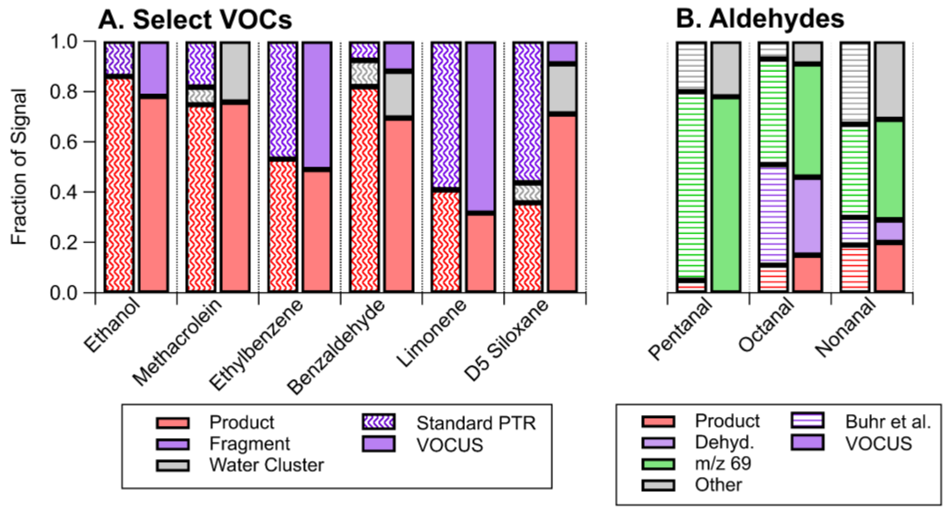

Figure S1. Comparison of ion product distributions for (a) select VOCs measured using a traditional drift tube described by Yuan et al. (2016) vs. the Vocus used in this work and (b) aldehydes reported by Buhr et al. (2002) and compiled in Pagonis et al. (2019) vs. the Vocus used in this work. Note that "product" refers to the proton-transfer product, "Dehyd." refers to the product generated by aldehyde dehydration, "fragment" refers to species-specific fragmentation processes, and "other" refers to the sum of multiple fragments. We exclude fragments below m/z 33 for these intercomparisons due to the BSQ mass discrimination employed in the Vocus (Krechmer et al., 2018).

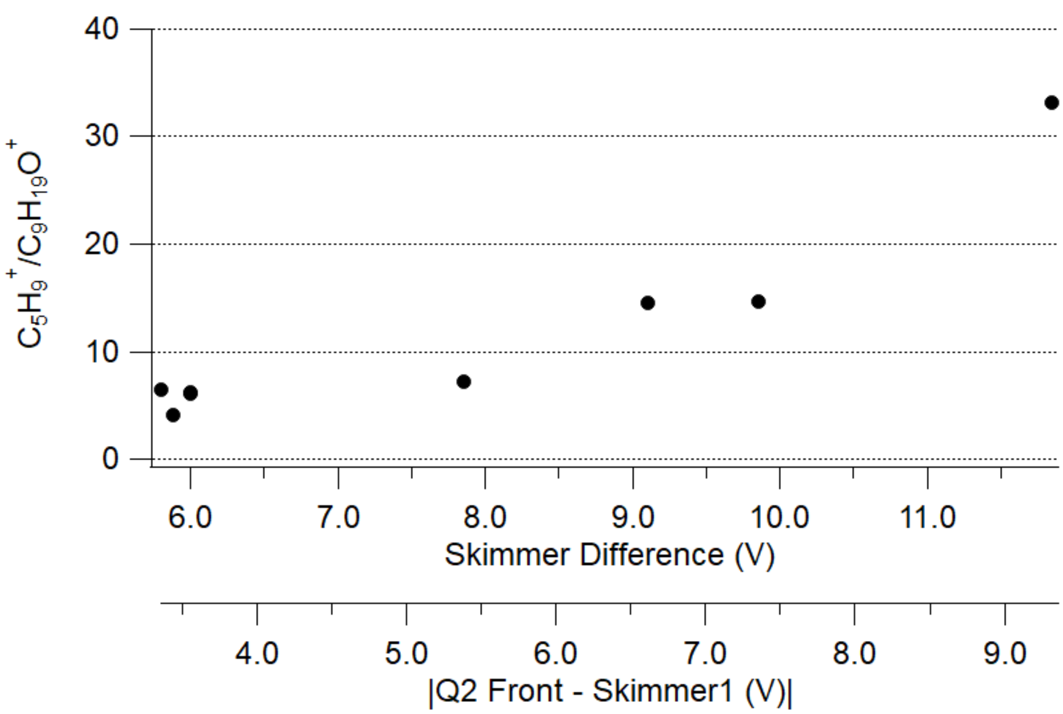

Figure S2. Nonanal fragmentation ratio of m/z 69 ($C_5H_9^+$) to m/z 143 ($C_9H_{19}O^+$) for a range of voltage gradients between the first skimmer (Skimmer 1), front voltage of the big segmented quadrupole (Q2 Front), and second skimmer (Skimmer 2) in the Berkeley Vocus PTR-ToF-MS. The "Skimmer Difference" is the difference between Skimmer 2 and Skimmer 1.

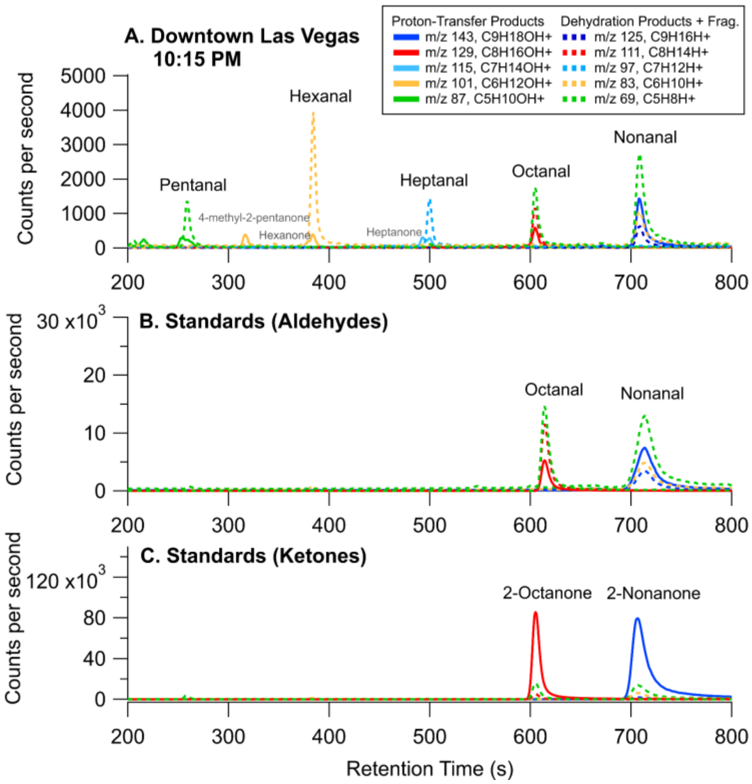

Figure S3. (a) Chromatographic distribution of C_5 - C_9 aldehydes measured in downtown Las Vegas (A). Standard additions of C_8-C_9 aldehydes (b) and ketones (c) are shown to demonstrate that fragmentation patterns for observed peaks match those of octanal and nonanal.

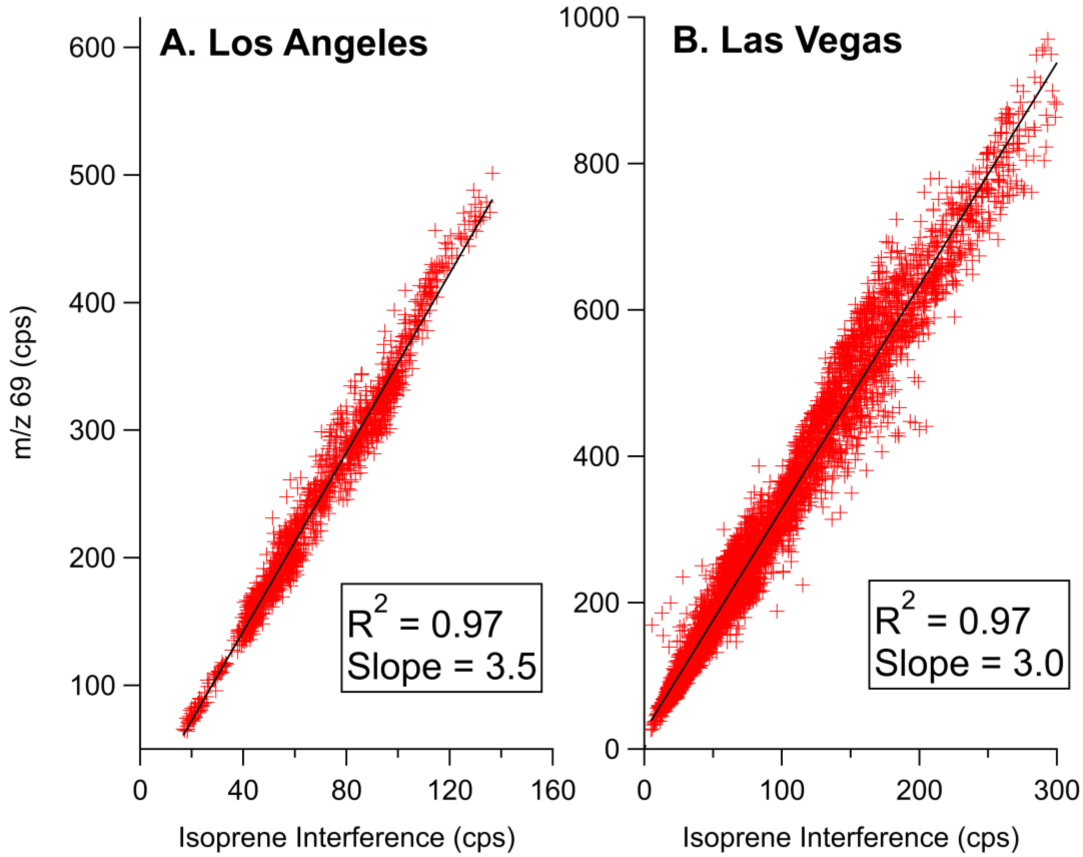

Figure S4. Slope of m/z 69 vs the sum of aldehydes (m/z 111 + m/z 125) from nighttime data (00:00-4:00 Local Time) in (a) Los Angeles and (b) Las Vegas during SUNVEx

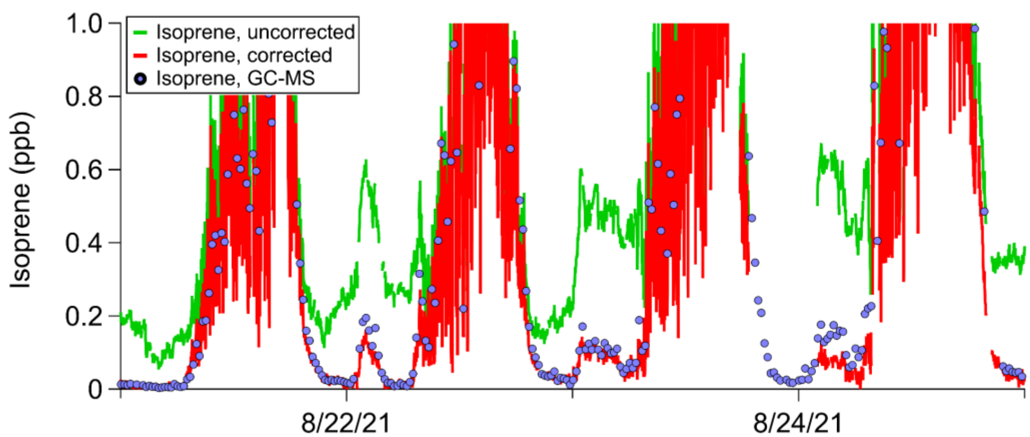

Figure S5. Time series of corrected and uncorrected isoprene signals on Los Angeles data with GC-MS isoprene data for comparison. The *y*-axis isoprene mixing ratio scale is enlarged to highlight nighttime data.

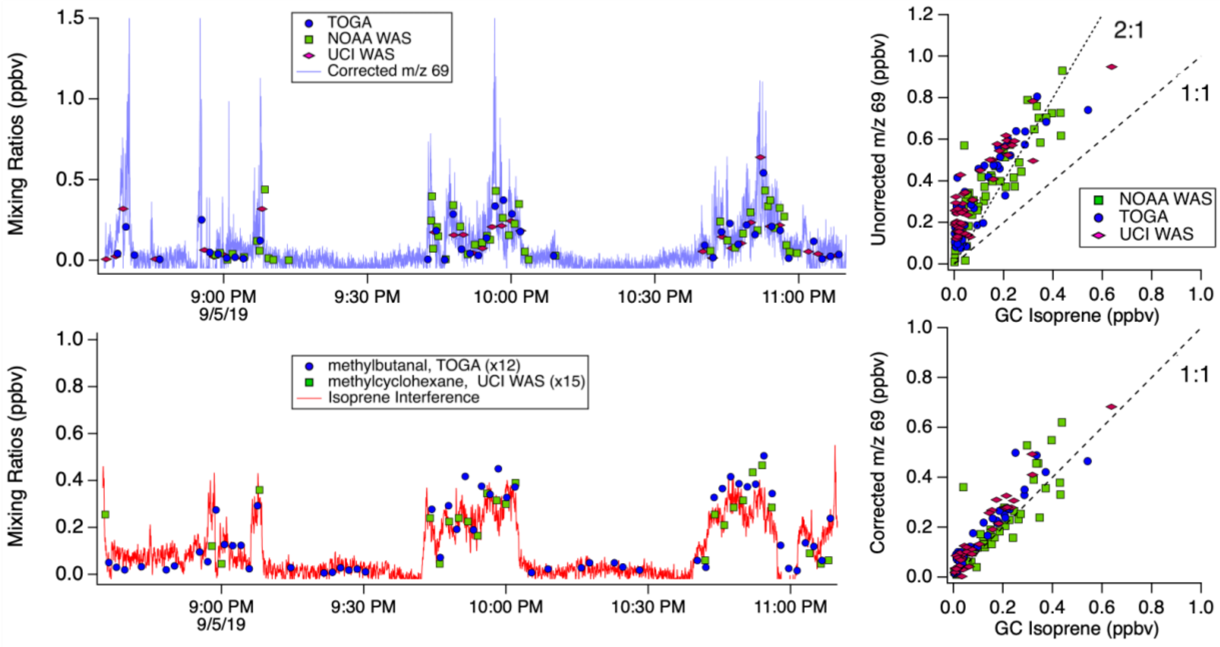

Figure S6. Impact of isoprene interference correction on m/z 69 measurements from the Oslo PTR-ToF-MS during FIREX-AQ. The time series at the top shows the corrected signal at m/z 69 and comparison to GC-MS measurements of isoprene. The bottom time series shows the estimated contribution of the isoprene interference to m/z 69 and a comparison to the GC-MS measurements of methylpropanal and methylcyclohexane, which are proxies for the key interfering species. The scatter plots show the comparison of the uncorrected (top) and corrected (bottom) signal at m/z 69 to GC-MS measurements of isoprene.

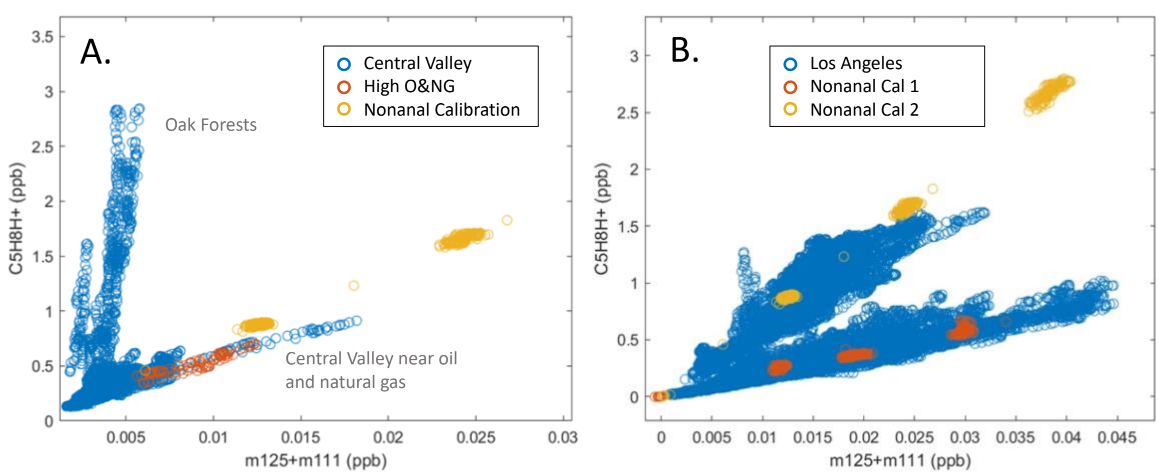

Figure S7. Observations of m/z 69 ($C_5H_8H^+$) and the sum of m/z 125 + m/z 111 in (a) the Central Valley and (b) Los Angeles Basin during RECAP-CA flights. Samples collected over dense oil fields in the Central Valley are highlighted in panel (a). For each dataset, the ratio of m/z 69 to m/z 125 + m/z 111 for nonanal are shown. Nonanal was calibrated regularly during the campaign, and changes to the slope in panel (b) result from different instrument operating conditions.

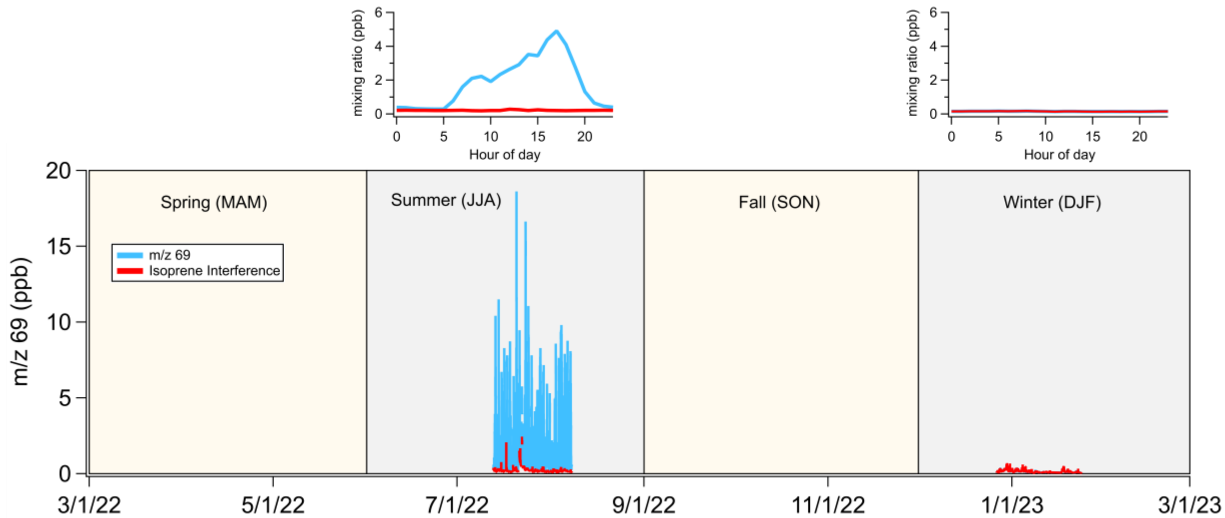

Figure S8. (bottom) Time series of m/z 69 and isoprene interference measured by the Stony Brook PTR-ToF-MS at the forested suburban Flax Pond ground site in Long Island. (top) Diel patterns of m/z 69 and isoprene interference mixing ratios for each season.

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