



Supplement of

Unexplored volatile organic compound emitted from petrochemical facilities: implications for ozone production and atmospheric chemistry

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Supplementary information for “Unexplored VOC emitted from petrochemical facilities: implications for ozone production and atmospheric chemistry” by C. Sarkar et al., 2020:

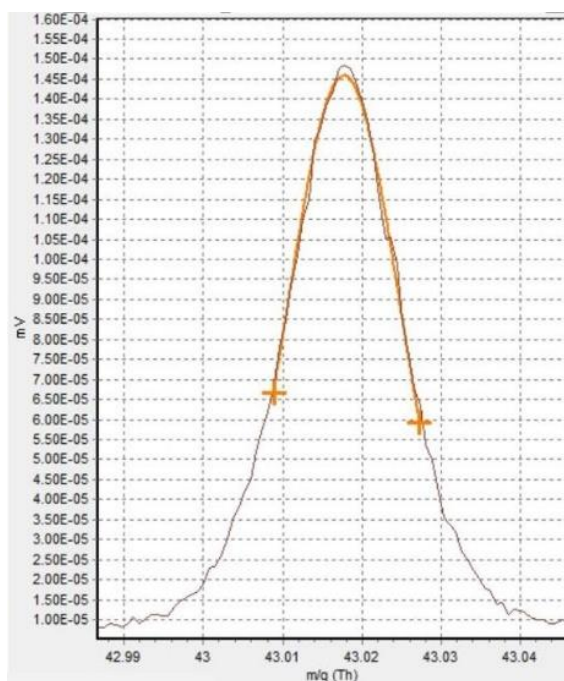


Figure S1. Illustrative mass spectra (30 second average) of ketene (ethenone) obtained at 09:56 Local Time (LT) during 29 May morning flight

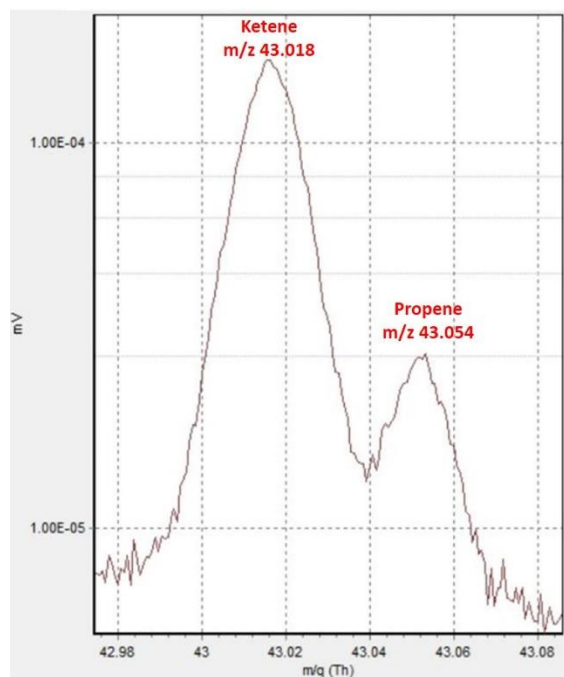


Figure S2. Illustrative mass spectra (30 second average) of showing the separation of ketene (m/z 43.018) and propene (m/z 43.054) obtained during 29 May morning flight

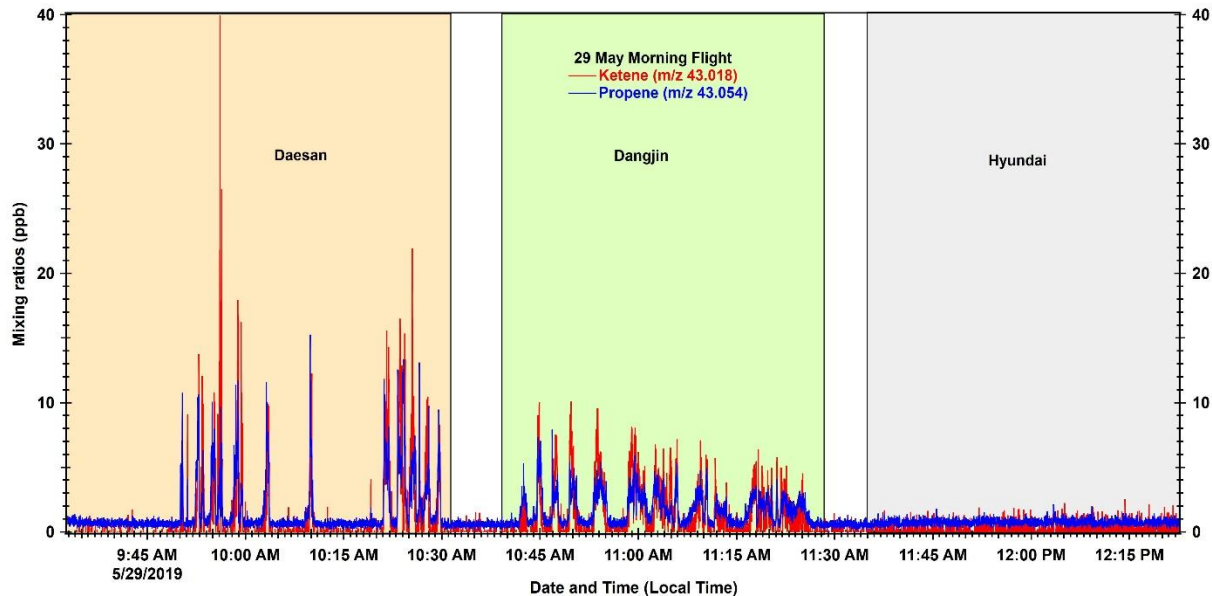
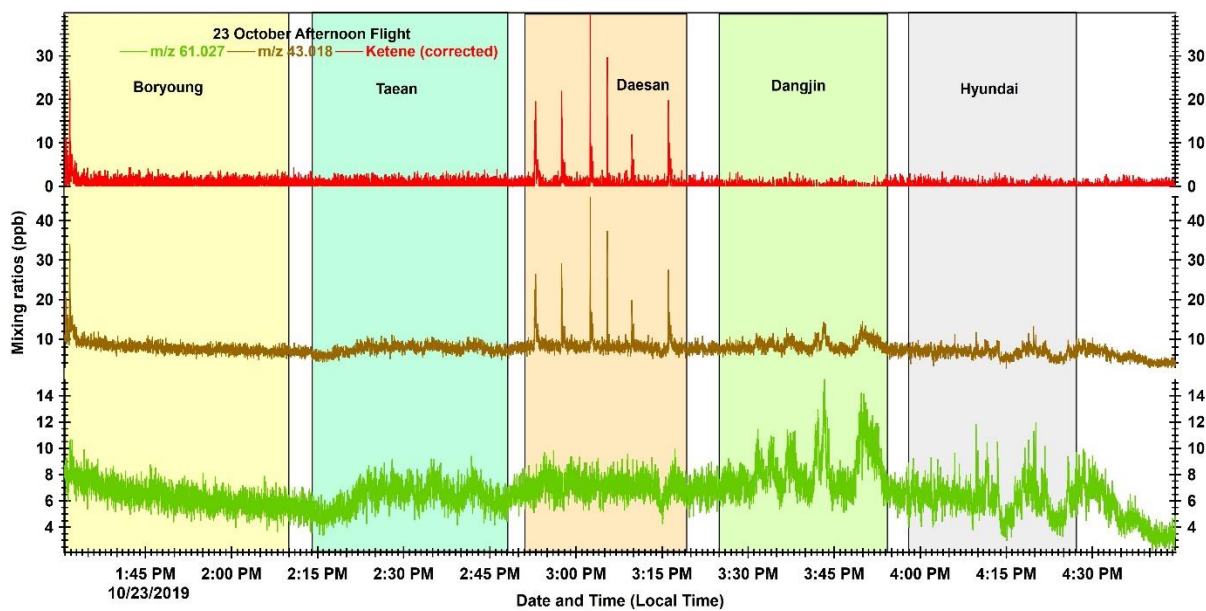
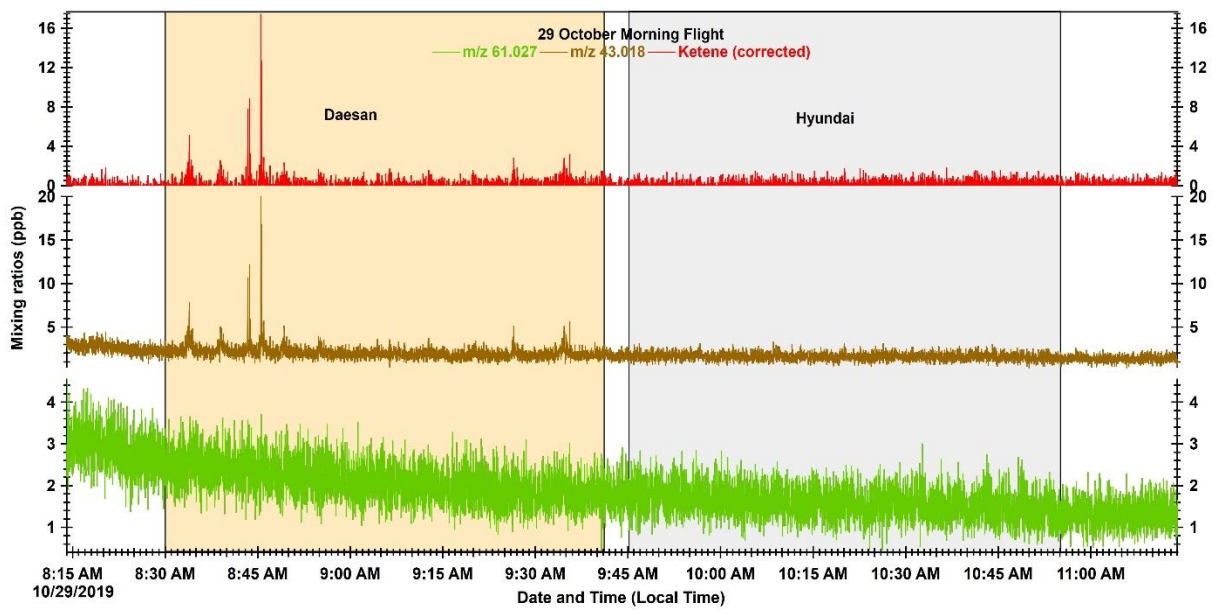
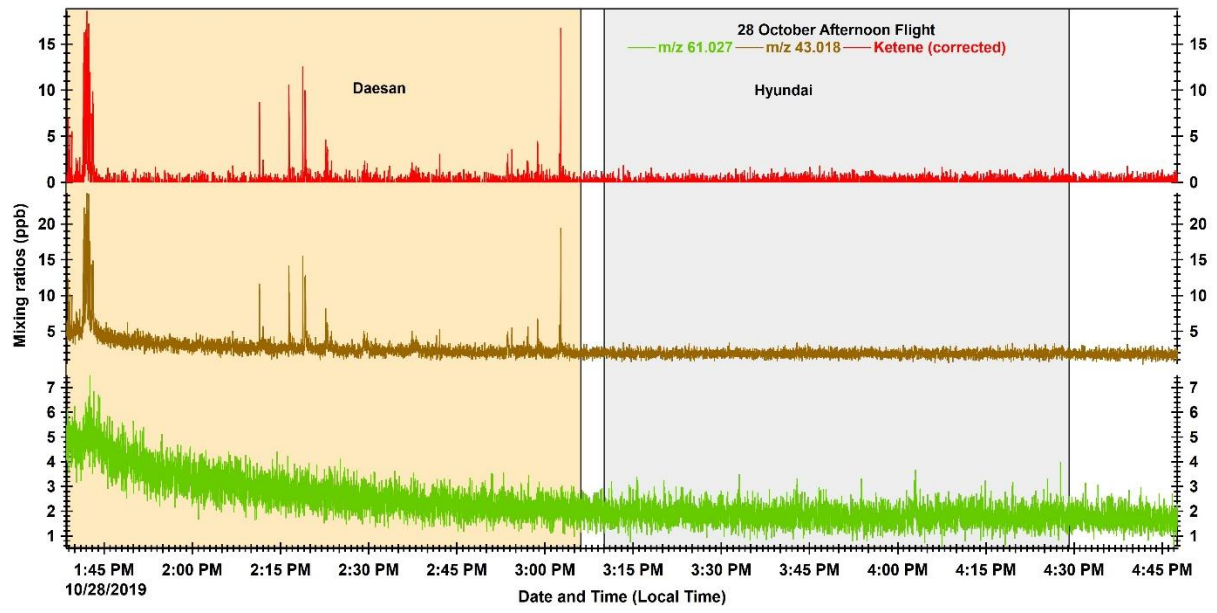


Figure S3. Timeseries plot of the corrected ketene measured at $m/z = 43.018$ (in red) and propene measured at $m/z = 43.054$ (in blue) during the research flight conducted on 29 May morning

Fall 2019 Timeseries:





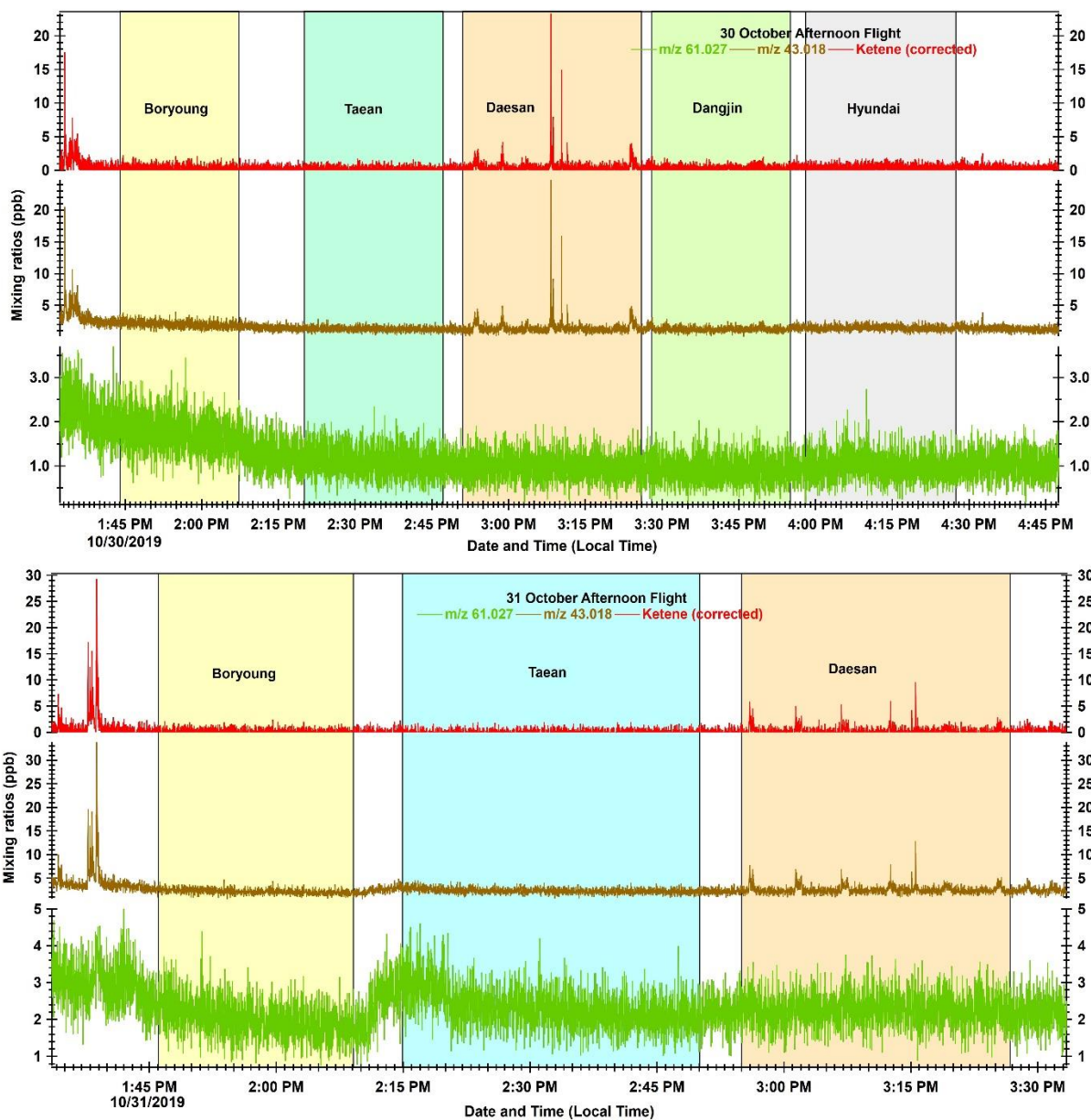


Figure S4. Timeseries profiles for mixing ratios (1 Hz resolution) of acetic acid and glycolaldehyde parent ion ($m/z = 61.027$), ketene fragment ($m/z = 43.018$) and corrected ketene (corrected for $m/z 61.027$ fragmentation) during five research flights conducted on October 2019 (fall season). The light yellow, violet, cyan, green and pink shaded areas represent the duration for which flights were flying over Boryoung, Hyundai, Taean, Dangjin and Daesan, respectively

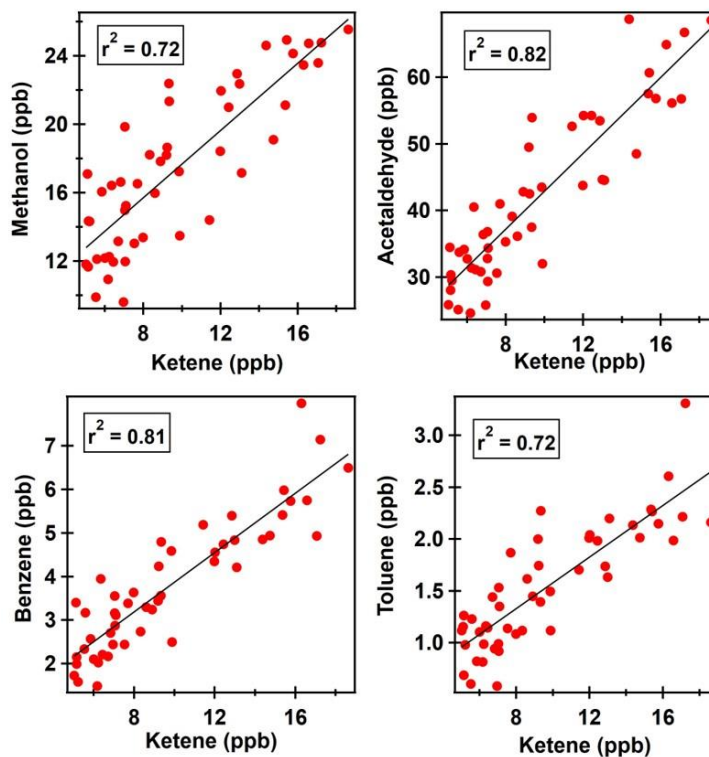


Figure S5. Correlation for the peak values of ketene with methanol, acetaldehyde, benzene and toluene (using 1 Hz data) over Daesan petrochemical facility during 28 October afternoon flight

Table S1. Sensitivity factors and limit of detections (LOD) for methanol, acetaldehyde, benzene and toluene

VOCs	m/z	Sensitivity factor (ncps/ppb)	Limit of detection (LOD) in ppb
Methanol	33.034	14.86	2.27
Acetaldehyde	45.033	30.27	2.30
Benzene	79.054	25.90	0.10
Toluene	93.070	30.61	0.11

Table S2. Emission rates of VOCs measured over Daesan petrochemical facility. Values represent the emission rate going out of the screen

Research Flights	Ketene (kg h ⁻¹)	Benzene (kg h ⁻¹)	Acetaldehyde (kg h ⁻¹)	Toluene (kg h ⁻¹)
<i>Summer 2019:</i>				
29 May Morning	354	991	1883	363
<i>Fall 2019:</i>				
23 October Afternoon	337	252	786	487
28 October Afternoon	353	651	2145	191
29 October Morning	40	294	1026	131
30 October Afternoon	112	237	604	117

Table S3. Parameters used in equation (8) to generate the Gaussian plumes for each date.

Fig. S7	Date	I	$s_{o,i}$ (m)	$z_{o,i}$ (m)	$\sigma_{s,i}$ (m)	$\sigma_{z,i}$ (m)
a)	May 29, 2019	1	3750	115	800	400
		2	6800	115	800	400
c)	Oct. 28, 2019	1	11200	115	800	400