Posting type	Advisory
Subject	Carbon analyzer signal integration threshold modified
Module/Filter	URG 3000 / Quartz 25mm
AQS Parameter Codes	88312, 88320, 88321, 88324, 88325, 88326, 88327, 88328, 88329, 88330, 88331, 88355, 88357, 88370, 88374, 88375, 88376, 88377, 88378, 88379, 88380, 88381, 88382, 88383, 88384, 88385, 88388
Sites	Entire CSN network
Period	January 1, 2016 through September 12, 2017 sample dates
Recommendation	Information only
Submitter	N. Hyslop, nmhyslop@ucdavis.edu

Starting with January 2016 sample dates, Desert Research Institute (DRI) switched from Model 2001 to Model 2015 carbon analyzers for the quartz filter samples. The new Model 2015 analyzers measure carbon with a Nondispersive Infrared [NDIR] carbon dioxide (CO_2) detector, where the old Model 2001 analyzers had used Flame Ionization Detection (FID) of methane (CH_4). After examination of several months' worth of data, DRI determined that the Model 2015 carbon signal integration threshold differed from that of the Model 2001. This difference mostly affected low elemental carbon (EC) concentrations. Further data analysis and testing by DRI determined that a revised Model 2015 threshold for fractions organic carbon 1 (OC1) through EC2), with an unchanged threshold for EC3, was more equivalent to the carbon detection sensitivity used in the Model 2001 analyzers. The reprocessed 2016 average EC concentration increased by 0.03 μg/m^3, which is similar to the lower quantifiable limit based on the field blanks (0.024 μg/m^3). The threshold change has a minor effect on average carbon levels. Figure 1 shows the original versus reprocessed loadings for EC and OC; the differences are not visible on a linear scale. Figure 2 shows the same data on a log scale, illustrating there are differences at the lowest concentrations, particularly below 10 μg/filter (which corresponds to 0.3 μg/m^3 assuming a nominal sample volume of 32 m^3). Figure 3 provides another way of looking at the differences; the concentration data were binned into 20 groups (5th percentiles), the bottom plot shows the average concentration for each bin, and the top plot shows the average relative difference between the original and reprocessed carbon loadings for each bin.

After reviewing the differences in the carbon concentrations with the old and new thresholds and the minor impact on the data, the decision was made to not reprocess or redeliver the data to AQS. The differences are too small to warrant the effort and disruption that would ensue if the values were changed. The new integration threshold was implemented beginning with samples collected on September 13, 2017. This advisory serves to inform data users of the change in the integration threshold and slight bias in January 1 – September 12, 2017 measured values toward under-reporting at low carbon concentrations.

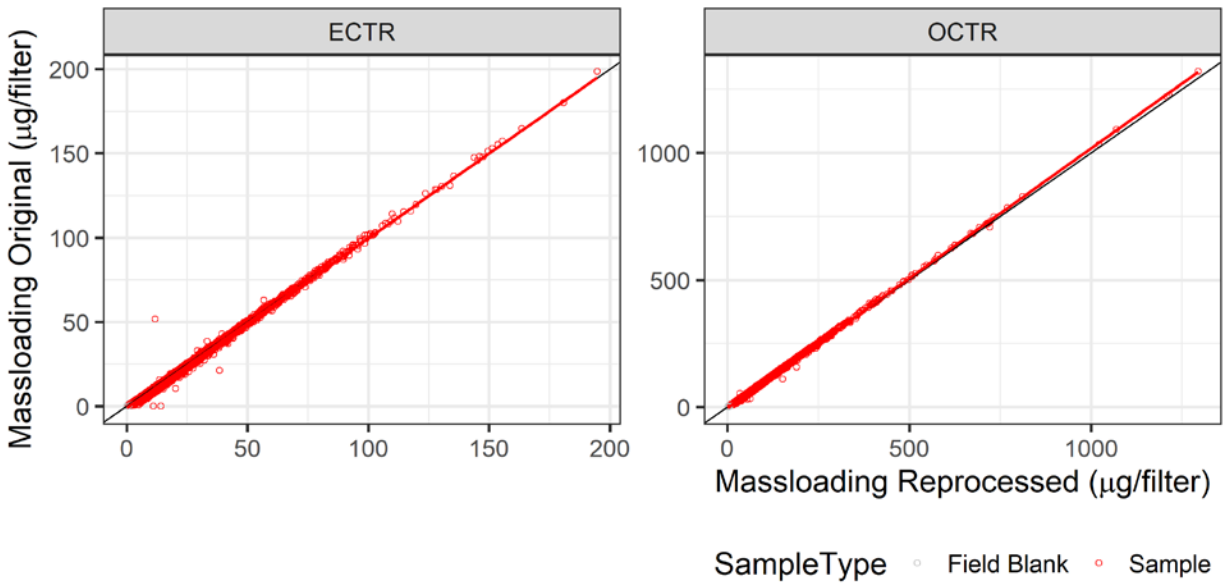

Figure 1. Plots comparing the Original (y-axis) and Reprocessed (x-axis) carbon filter loadings for elemental carbon (ECTR) and organic carbon (OCTR) on linear scales.

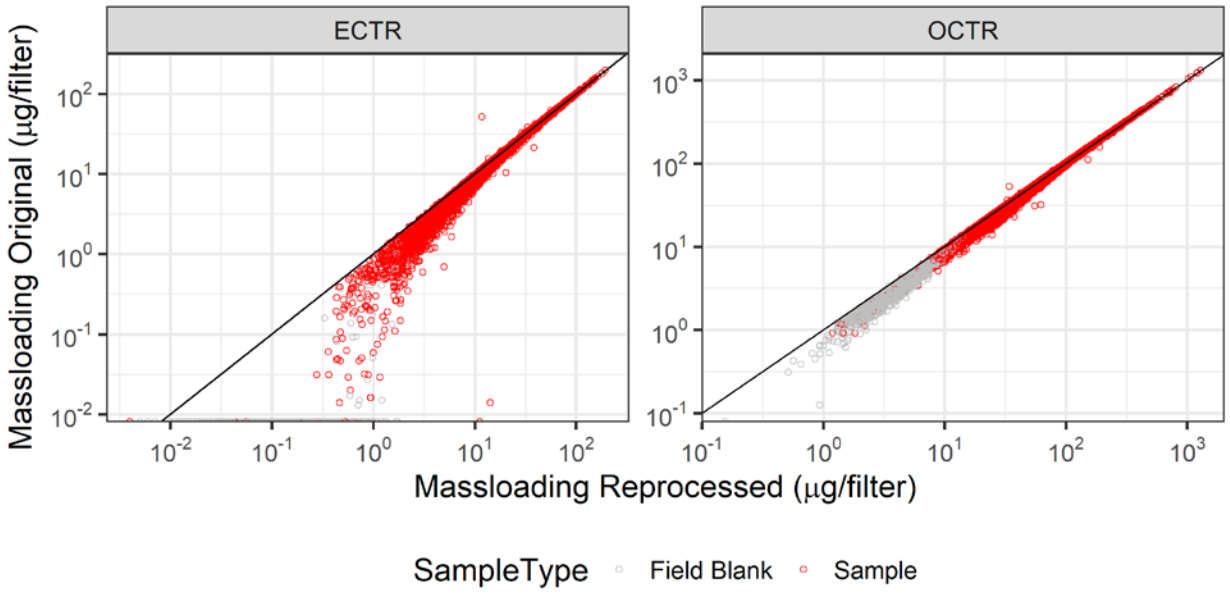

Figure 2. Plots comparing the Original (y-axis) and Reprocessed (x-axis) carbon filter loadings for elemental carbon (ECTR) and organic carbon (OCTR) on log scales.

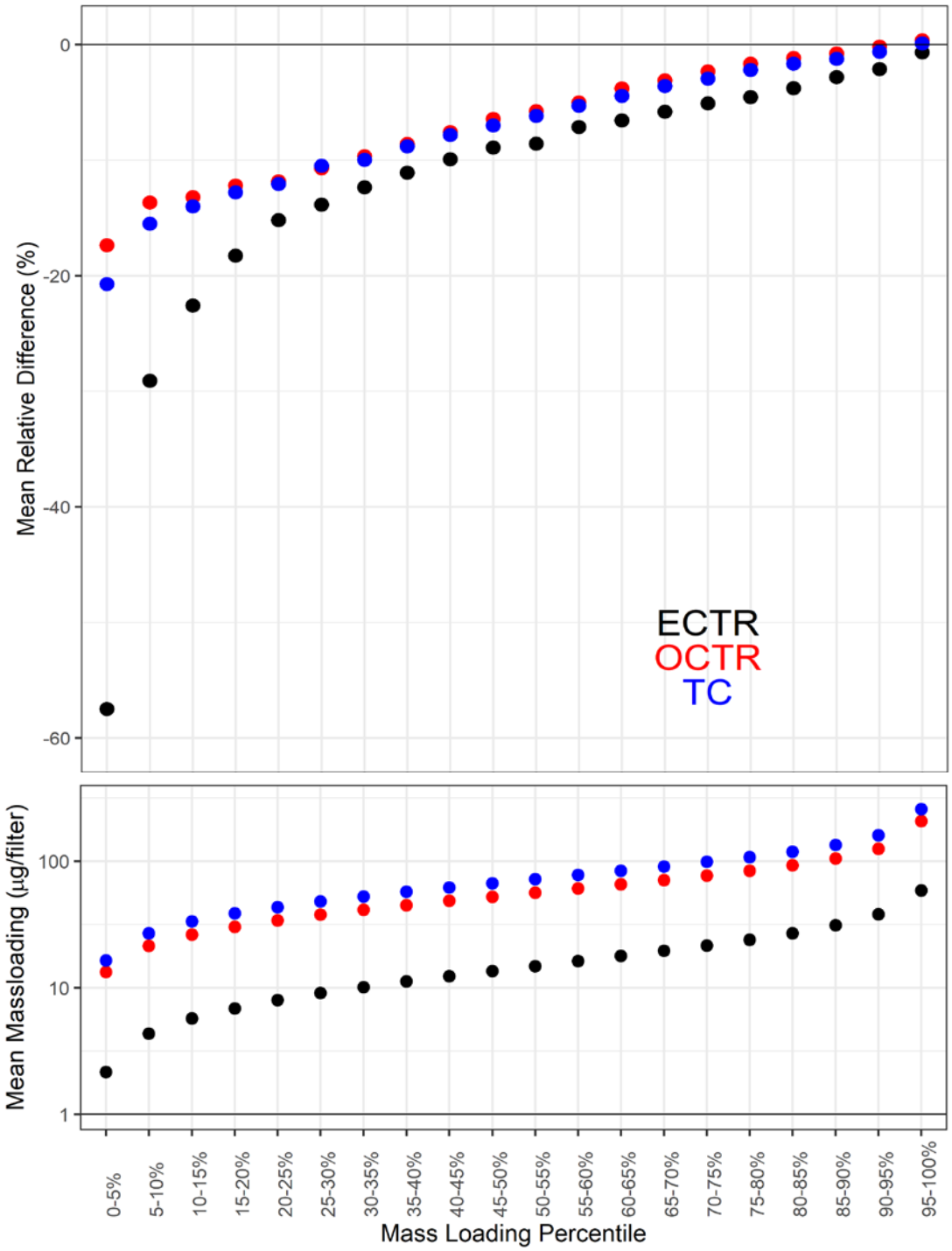

Figure 3. Mean mass loading (bottom, log scale) and mean relative difference (top, linear scale) for each 5th percentile loading bin. Relative difference is the originally reported loading (µg/filter) minus the reprocessed loading with the updated integration threshold divided by the reprocessed loading, $\frac{C_{original}-C_{reprocessed}}{C_{reprocessed}} \times 100\%$.