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Supporting Information for

The abundance and sources of ice nucleating particles (INPs) within Alaskan ice fog

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Introduction

This supporting information describes details and shows supporting figures of filter and substrate collection, ice crystal concentration, meteorological conditions, levoglucosan, and EOF analysis.

Sample Date	Time (AKST)	# of particles analyzed
1/26/2022	9:00–9:00*	173
1/27/2022	9:00–9:00*	11
1/28/2022	9:00–9:00*	38
1/29/2022	21:00–9:00*	131
1/31/2022	9:00–21:00	29
1/31/2022	21:00–9:00*	516
2/1/2022	9:00–21:00	64
2/2/2022	9:00–21:00	20
2/2/2022	21:00–9:00*	16
2/3/2022	9:00–21:00	7
2/4/2022	9:00–9:00*	424
2/5/2022	9:00–9:00*	714
2/7/2022	9:00–9:00*	678
2/11/2022	9:00–9:00*	30
2/12/2022	9:00–9:00*	32
2/16/2022	9:00–9:00*	588
2/19/2022	9:00–9:00*	164
2/24/2022	9:00–9:00*	14
2/25/2022	9:00–9:00*	598

Table S1. Summary of ALPACA samples analyzed by SEM-EDX. The sample date, start and end times, and number of particles analyzed are shown. *indicates a sample end time on the following day. Some samples were found to have particle loading too low for CCSEM-EDX. For these samples (highlighted in blue), only manual SEM images and EDX spectra were collected.

Start Datetime	End Datetime	Collection Frequency	3–12 µm Processing	1.2–3 µm Processing	0.3–1.2 µm Processing	0.15–0.3 µm Processing
1/17/22 9:00	1/18/22 9:00	24 hr				
1/18/22 9:00	1/19/22 9:24	24 hr				
1/19/22 9:24	1/20/22 9:06	24 hr				
1/20/22 9:06	1/21/22 9:18	24 hr				
1/21/22 9:18	1/22/22 9:01	24 hr				

1/22/22 9:01	1/23/22 8:57	24 hr				
1/23/22 8:57	1/24/22 9:11	24 hr				
1/24/22 9:11	1/25/22 8:56	24 hr				
1/25/22 8:56	1/26/22 9:11	24 hr				
1/26/22 9:11	1/27/22 8:54	24 hr				
1/27/22 8:54	1/28/22 8:54	24 hr				
1/28/22 8:54	1/29/22 9:00	24 hr				
1/29/22 9:00	1/29/22 21:00	12 hr				
1/29/22 21:00	1/30/22 8:58	12 hr	✓			✓
1/30/22 8:58	1/30/22 21:31	12 hr				
1/30/22 21:31	1/31/22 9:13	12 hr				
1/31/22 9:13	1/31/22 20:28	12 hr	✓			✓
1/31/22 20:28	2/1/22 8:59	12 hr				
2/1/22 8:59	2/1/22 20:50	12 hr				
2/1/22 20:50	2/2/22 9:05	12 hr				
2/2/22 9:05	2/2/22 20:54	12 hr				
2/2/22 20:54	2/3/22 9:04	12 hr	✓			✓
2/3/22 9:04	2/3/22 21:51	12 hr				
2/3/22 21:51	2/4/22 8:58	12 hr				
2/4/22 8:58	2/4/22 9:17	24 hr				

2/4/22 9:17	2/5/22 8:57	24 hr				
2/5/22 8:57	2/6/22 9:00	24 hr				
2/6/22 9:00	2/7/22 9:10	24 hr				
2/7/22 9:10	2/8/22 9:04	24 hr				
2/8/22 9:04	2/9/22 9:02	24 hr				
2/9/22 9:02	2/10/22 9:04	24 hr				
2/10/22 9:04	2/11/22 9:02	24 hr				
2/11/22 9:02	2/12/22 8:59	24 hr				
2/12/22 8:59	2/13/22 8:58	24 hr				
2/13/22 8:58	2/14/22 9:03	24 hr				
2/14/22 9:03	2/15/22 9:02	24 hr				
2/15/22 9:02	2/16/22 9:03	24 hr				
2/16/22 9:03	2/17/11 9:19	24 hr				
2/17/11 9:19	2/17/11 14:11	5 hr				
2/17/11 14:11	2/18/22 9:00	19 hr				
2/18/22 9:00	2/19/22 8:58	24 hr	✓			✓
2/19/22 8:58	2/20/22 8:53	24 hr				
2/20/22 8:53	2/21/22 9:07	24 hr				
2/21/22 9:07	2/22/22 9:00	24 hr				
2/22/22 9:00	2/23/22 9:08	24 hr				

2/23/22 9:08	2/24/22 9:58	24 hr				
2/24/22 9:58	2/25/22 8:51	24 hr	✓			✓
2/25/22 8:51	2/26/22 9:00	24 hr				

Table S2. Metadata for DRUM samples, including collection dates, times, and durations, and which samples and stages were subject to INP processing.

Start Datetime (AKST)	End Datetime (AKST)	Collection Duration	INP Processing	INP Treatments	Levoglucosan Analysis
1/17/22 9:06	1/18/22 9:07	24 hr	✓		✓
1/18/22 9:09	1/19/22 19:32	24 hr	✓		
1/19/22 9:34	1/20/22 9:17	24 hr	✓	✓	
1/20/22 9:22	1/21/22 9:24	24 hr	✓		
1/21/22 9:30	1/22/22 9:06	24 hr	✓		
1/22/22 9:11	1/23/22 9:02	24 hr	✓		
1/23/22 9:04	1/24/22 9:15	24 hr			
1/24/22 9:18	1/25/22 9:03	24 hr	✓		
1/25/22 9:06	1/26/22 9:16	24 hr	✓		
1/26/22 9:20	1/27/22 9:00	24 hr	✓		
1/27/22 9:06	1/28/22 8:59	24 hr	✓	✓	
1/28/22 9:03	1/29/22 9:07	24 hr	✓		
1/29/23 9:10	1/29/22 21:04	12 hr	✓	✓	✓
1/29/22 21:07	1/30/22 9:04	12 hr	✓		
1/30/22 9:10	1/30/22 20:24	12 hr	✓		

1/30/22 20:56	1/31/22 9:18	12 hr	✓		
1/31/22 9:21	1/31/22 20:52	12 hr	✓	✓	
1/31/22 20:54	2/1/22 9:05	12 hr	✓		✓
2/1/22 9:07	2/1/22 20:58	12 hr	✓		
2/1/22 21:00	2/2/22 9:10	12 hr	✓		
2/2/22 9:11	2/2/22 20:58	12 hr	✓		
2/2/22 20:59	2/3/22 9:07	12 hr	✓	✓	
2/3/22 9:09	2/3/22 20:58	12 hr	✓		✓
2/3/22 20:59	2/4/22 9:01	12 hr	✓		✓
2/4/22 9:06	2/5/22 9:00	24 hr	✓		
2/5/22 9:03	2/6/22 9:04	24 hr	✓	✓	
2/6/22 9:07	2/7/22 9:14	24 hr	✓		
2/7/22 9:17	2/8/22 9:07	24 hr	✓		
2/8/22 9:10	2/9/22 9:08	24 hr	✓		
2/9/22 9:11	2/10/22 9:07	24 hr	✓	✓	
2/10/22 9:09	2/11/22 9:05	24 hr	✓		
2/11/22 9:09	2/12/22 9:02	24 hr	✓		
2/12/22 9:04	2/13/22 9:01	24 hr	✓		
2/13/22 9:05	2/14/22 9:06	24 hr	✓		
2/14/22 9:12	2/15/22 9:05	24 hr	✓	✓	
2/15/22 9:08	2/16/22 9:06	24 hr			
2/16/22 9:09	2/17/11 9:06	24 hr	✓		
2/17/22 9:09	2/18/22 9:03	24 hr	✓		✓
2/18/22 9:07	2/19/22 9:02	24 hr	✓		

2/19/22 9:06	2/20/22 8:57	24 hr	✓		
2/20/22 9:01	2/21/22 9:11	24 hr	✓		
2/21/22 9:15	2/22/22 9:05	24 hr	✓		

Table S3. Metadata for filter samples, including collection dates, times and durations, and which samples were subject to INP processing, INP treatments, and levoglucosan analysis. Checkmarks indicate which filters were subject to the various analytical techniques.

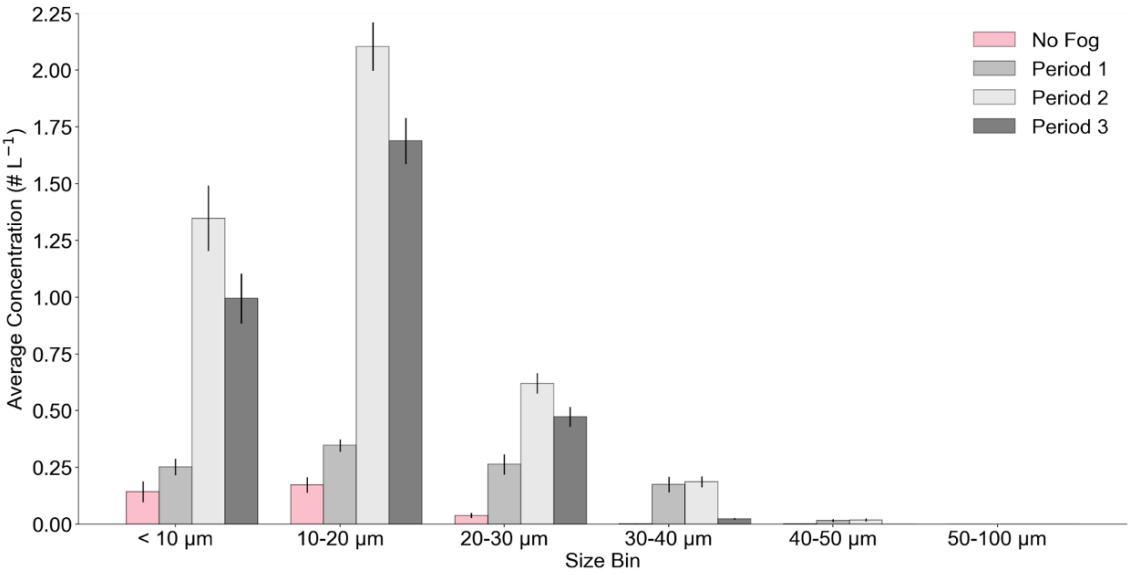


Figure S1. Average ice crystal concentrations at Fort Wainwright during and outside of the ice fog period (28 January 16:00 – 3 February 11:00) for multiple size bins. For the entire segment, liquid droplets were 0.75% and ice crystals were 99.25% of the total particles measured.

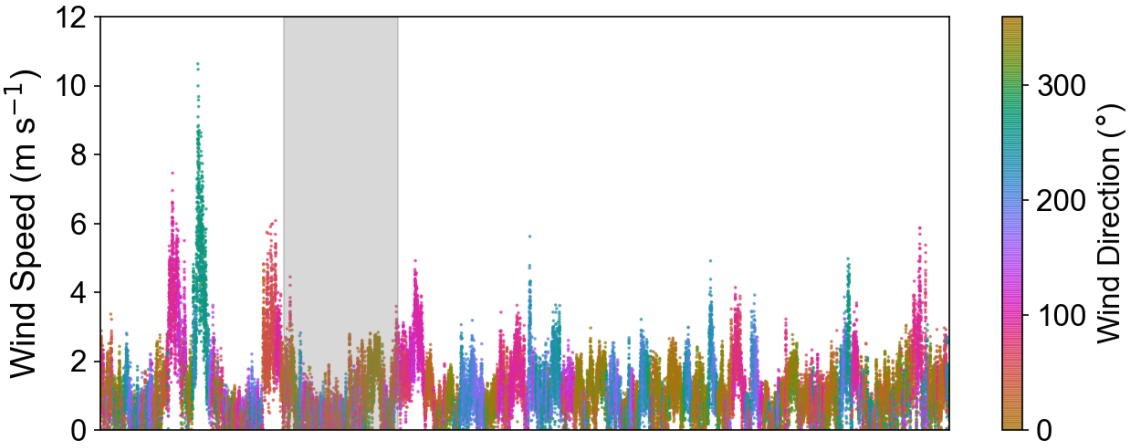


Figure S2. Time series of wind speed measured at 23 m AGL, colored by wind direction. Ice fog period is denoted by gray shading.

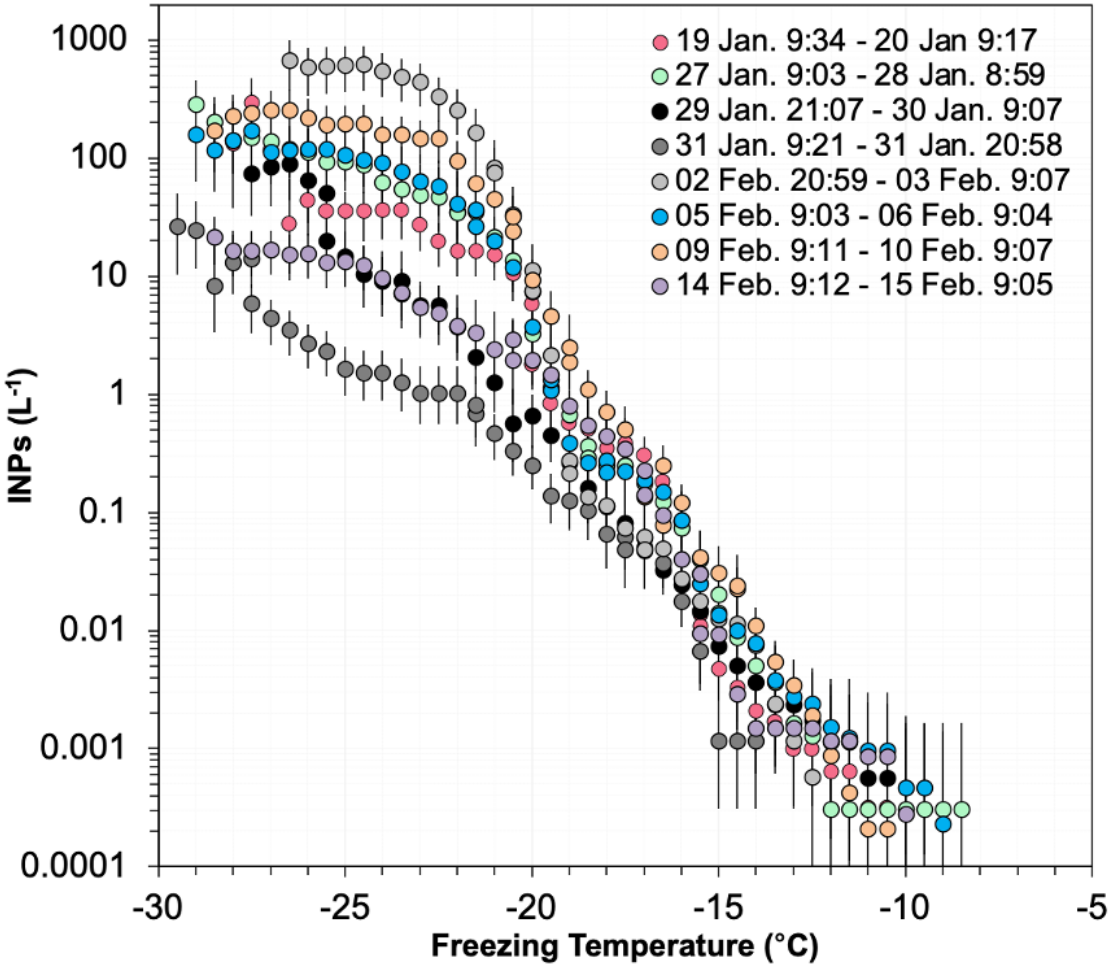


Figure S3. Cumulative total INP spectra for filters that were selected for treatments. The gray/black colors indicate filters from the ice fog period. Error bars represent 95% confidence intervals.

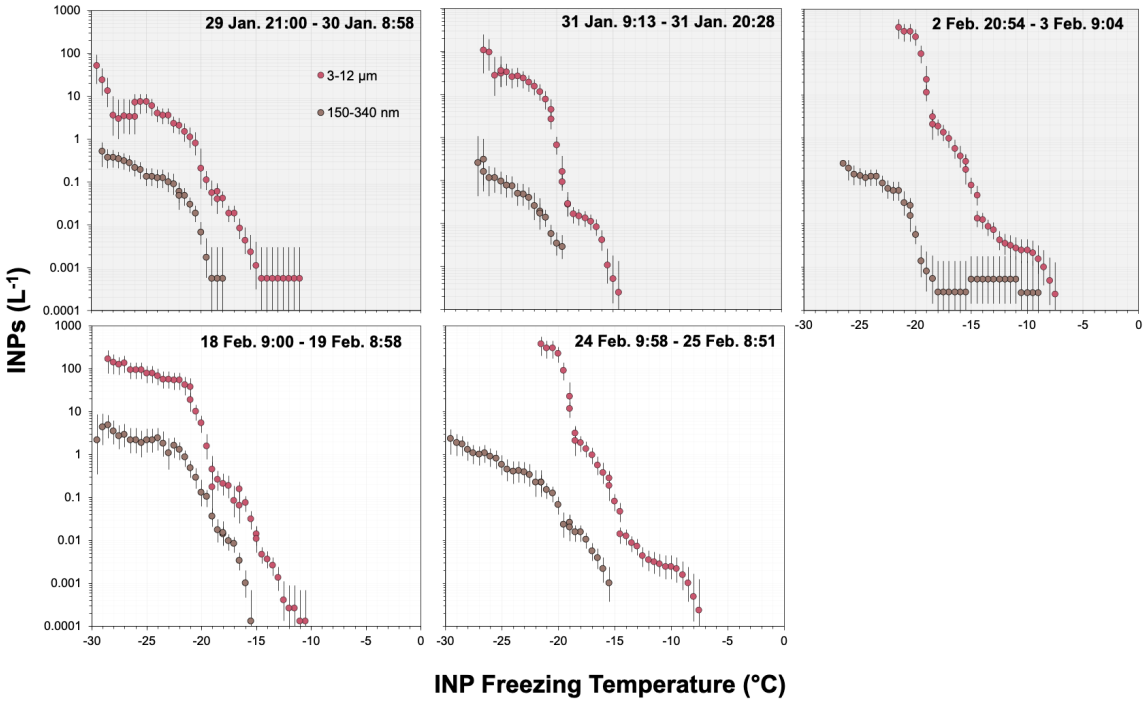


Figure S4. Cumulative INP spectra from the 150 – 340 nm and 3 – 12 µm DRUM size bins. Error bars represent 95% confidence intervals.

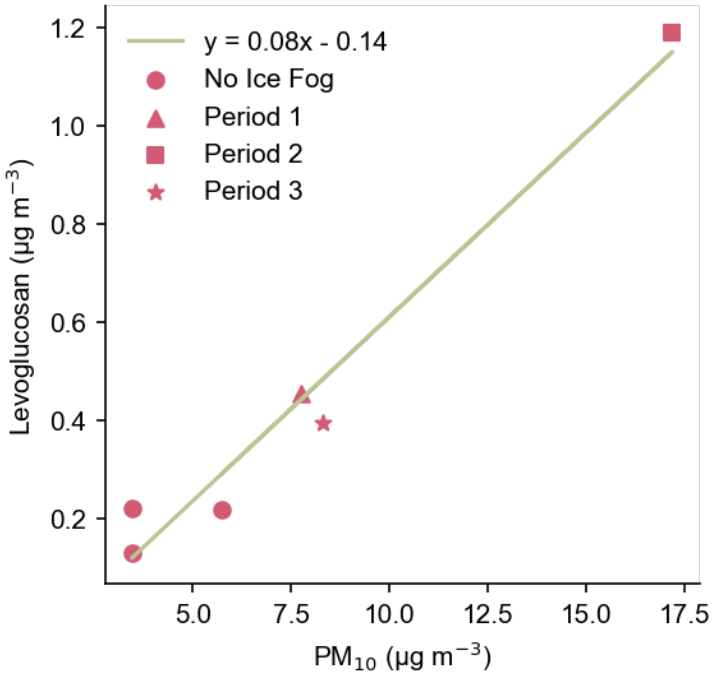


Figure S5. Correlation of levoglucosan measured from select filters and total PM_{10} mass concentrations.

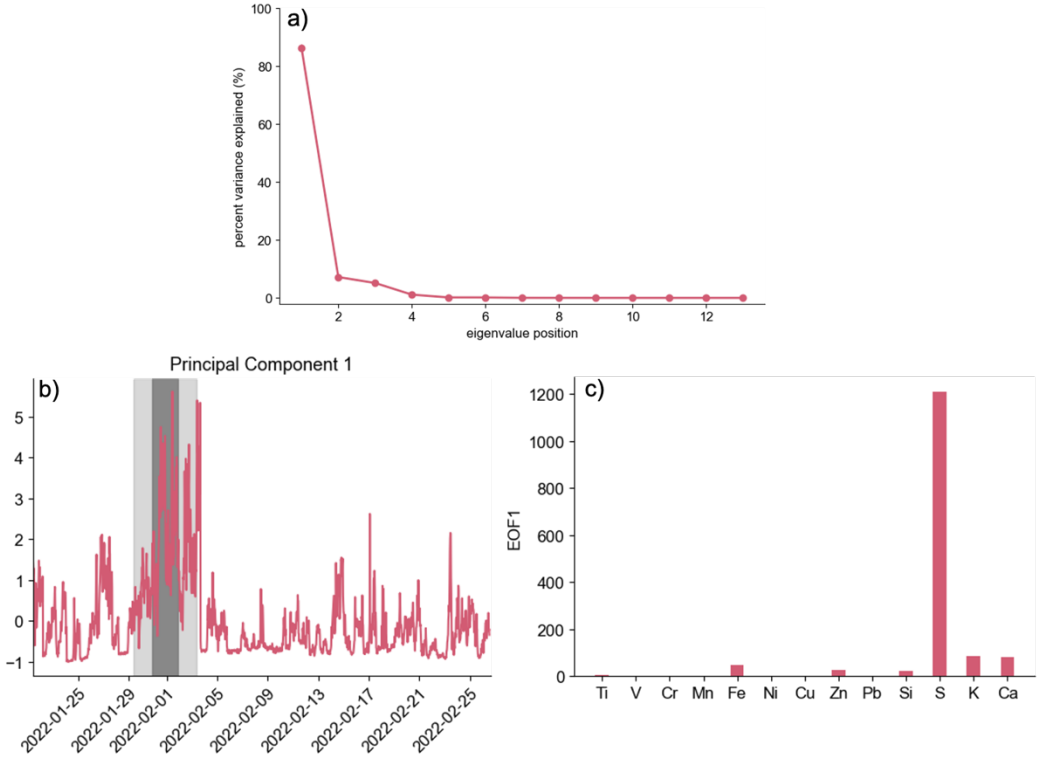


Figure S6. a) Percent variance explained by each EOF. b) Time series of principal component 1 with the ice fog sub periods indicated in gray. c) Components of principal component 1.