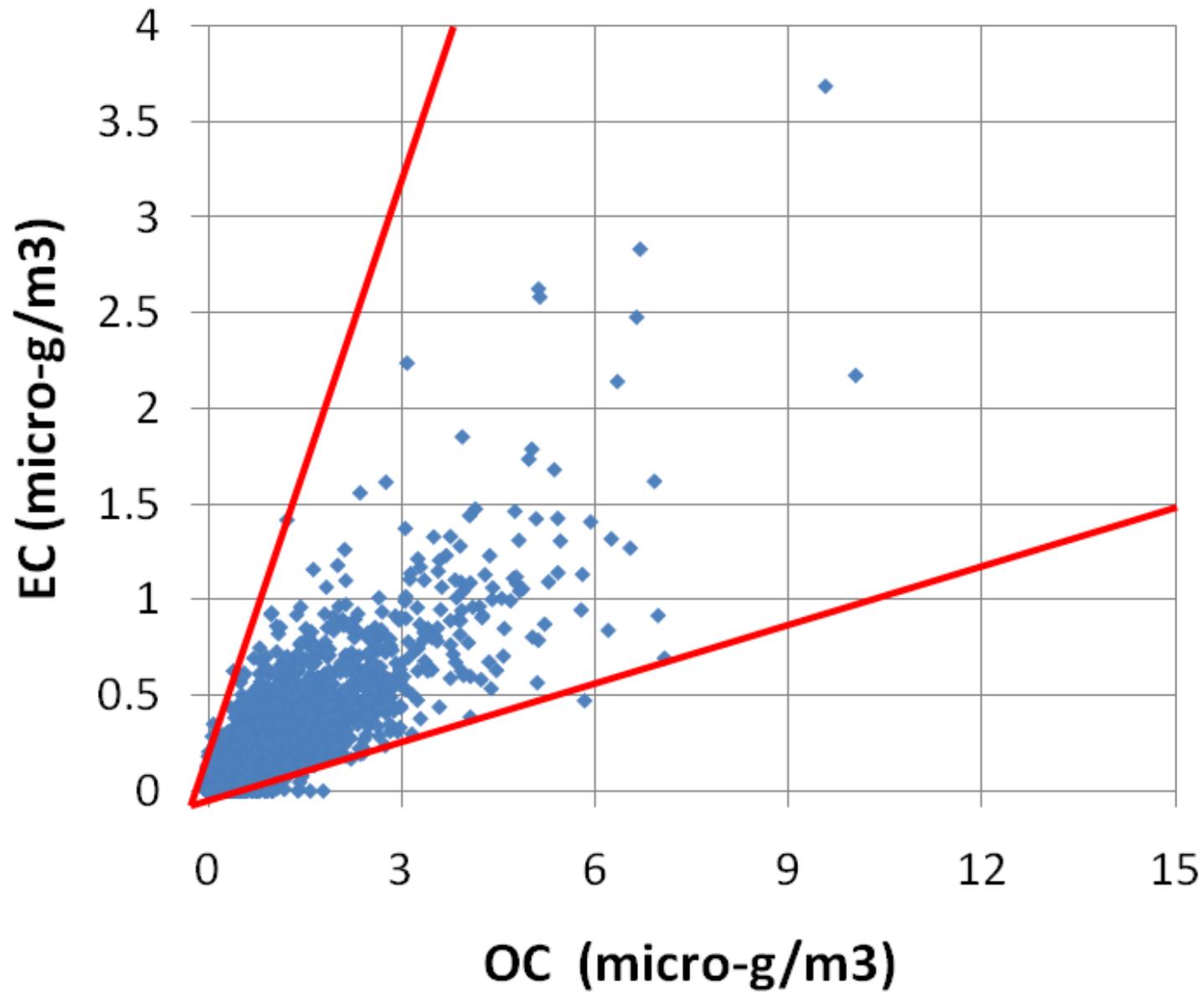
OBSERVATIONS

- ✘ Washington DC
 - + There is a decreasing trend in EC/OC ratio from 1989 – 2004
 - + when “animating” the data, all EC/OC ratios decrease from 1997-2004 compared to the previous 8 year period.
 - + when “animating” the data, all EC/OC ratios increase from 2005 - 08 compared to the previous 8 year period.
 - + The EC/OC ratios (and upper edge) in 2005 increase compared to 2004 and are more similar to the 1989 and 1990 scatter plots than the 2004 data.
- ✘ Rural sites
 - + Similar observations for the rural data can be made as the Washington DC data, except that it is more subtle. This is expected due to the lower EC concentrations at the rural sites.

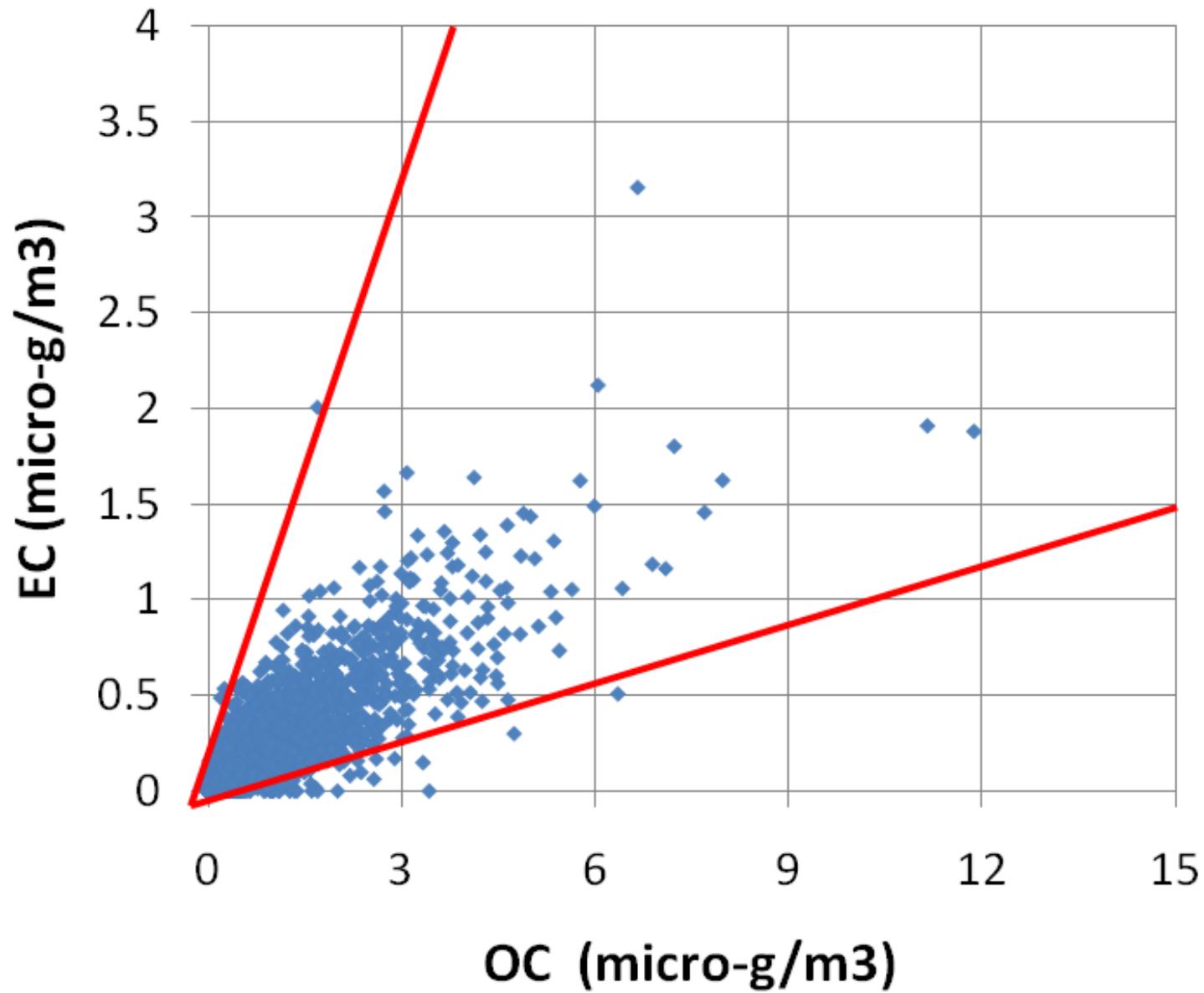
RESULTS

- ✘ We have trends in the EC/OC (EC/TC) ratios
- ✘ These trends may be due to analytical issues as opposed to atmospheric changes.
- ✘ These results indicate (at least to me) that the EC/OC ratios may have actually been relatively constant over the past 20 years.
- ✘ If the EC/OC trends are false then they would accentuate decreasing trends or moderate increasing EC trends

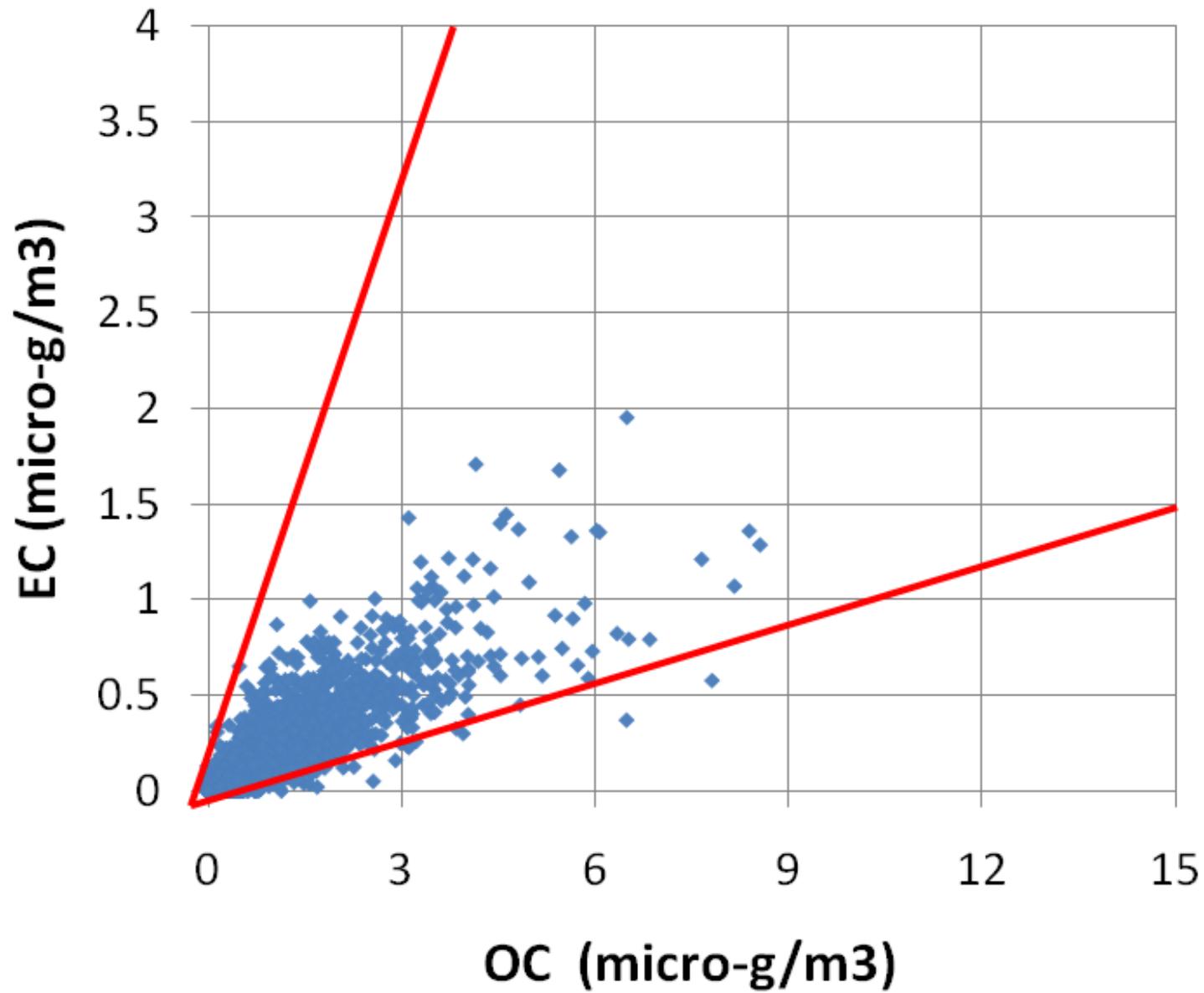
1989



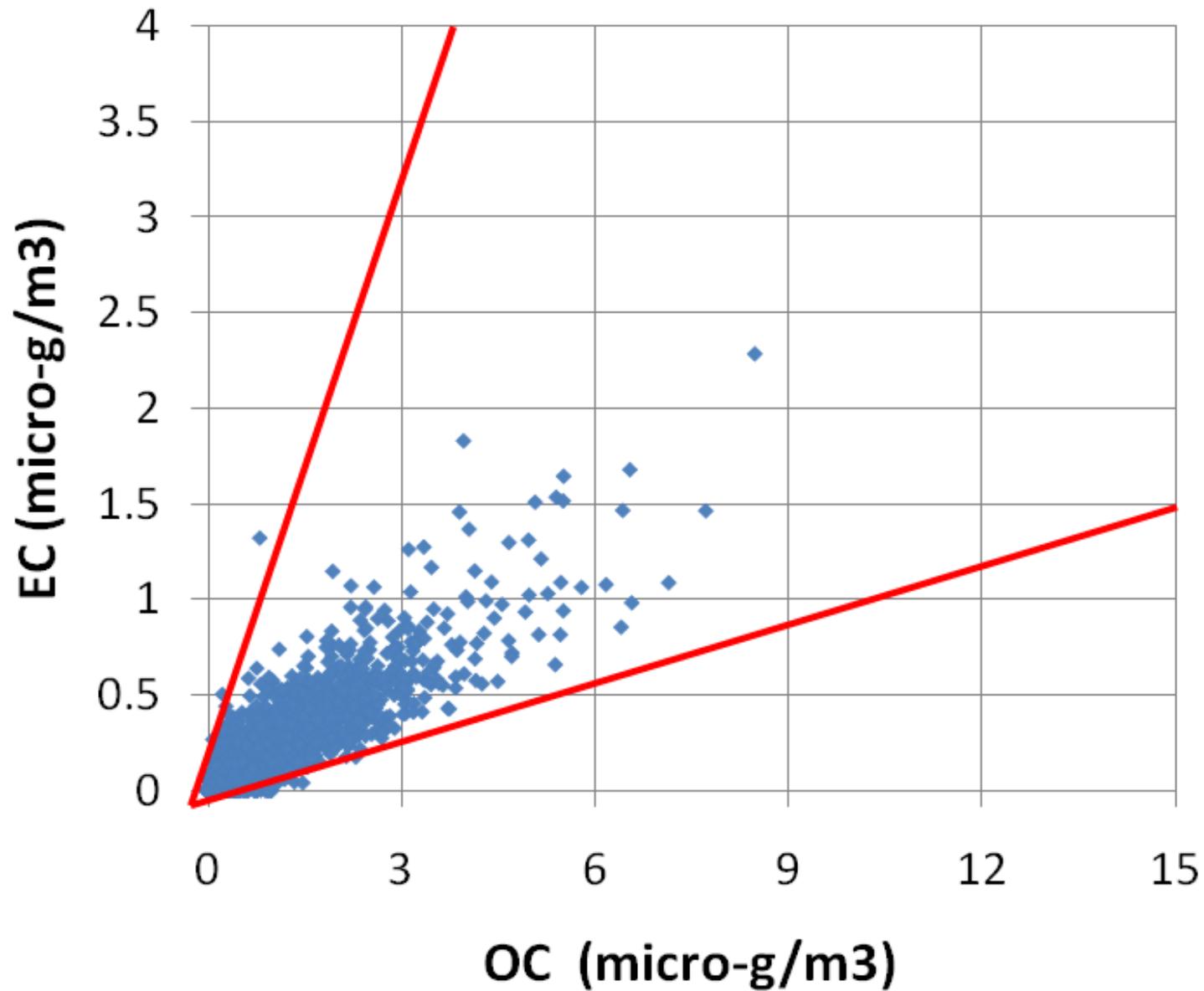
1990



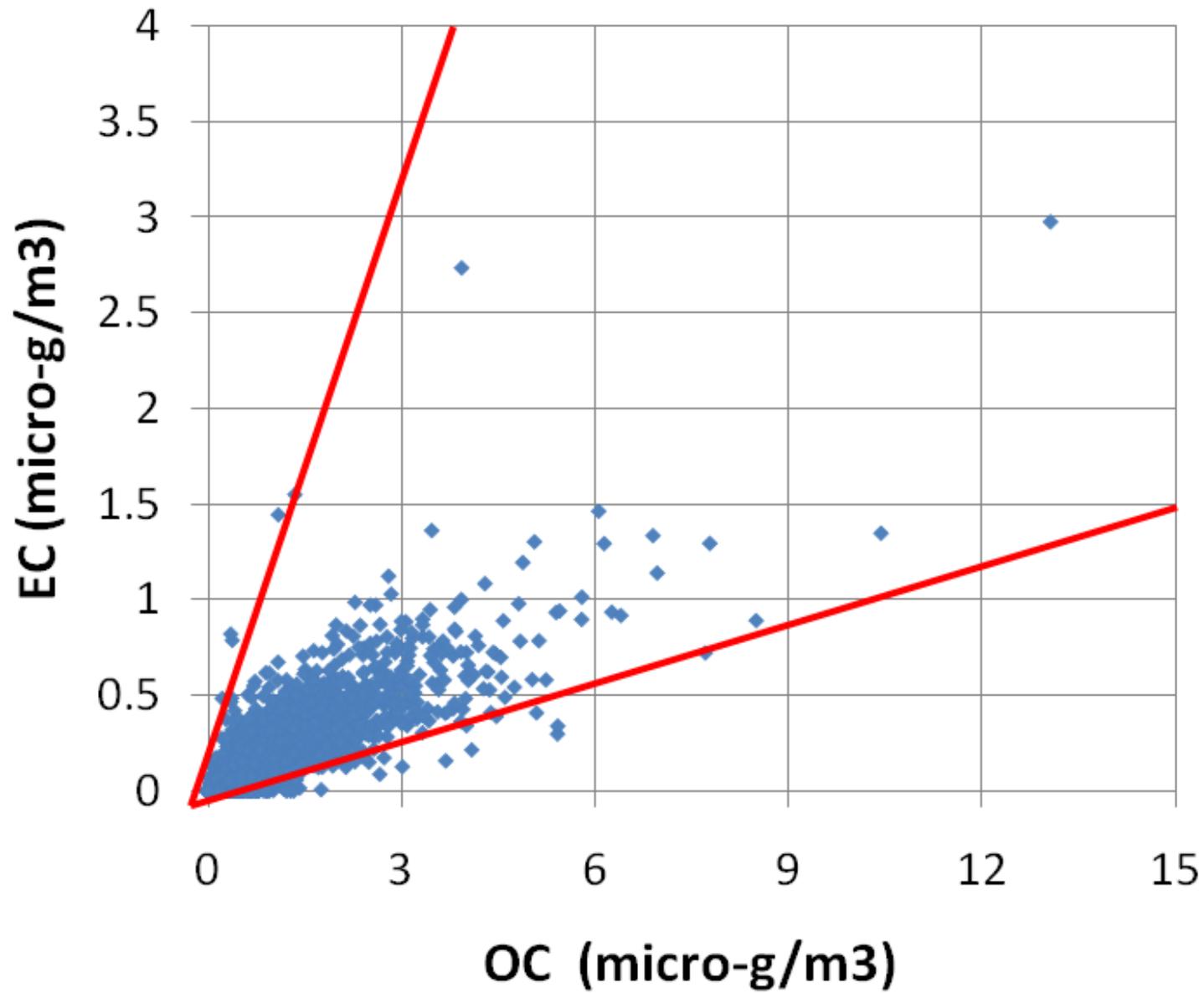
1991



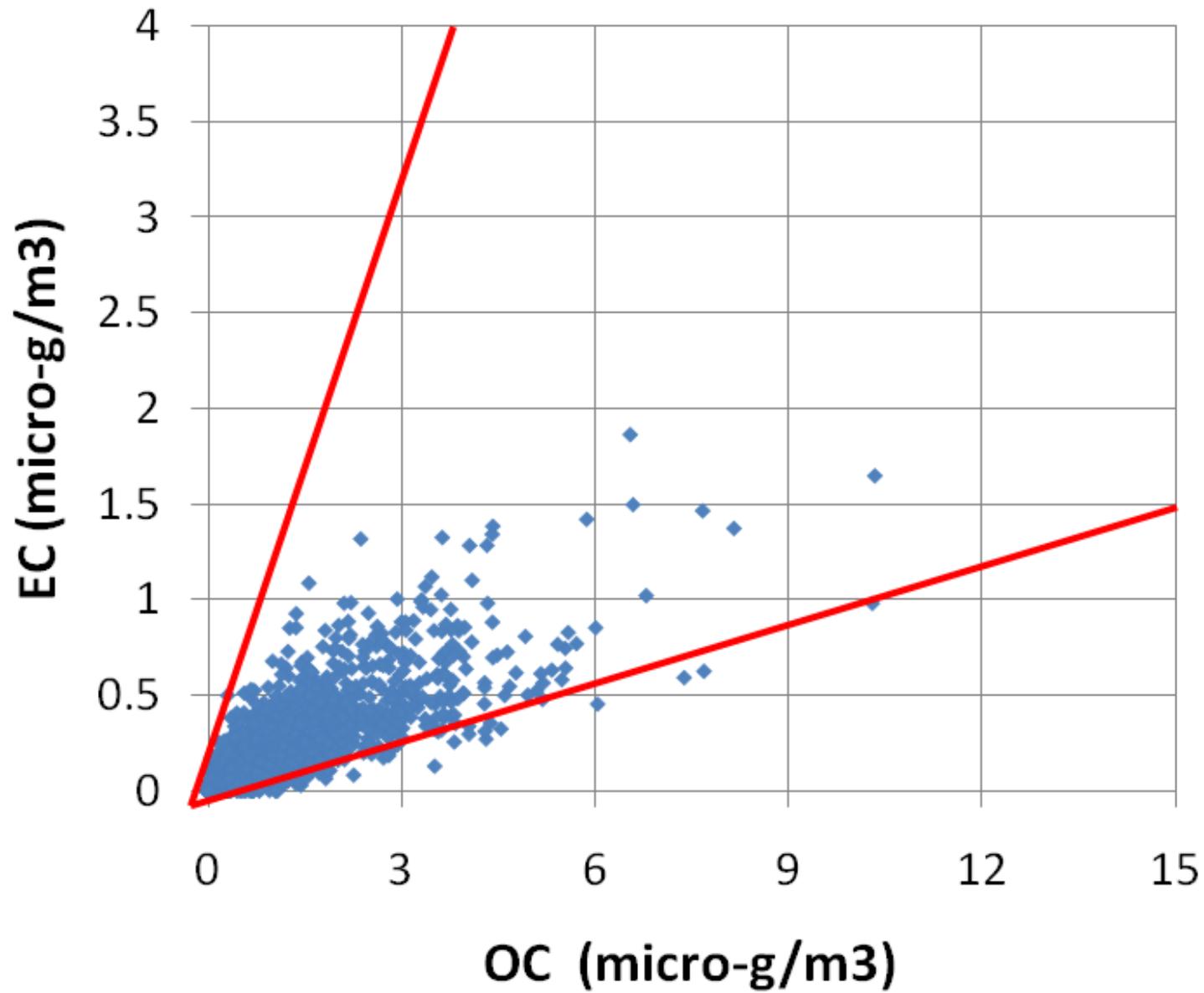
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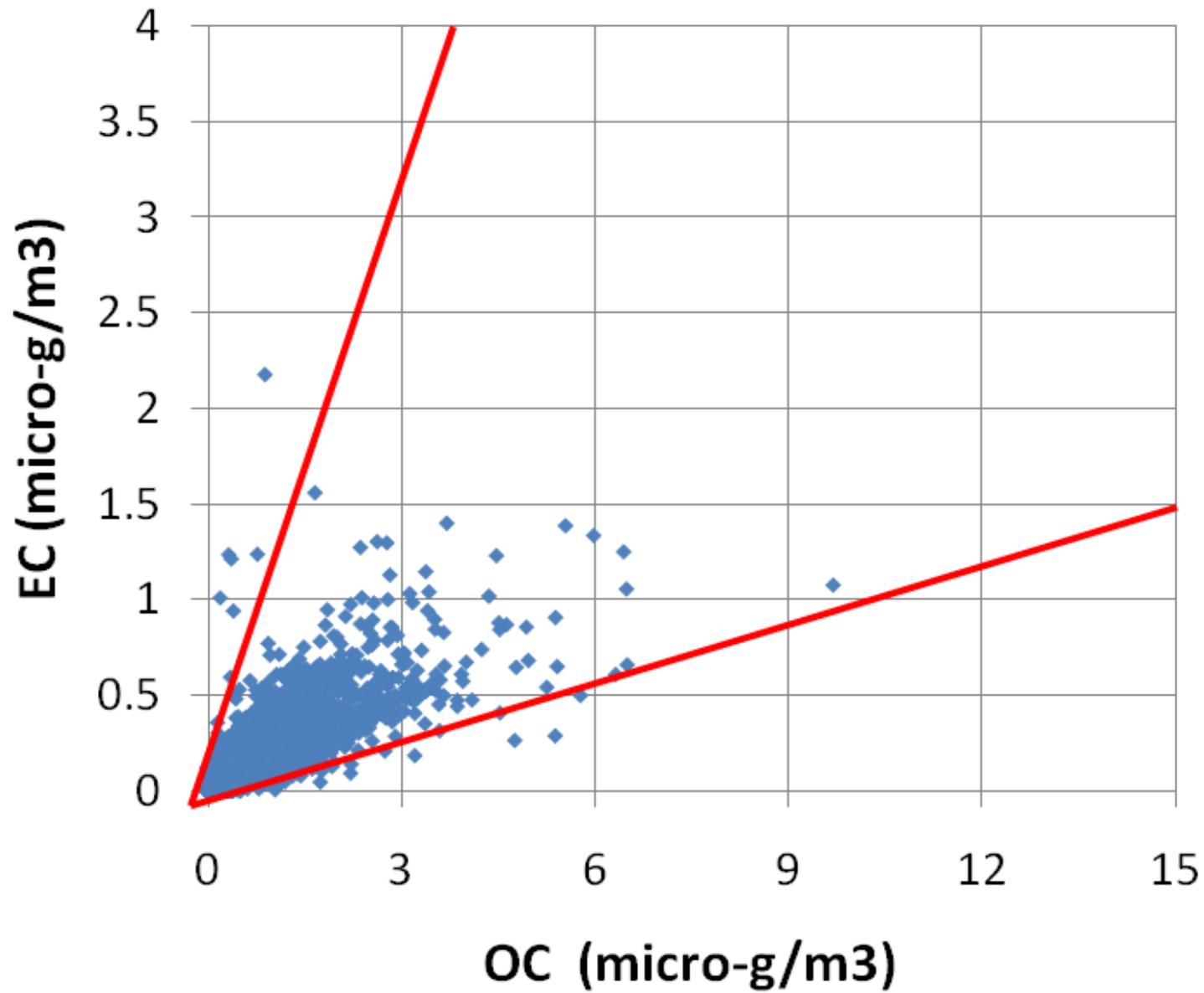
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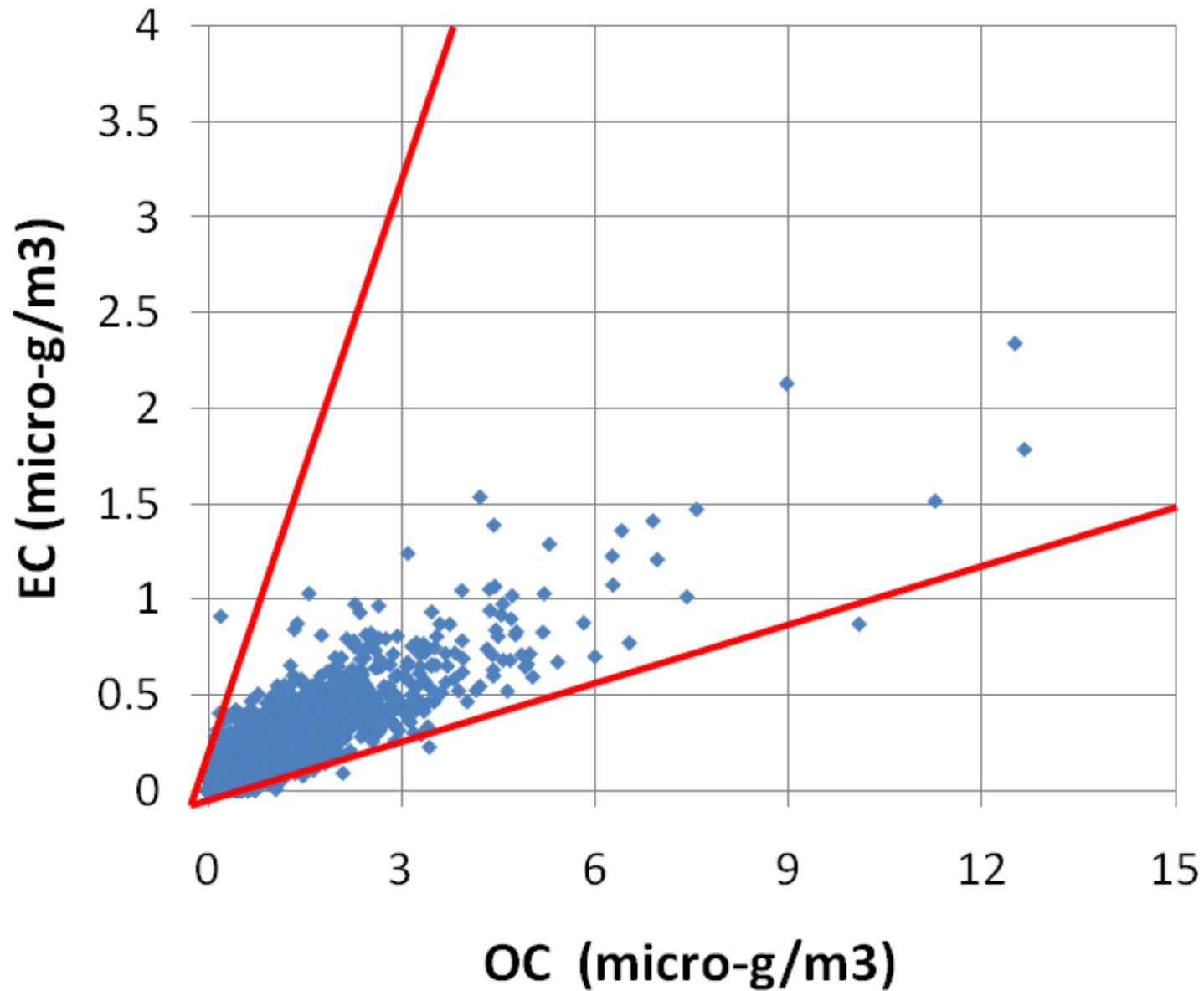
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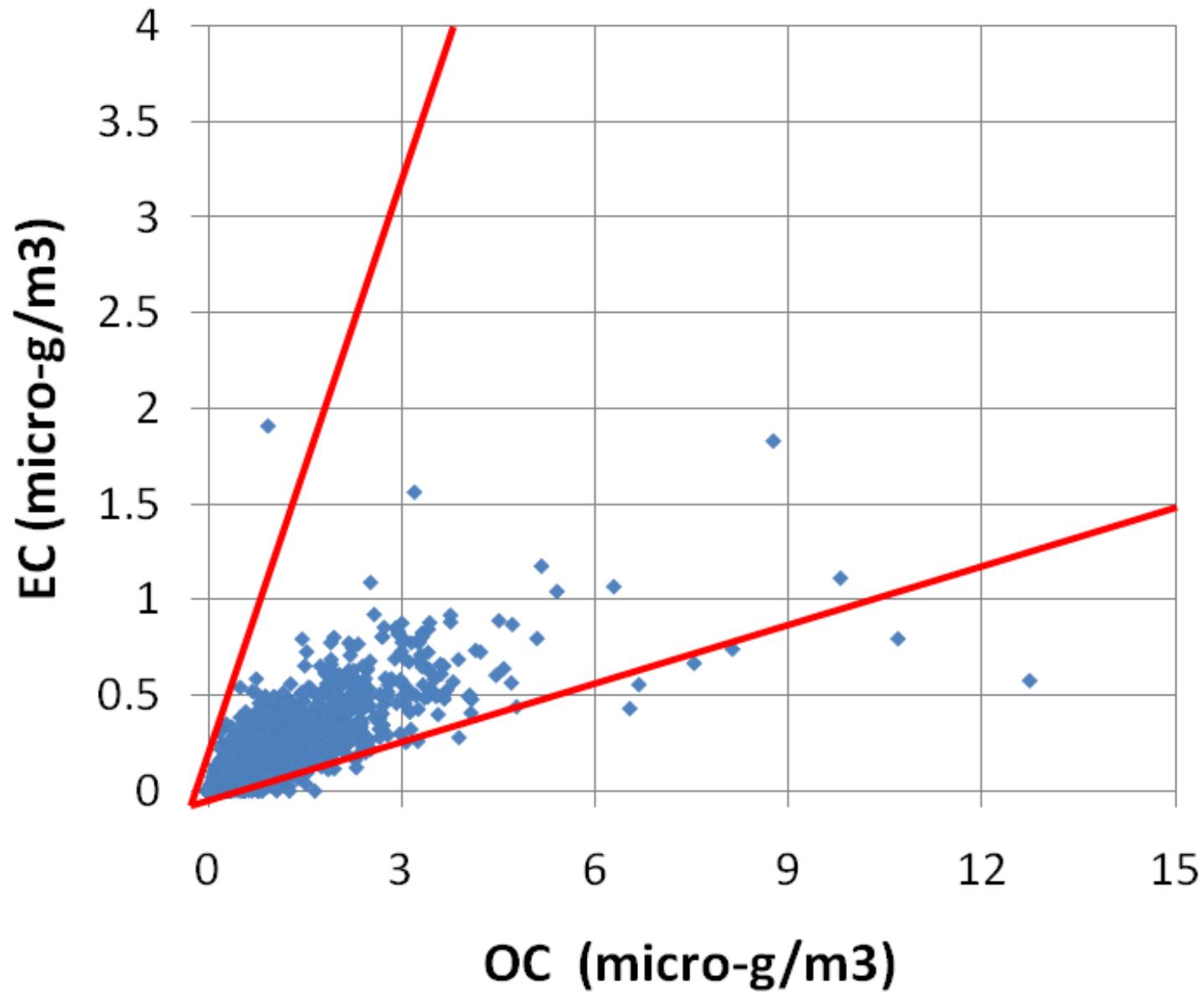
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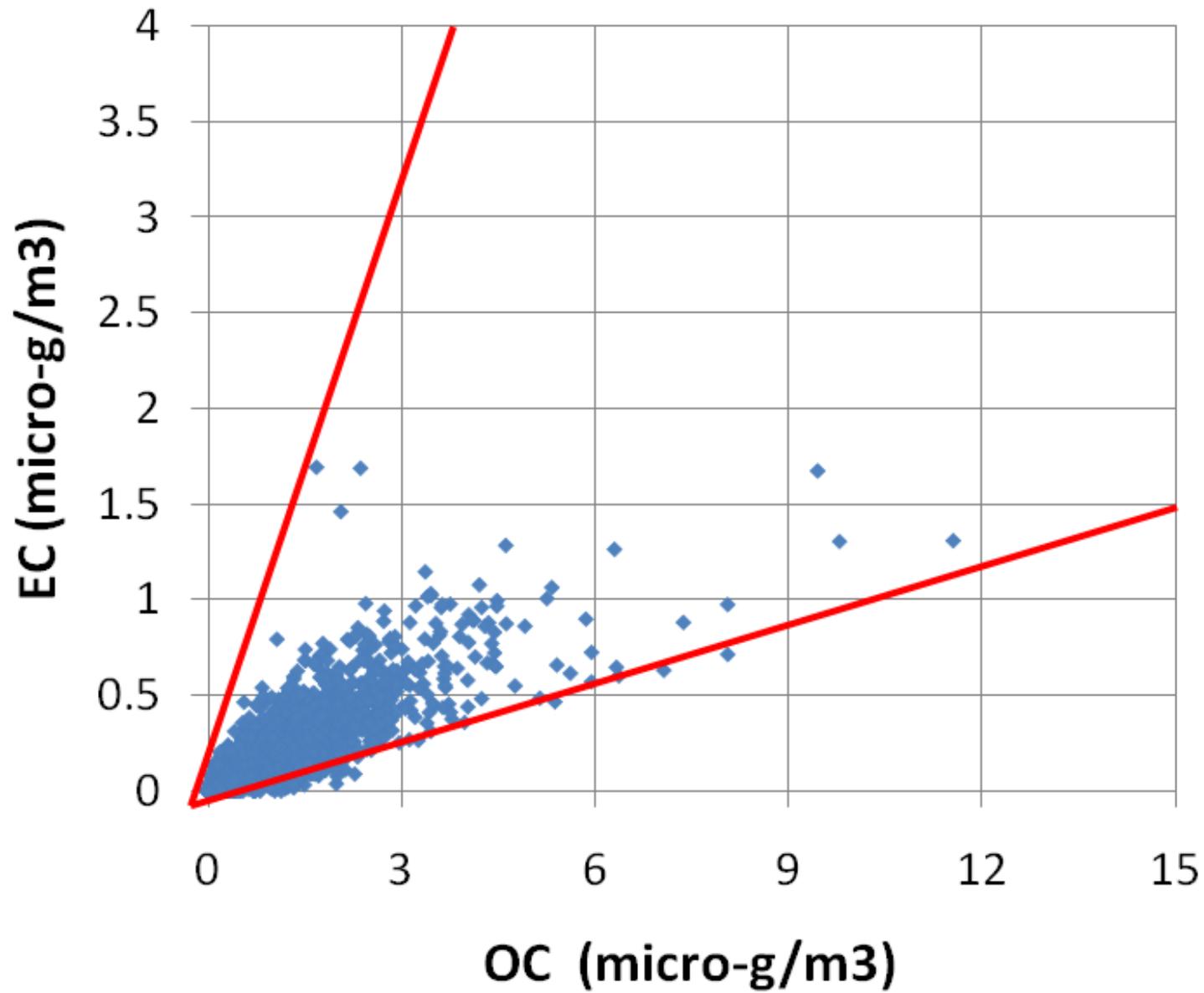
1996



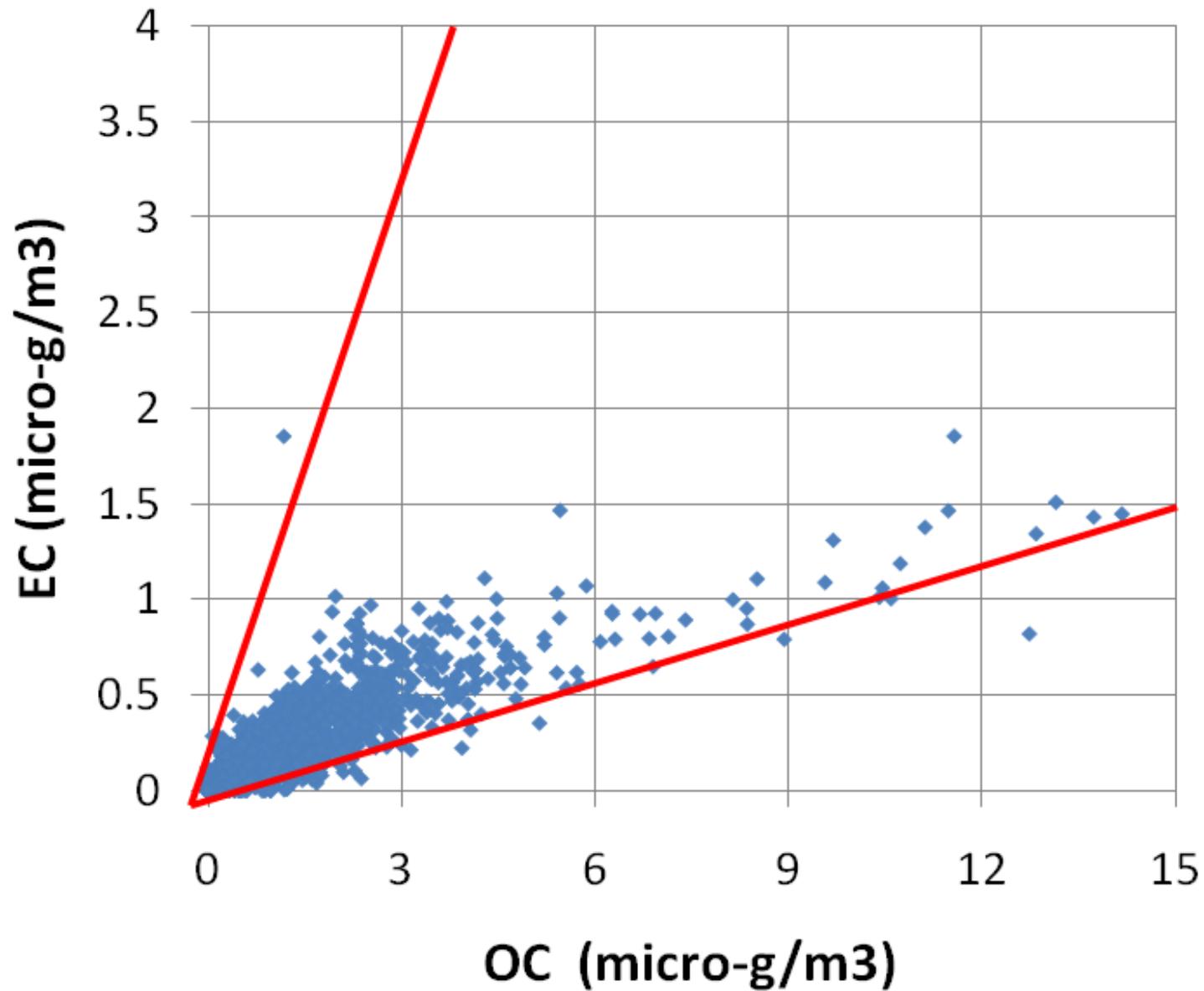
1997



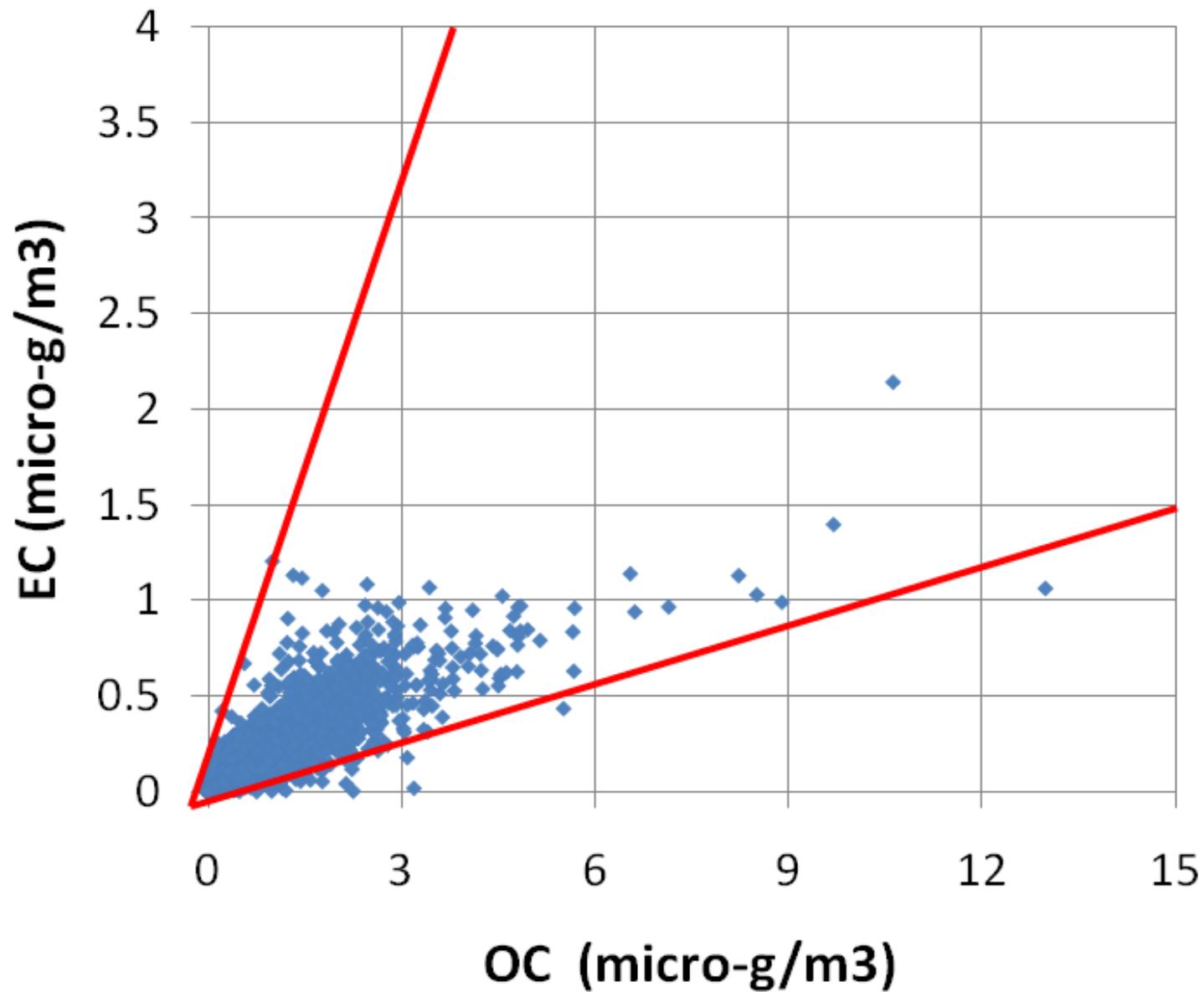
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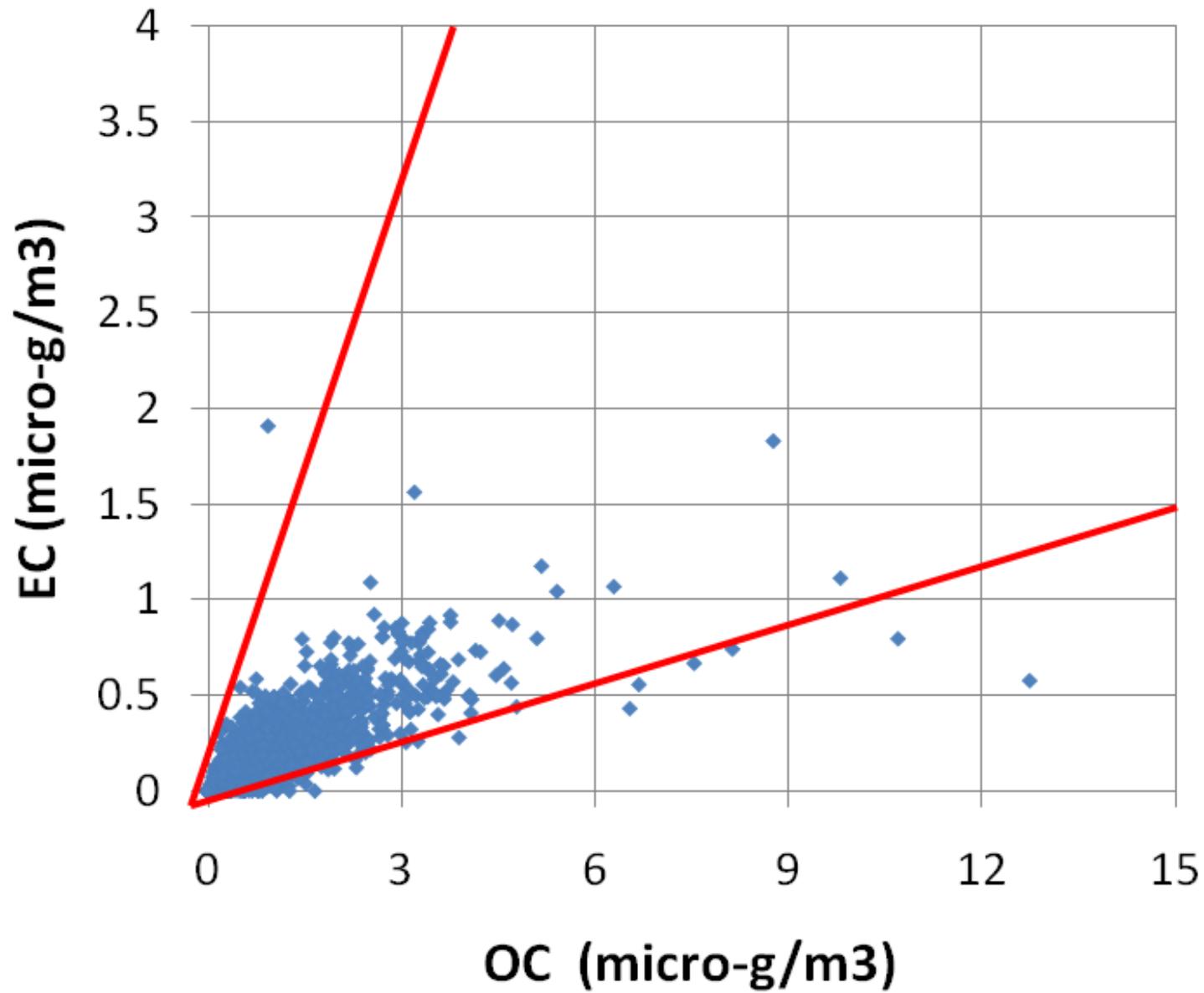
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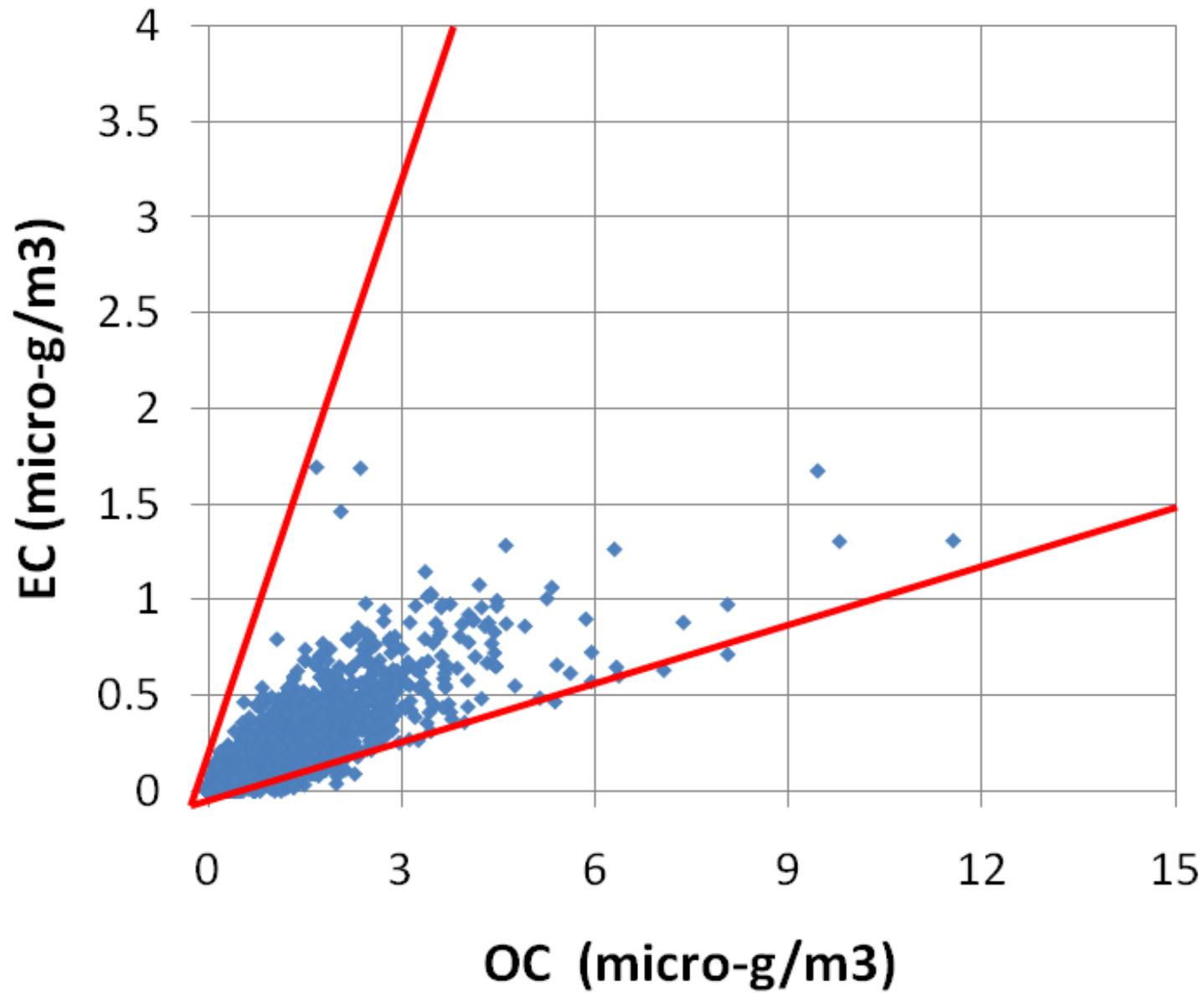
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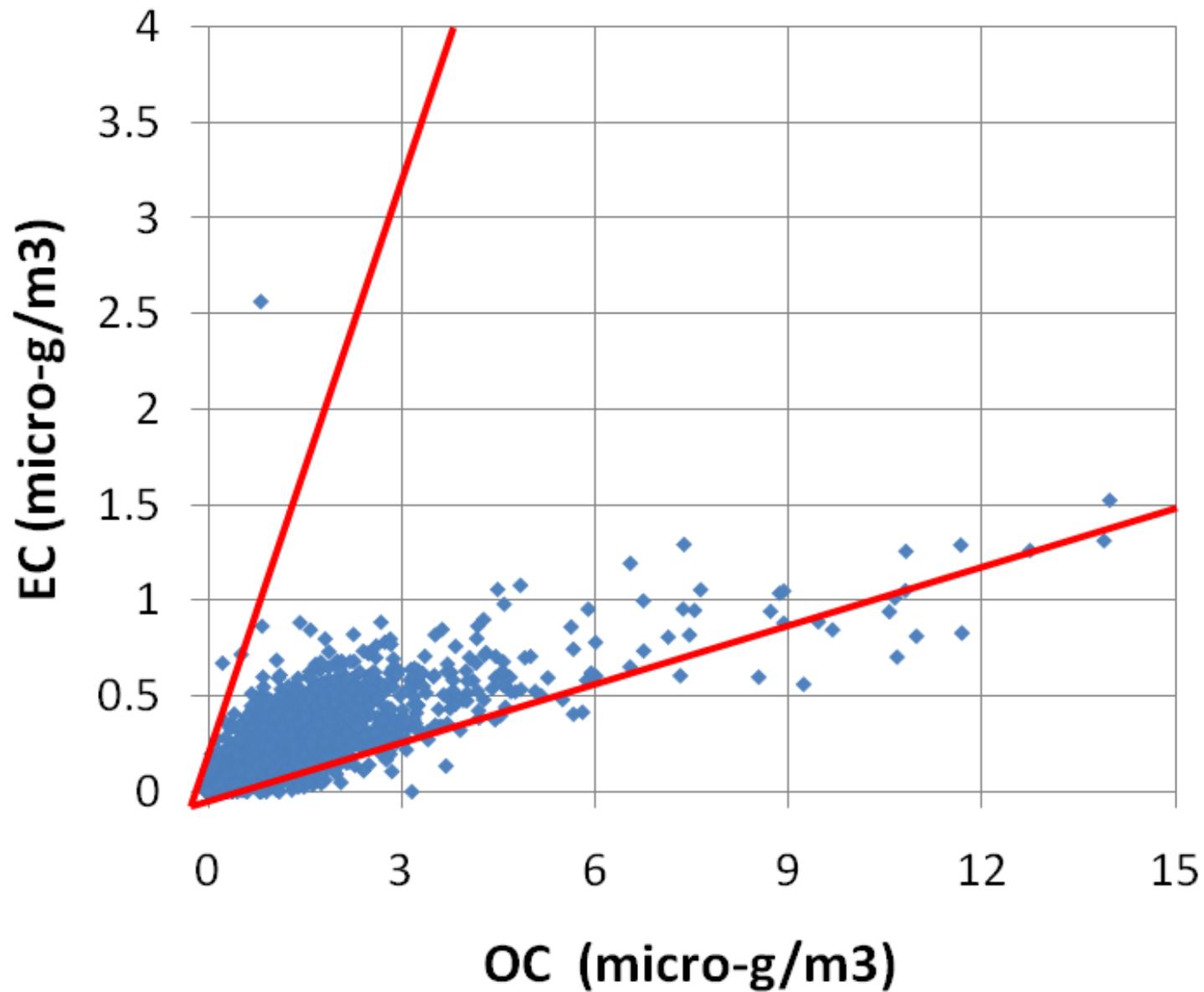
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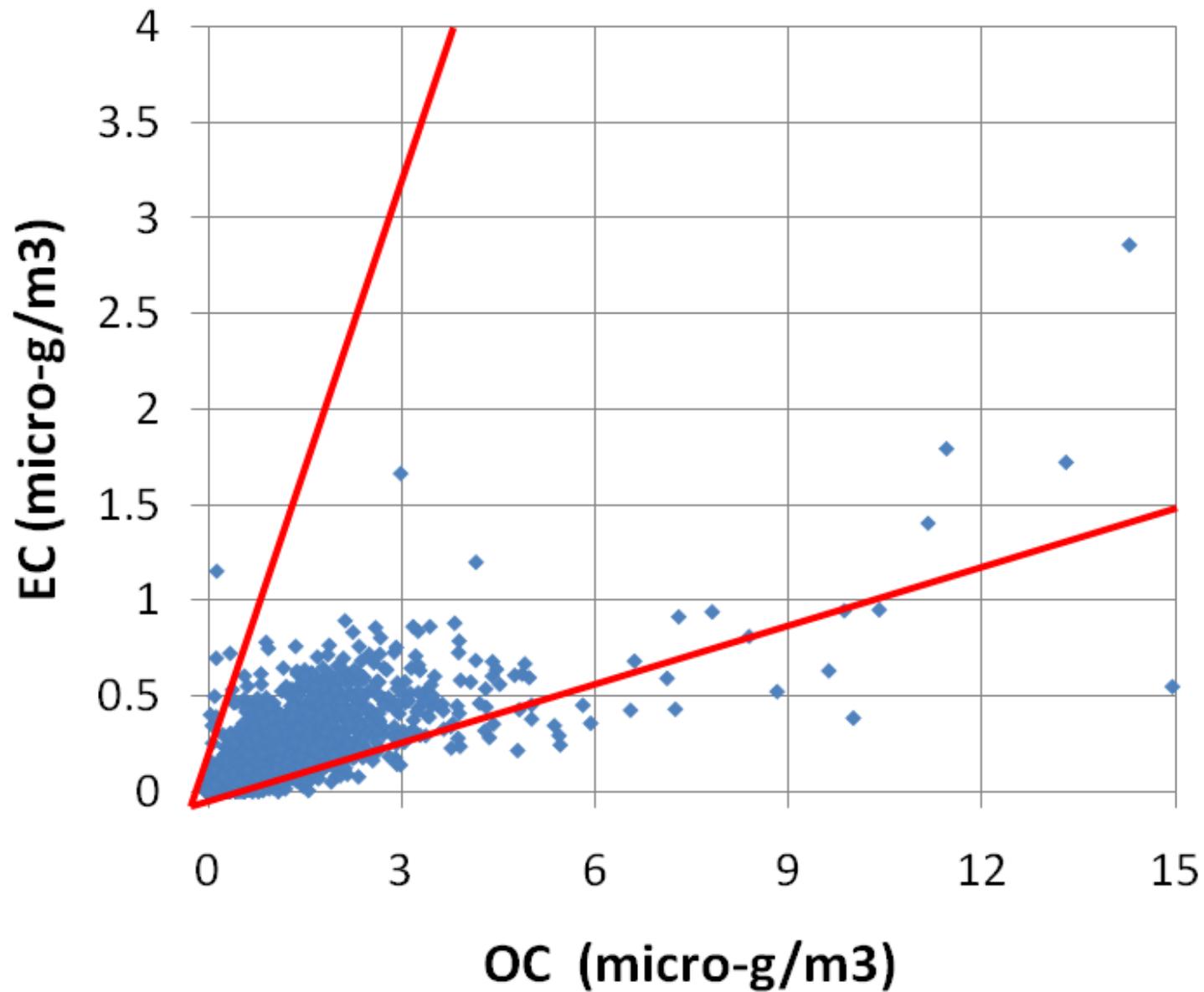
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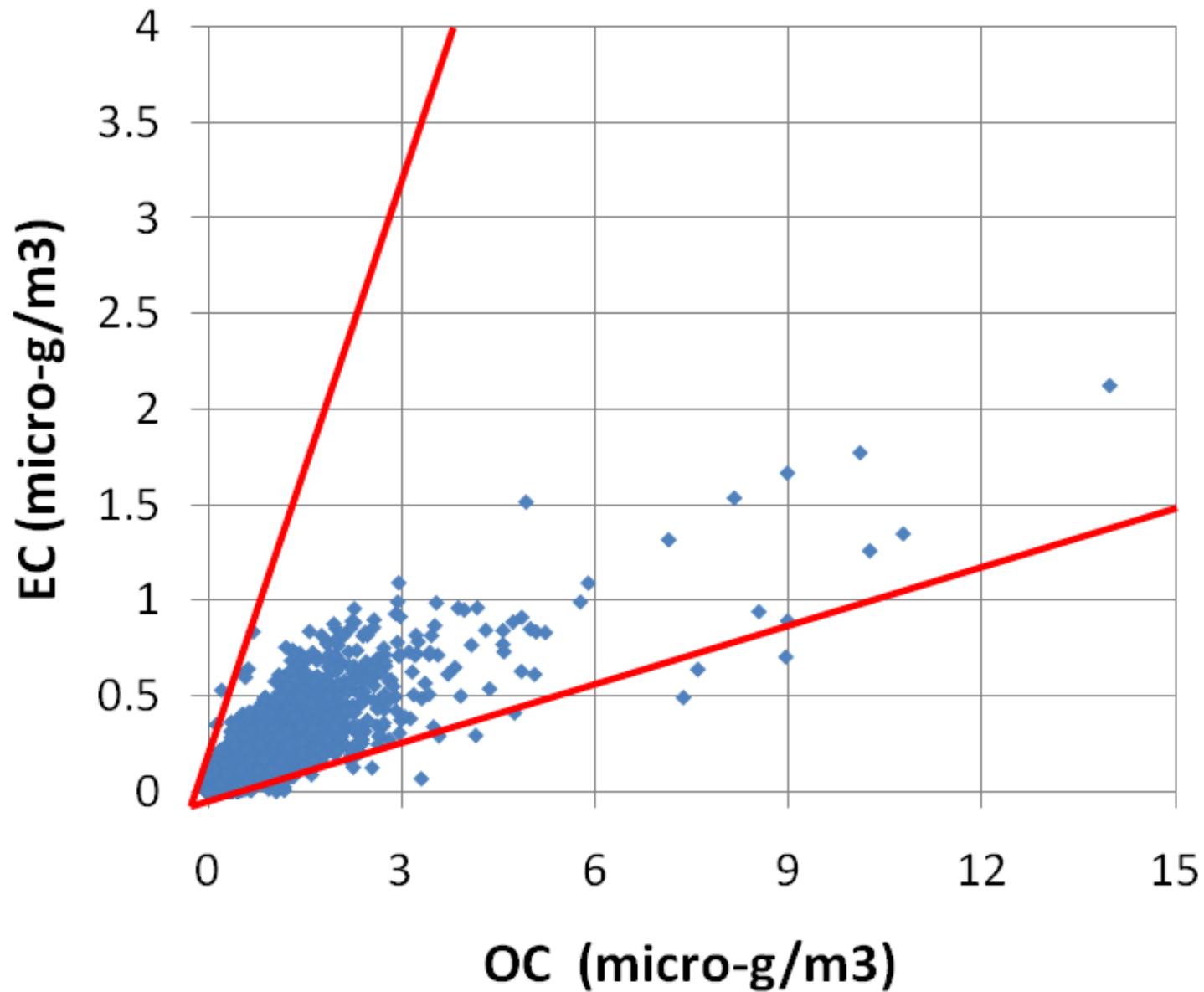
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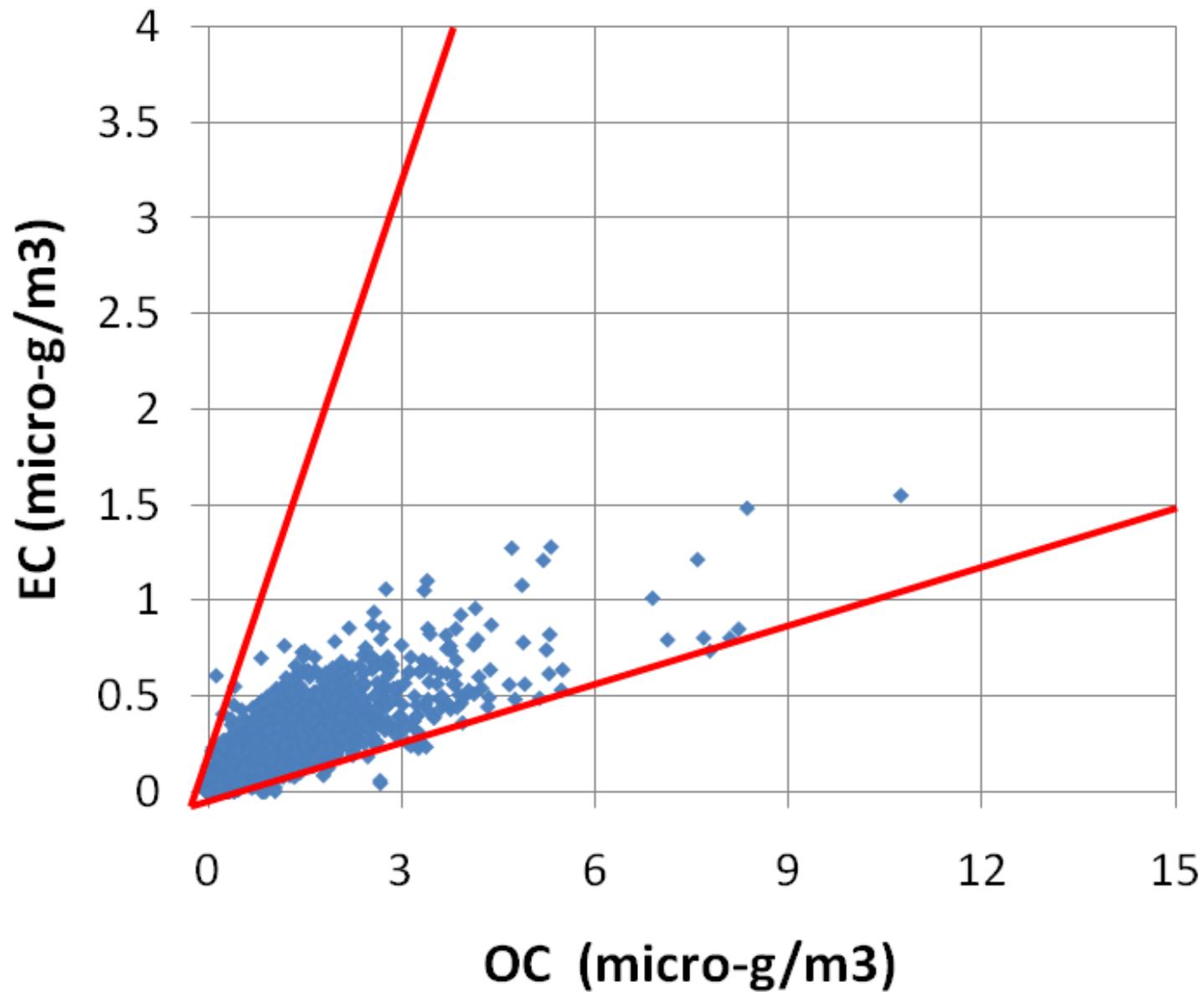
2004



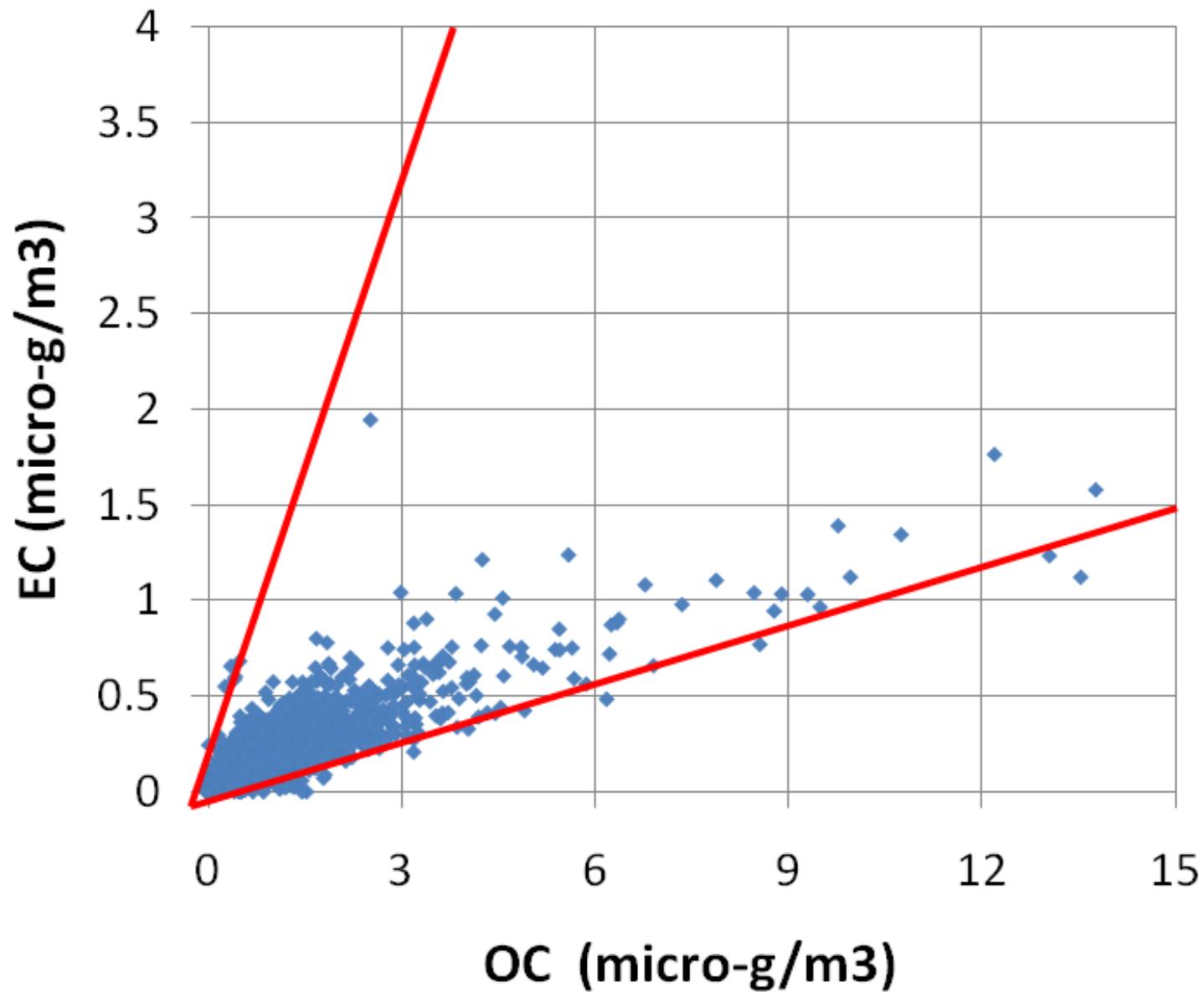
2005



2006



2007



2008

