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# OH and $HO_2$ radical chemistry in a midlatitude forest: measurements and model comparisons

**Michelle M. Lew et al.**

*Correspondence to:* Philip S. Stevens (pstevens@indiana.edu)

**Table S1:** Characterization of measured compounds by various institutions (IU: Indiana University, UMass: University of Massachusetts, LD: IMT Lille Douai) into RACM2 groups.

| RACM2 | VOCs | Source | RACM2 | VOCs | Source |
|---|---|---|---|---|---|
| **NO** | NO | UMass | **HCHO** | Formaldehyde | LD |
| **NO2** | $NO_2$ | UMass | **ACD** | Acetaldehyde | LD |
| **H2O** | Water vapor | IU | **ACT** | Acetone | LD |
| **HONO** | Nitrous Acid | IU | **EOH** | Ethanol | LD |
| | | | **ACE** | Acetylene | LD |
| **CH4** | Methane | est | **ISO** | Isoprene | LD |
| **ETH** | Ethane | LD | **MACR** | Methacrolein | est* |
| **HC3** | Propane, isobutene, butane, neopentane, 2,2-dimethylbutane, 2,2-diemthylpentane | LD | **MEK** | Methyl ethyl ketone | LD |
| **HC5** | Isopentane, pentane, propyne, 2-methylpentane, 3-methylpentane, hexane, 2,4-dimethylpentane, 2,2,3-trimethylbutane, 3,3-dimethylpentane, 2,3-diemthylpentane, isooctane | LD | **MVK** | Methyl vinyl ketone | LD |
| **HC8** | Butyne, cyclopentane + 2,3-diemthylbutane, cyclohexane, 2-methylhexane, heptane, octane, nonane, undecane, dodecane, nC13, nC14 | LD | **API** | α-pinene, β-pinene, 3-carene | LD |
| **ETE** | Ethene | LD | **ROH** | Borneol | LD |
| **OLT** | Propene, 1-butene, isobutene, 3-methyl-1-butene, 1- pentene, 2- methyl-1-butene, hexene | LD | **BENZENE** | Benzene | LD |
| **OLI** | trans-2-butene, cis-2-butene, trans-2-pentene, 2-methyl-2- butene, 1-pentene, cis-2- pentene, cyclopentane | LD | **TOL** | Toluene, chlorobenzene, ethylbenzene, styrene, isopropylbenzene, n-propylbenzene, 2-ethyltoluene, n-butylbenzene | LD |
| **DIEN** | 1,3-butadiene, 3-methyl-1,4-pentadiene | LD | **MXYL/ PXYL** | m+p xylene, 3-ethyltoluene, 4-ethyltoluene, 1,3,5-trimethylbenzene + camphene, 1,2,4-trimethylbenzene + nC10, 1,2,3-trimethylbenzene + α-terpinene | LD |
| **KET** | Nopinone | LD | **OXYL** | o-xylene | LD |
| | | | **ORA1** | Formic Acid | LD |

*Mixing ratios of CO were estimated based on published emission ratios of CO with benzene (Warneke et al., 2007). Mixing ratios of methacrolein were estimated based on measured MVK/MACR ratios (Apel et al., 2002)

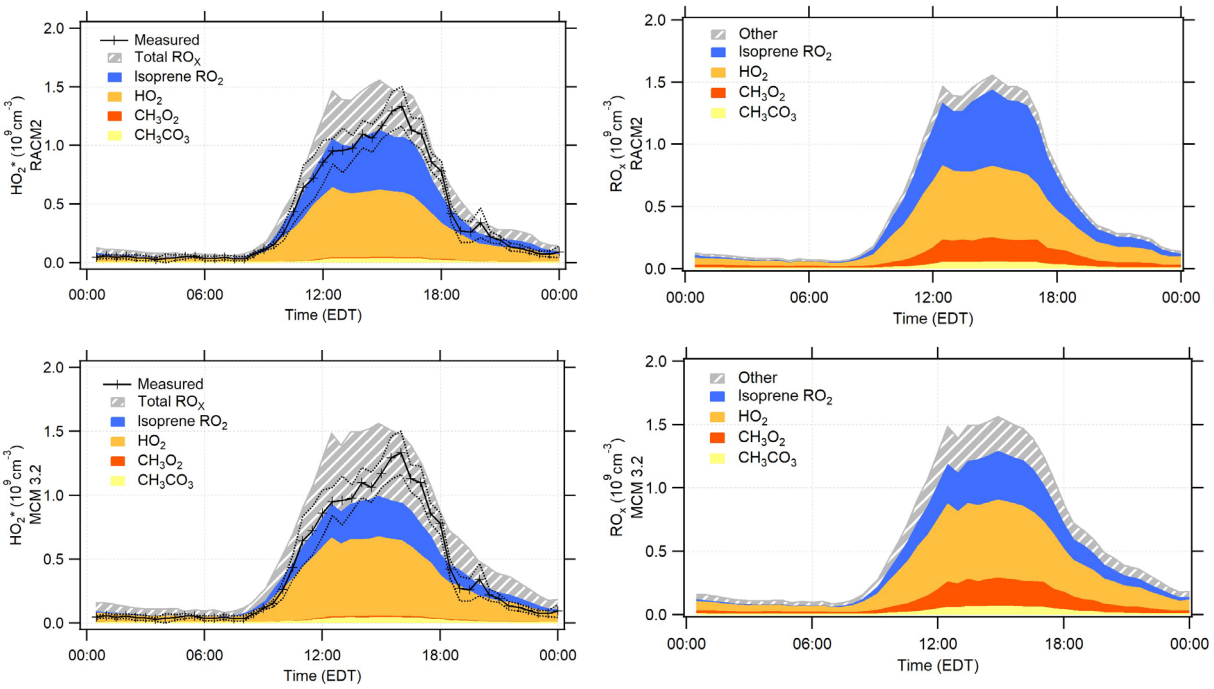


**Figure S1.** The RACM2 and MCM 3.2 diurnal average modeled peroxy radical concentration and composition for the days when NO was measured simultaneously (see text). Left panels show the modeled contribution to the $HO_2$* concentrations. Measured 30-min mean $HO_2$* is shown by the black line with ± 1σ standard error shown by the dotted lines. The calibration uncertainty of the measurements (not shown) is 38% (2σ). Right panels show the total $RO_x$ ($RO_2$ +$HO_2$) composition predicted by each model.

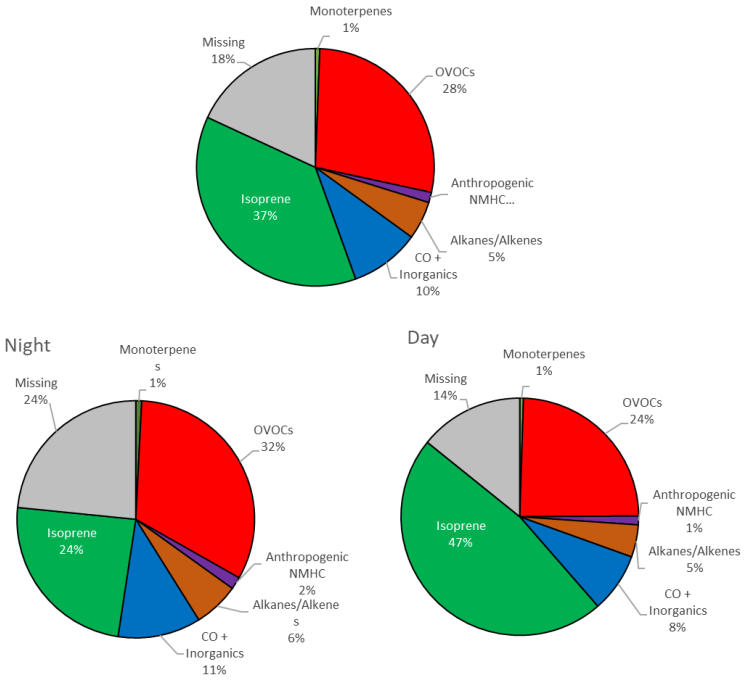


**Figure S2.** The diurnal average components of the mean calculated OH reactivity over the course of the campaign (top), as well as that during daytime (08:00-20:00 hours) and nighttime (20:00-08:00 hours).

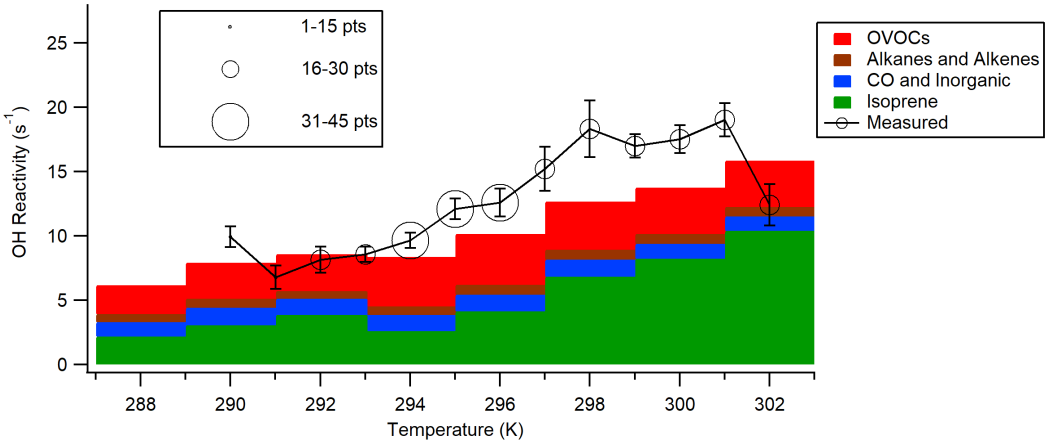


**Figure S3.** Median measured and calculated OH reactivity separated by the measured components over the observed temperature range. Size of the measured symbol indicates the number of measurements in each temperature bin. Error bars represent ±1σ standard error.

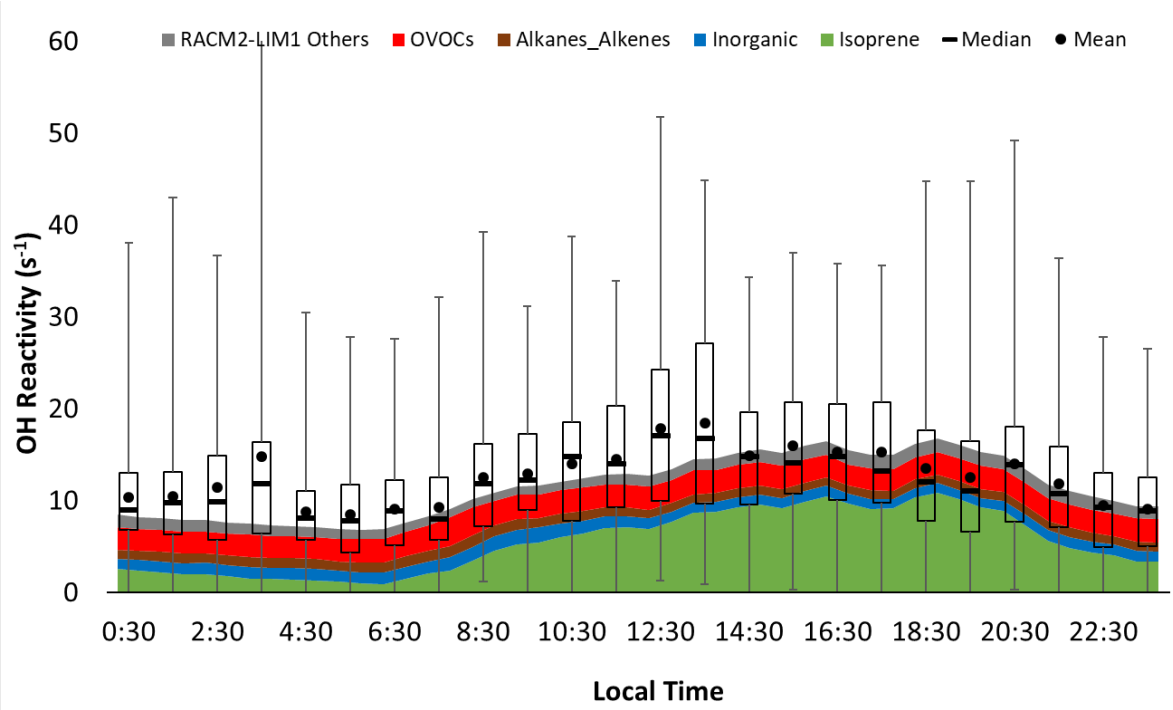


**Figure S4**. Diurnal box and whiskers plot of observed total OH reactivity showing the mean and median values for each hour with the mean calculated values from the measured OH sinks as well as the unmeasured oxidation products from the RACM2-LIM1 model results. Error bars show range of measurements and bars show Q1 and Q3 for the measured OH reactivity.

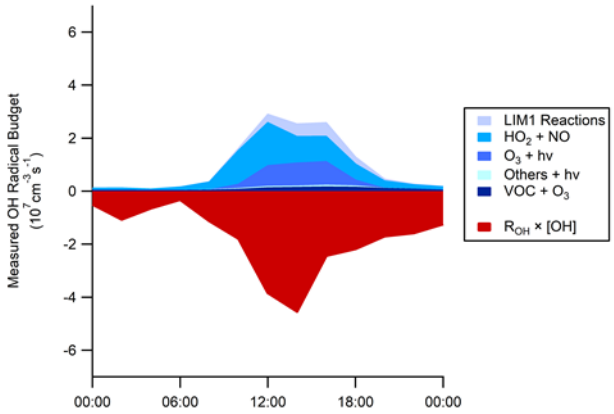


**Figure S5:** Experimental daytime OH radical budget for the days when NO was measured based on measured production and loss rates. Concentrations of $HO_2$ used to calculate the $HO_2$ + NO production rate were estimated based on the measured concentrations of $HO_2$* and the modeled $HO_2/HO_2$* ratio for these days (approximately 0.6). The modeled LIM1 contribution to OH production is included for reference. The OH loss rate is based on the average total OH reactivity measurements for this period.

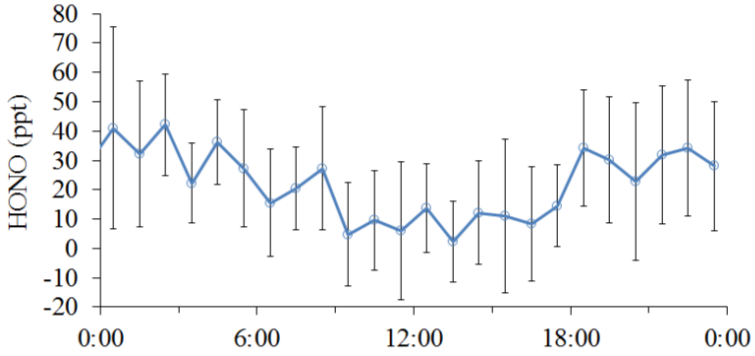


**Figure S6.** Diurnal average measurements of HONO during the IRRONIC 2015 campaign. Error bars represent the standard error of the measurements.

**References**

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