Table S3. NMHC composition of primary emissions sources impacting the NFR.

|  |  |  |  |  |
| --- | --- | --- | --- | --- |
| *Compound* | *Raw Natural Gas* *Greater Wattenberg (%) a* | *Non-tailpipe Emissions**(weight % in fuel) b* | *Tailpipe Emissions**(weight % of carbon) c* | *Extratropical Biomass Burning (g kg-1) d* |
| Ethane | 12.2 ± 2.51 | 0.099 ± 0.011 |  | 0.27 ± 0.09 |
| Propane | 5.81 ± 2.71 | 0.690 ± 0.059 | 0.351 ± .045 | 0.25 ± 0.11 |
| i-Butane | 0.85 ± 0.5 | 1.072 ± 0.111 | 0.207 ± 0.216 | 0.022 ± 0.009 |
| n-Butane | 1.61 ± 0.98 | 6.542 ± 0.499 | 2.20 ± 5.51 | 0.069 ± 0.038 |
| i-Pentane | 0.40 ± 0.29 | 38.367 ± 3.173 | 9.35 ± 2.35 | 0.026 ± 0.029 |
| n-Pentane | 0.38 ± 0.33 | 10.313 ± 0.801 | 2.40 ± 0.763 | 0.05 ± 0.06 |
| Benzene | \* *sum of all compounds C6 and greater account for* 0.35 ± 0.32 | 0.506 ± 0.042 | 3.54 ± 1.56 | 0.49 ± 0.08 |
| Toluene | 1.521 ± 0.121 | 6.11 ± 2.44 | 0.40 ± 0.10 |
| Ethylbenzene | 0.097 ± 0.008 | 1.45 ± 0.54 | 0.048 |
| Xylenes | 0.466 ± 0.026 | 7.47 ± 2.76 | 0.20 |
| Acetylene |  |  |  | 0.27 ± 0.09 |
| Ethene | 0 |  | 9.60 ± 0.618 | 1.12 ± 0.55 |
| Propene |  | 0.029 ± 0.004 | 6.29 ± 2.35 | 0.59 ± 0.16 |
| Trans-2-butene |  |  | 0.573 ± 0.149 | 0.01 ± 0.05 |

*a* Colorado Oil and Gas Conservation Commission (COGCC): Greater Wattenberg Area Baseline Study, https://cogcc.state.co.us/Library/DenverBasin/Greater\_Wattenberg\_Baseline\_Study\_

Report\_062007.pdff.pdf, 2007.

*b*California statewide average for 2010 from Gentner, D. R., Isaacman, G., Worton, D. R., Chan, A. W. H., Dallmann, T. R., Davis, L. C., Liu, S., Day, D. A., Russell, L.M., Wilson, K. R., Weber, R., Guha, A., Harley, R. A., and Goldstein, A. H.: Elucidating secondary organic aerosol from diesel and gasoline vehicles through detailed characterization of organic carbon emissions, Proc. Nat. Acad. Sci., 109, 18318 – 18323, 2012.

*c* Gentner, D. R., Worton, D. R., Isaacman, G., Davis, L. C., Dallmann, T. R., Wood, E. C., Herndon, S. C., Goldstein, A. H., Harley, R. A.: Chemical composition of gas-phase organic carbon emissions from motor vehicles and implications for ozone production, Environ. Sci. Technol., 47, 11837 – 11848, 2013

*d*Extratropical forest fire emission reported in g per kg of dry matter burned from Andreae, M.O. and Merlet P.: Emission of trace gases and aerosols from biomass burning, Global Biogeochemical Cycles, 15, 955-966, 2001.