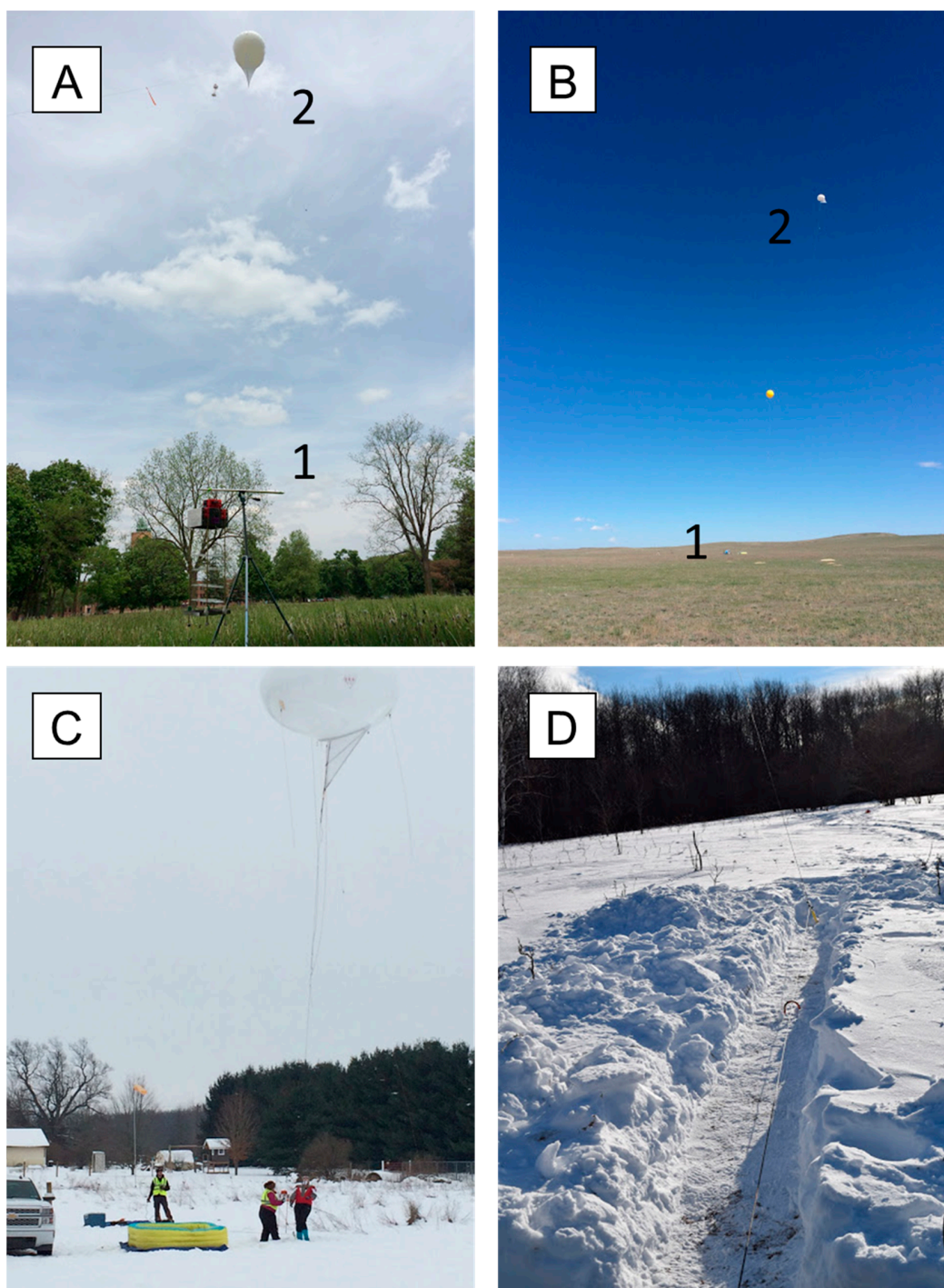**Figure S1.** Example images of sampling with tethered helikites. Near view (A) and far view (B) showing 1) an example of near-surface samplers during testing while hanging from tripods, within 2 m of the ground, and 2) an example of a high-altitude sampler suspended beneath helikite, reaching 150 m above the ground. One of each sample was collected at each of the three sites in the agricultural/developed and forested/undeveloped locations. Images C and D were taken during the 2016/2017 sampling effort and demonstrate the complexity of collecting samples in winter using a tethered helikite

Supplementary Materials

Table S1. Land cover from individual sites. Sampling date, site location and land use information for forested/undeveloped sites near Pellston, Michigan, USA, and agricultural/developed sites near Kalamazoo, Michigan, USA. Percent land cover was calculated for a 10,000-m diameter surrounding each site.

Site Name	Date of Sampling	GPS coordinates	% Forest	% Developed	% Agriculture	% Wetland	% Open Water	Other
UNDEVELOPED								
UMBS field	1/13/2017	45.561611, -84.679694	24.9	6.7	28.2	25.1	0.2	14.9
Robinson Road	1/13/2017	45.55047, -84.72366	36.1	6.1	10.7	20.8	17.1	9.2
Chickagami Trail	1/14/2017	45.483417, -84.689483	33.7	8.5	8.2	9.9	30.7	9.0
Average			31.6	7.1	15.7	18.6	16.0	11.0
DEVELOPED								
Parkview Campus	12/23/16	42.255917, -85.637150	21.5	55.6	15.0	2.6	1.6	3.7
Asylum Lake Preserve	12/23/2016	42.264083, -85.612233	19.3	43.3	25.3	8.3	2.1	1.7
Schoolcraft Airstrip	12/23/2016	42.178200, -85.669040	19.5	27.9	37.5	9.4	3.6	2.2
Average			20.1	42.3	25.9	6.8	2.4	2.5

Table S2. Land cover from air mass trajectories. Backwards trajectories for air masses sampled in each sampling effort were calculated using the National Oceanic and Atmospheric Administration (NOAA) Hybrid Single-Particle Lagrangian Integrated Trajectory (HYSPLIT). Percent land cover was calculated for a 10,000-m buffer surrounding each trajectory. A map of these trajectories are shown Figure 1C.

Location	Altitude (m)	% Forest	% Developed	% Agriculture	% Wetland	% Open Water	% Other
Undeveloped	2	15.3	2.6	4.6	13.3	59.7	4.6
	150	20.2	2.9	4.2	19.4	47.9	5.5
Developed	2	10.0	15.5	60.3	9.9	2.8	1.5
	150	11.8	11.5	67.3	5.6	2.3	1.4

Table S3. Arduino atmospheric data. Arduino sensors attached to sampling boxes recorded temperature, pressure and humidity data, as described in Spring et al. (2018). NR indicates that data were not recorded for that sampler.

Site Name	2m					150m				
	Time of sampling	Hour	Temp (°C)	Pressure (kPa)	Humidity (%)	Time of Sampling	Hour	Temp (°C)	Pressure (kPa)	Humidity (%)
Parkview Campus	10:15 - 4:30	1	1.211	99.269	70.623	NR	1	NR	NR	NR
		2	1.987	99.213	72.011		2	NR	NR	NR
		3	2.362	99.102	72.953		3	NR	NR	NR
		4	3.072	98.982	71.073		4	NR	NR	NR
		5	2.596	98.863	73.722		5	NR	NR	NR
		6	2.437	98.734	74.258		6	NR	NR	NR

Supplementary Materials

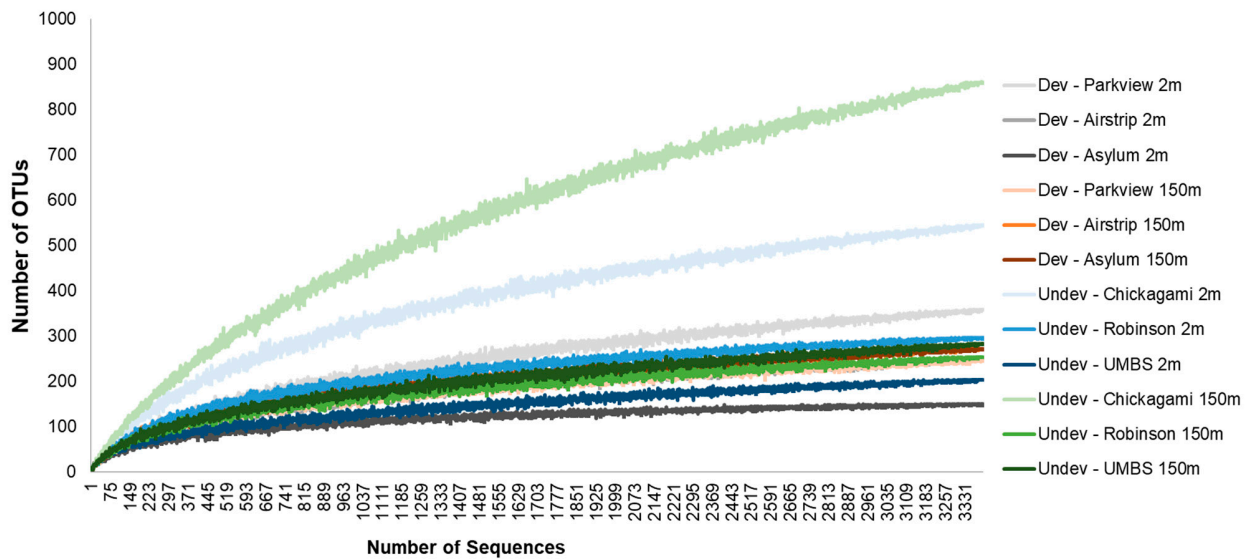|										
Asylum Lake Preserve	9:03 - 3:01	1	-0.654	99.291	77.551	9:02 - 3:00	1	-0.872	97.994	75.314
		2	0.553	99.256	74.235		2	-0.947	97.878	78.864
		3	1.526	99.206	74.546		3	-0.305	97.875	80.818
		4	2.005	99.095	75.472		4	0.199	97.782	81.767
		5	2.599	98.975	74.444		5	0.545	97.52	81.392
		6	2.349	98.871	76.432		6	0.706	97.458	81.246
Schoolcraft Airstrip	11:54 - 5:27	1	1.721	99.109	75.702	NR	1	NR	NR	NR
		2	2.478	98.991	75.049		2	NR	NR	NR
		3	2.51	98.889	76.666		3	NR	NR	NR
		4	2.466	98.727	76.593		4	NR	NR	NR
		5	2.122	98.648	78.47		5	NR	NR	NR
		6	1.943	98.54	79.595		6	NR	NR	NR
UMBS field	12:31 - 6:31	1	-3.571	101.265	35.148	NR	1	NR	NR	NR
		2	-5.465	101.265	40.82		2	NR	NR	NR
		3	-5.947	101.288	41.577		3	NR	NR	NR
		4	-9.285	101.354	51.361		4	NR	NR	NR
		5	-11.411	101.389	60.996		5	NR	NR	NR
		6	-11.744	101.391	64.674		6	NR	NR	NR
Robinson Road	10:46 - 4: 47	1	-8.384	100.899	48.03	11:12 - 5:13	1	-10.389	99.325	55.626
		2	-7.956	100.878	46.578		2	-10.355	99.455	52.899
		3	-7.633	100.87	46.189		3	-10.071	99.429	51.309
		4	-7.95	100.886	47.759		4	-10.076	99.354	54.049
		5	-8.919	100.94	50.352		5	-10.487	99.204	54.304
		6	-9.643	100.992	54.68		6	-11.014	99.162	57.305
Chickagami Trail	NR	1	9.862	100.668	27.556	11:04 - 5:09	1	-5.194	99.079	69.576
		2	9.697	100.544	29.949		2	-3.286	99.032	63.782
		3	NR	NR	NR		3	-2.219	98.952	58.685
		4	NR	NR	NR		4	-2.299	98.858	57.597
		5	NR	NR	NR		5	-2.029	98.81	56.358
		6	NR	NR	NR		6	-2.527	98.827	62.642

Figure S2. Collector's curves. The number of OTUs observed in air samples collected from three developed (Dev) and undeveloped (Undev) sites near surface (2 m) and at higher altitude (150 m).
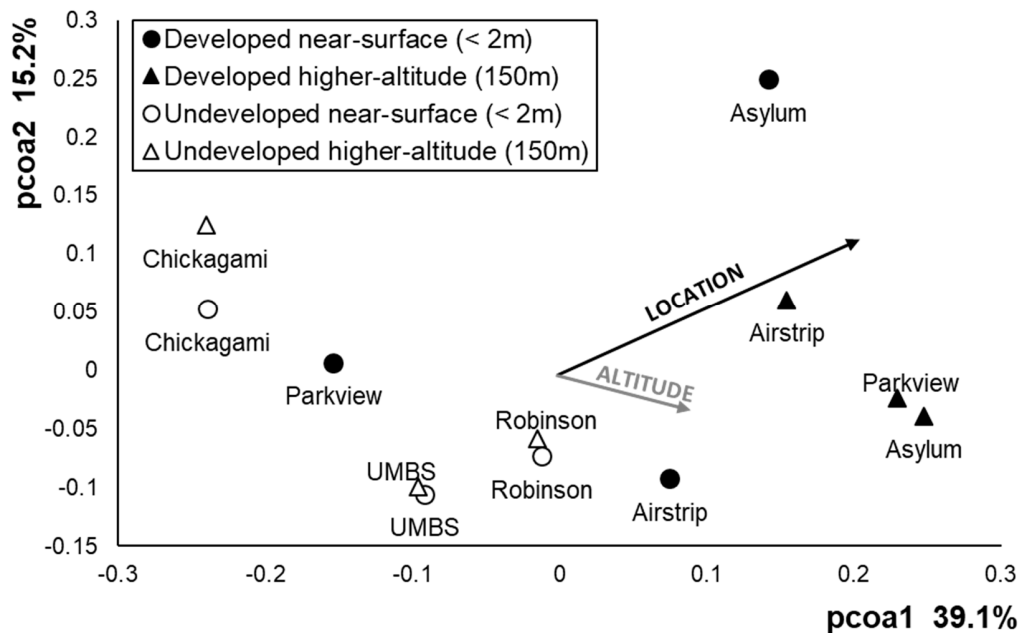

Figure S3. Community variation by location and altitude. Principle coordinates analysis using a weighted UniFrac distance matrix to examine community similarity across all twelve air samples. When all samples are examined together, 57% of the variation in airborne communities is explained by the location (black arrow), which varies by land use, air mass sampled and sampling date ($p = 0.043$). Eight percent of the variation is explained by altitude (gray arrow), which was not significant ($p = 0.701$). We note that at the at the land use level, replicate sites were sampled within the same air mass, so they cannot be treated independently. This figure demonstrates that when considered together, air samples varied by land use/air mass/collection date, as is consistent with the assumptions underlying our hypotheses.