The Fifth International Workshop on Ice Nucleation Phase 3 (FIN-03): Field Intercomparison of Ice Nucleation Measurements

Supporting Information

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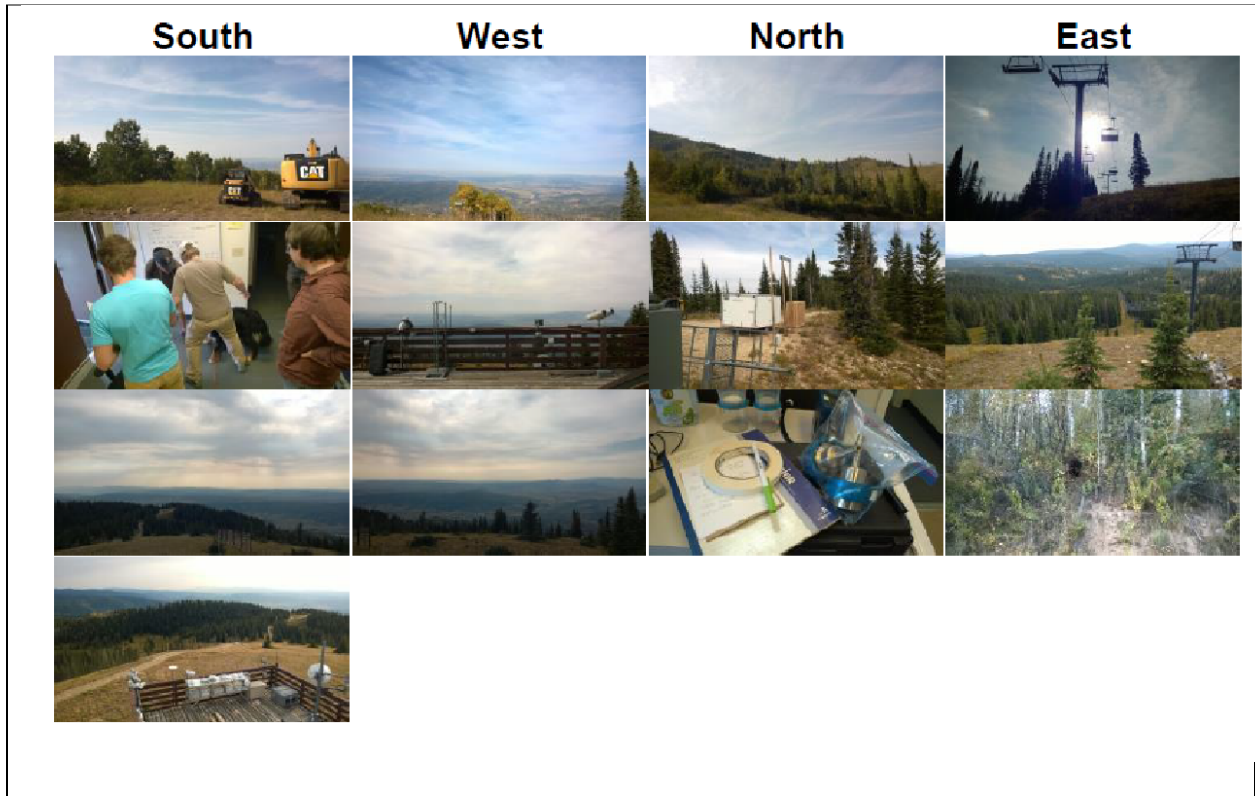
S1. Weather conditions and photos

Photographs shown here are available at https://sspetters.github.io/fin03/index.html or upon request to Sarah Petters.

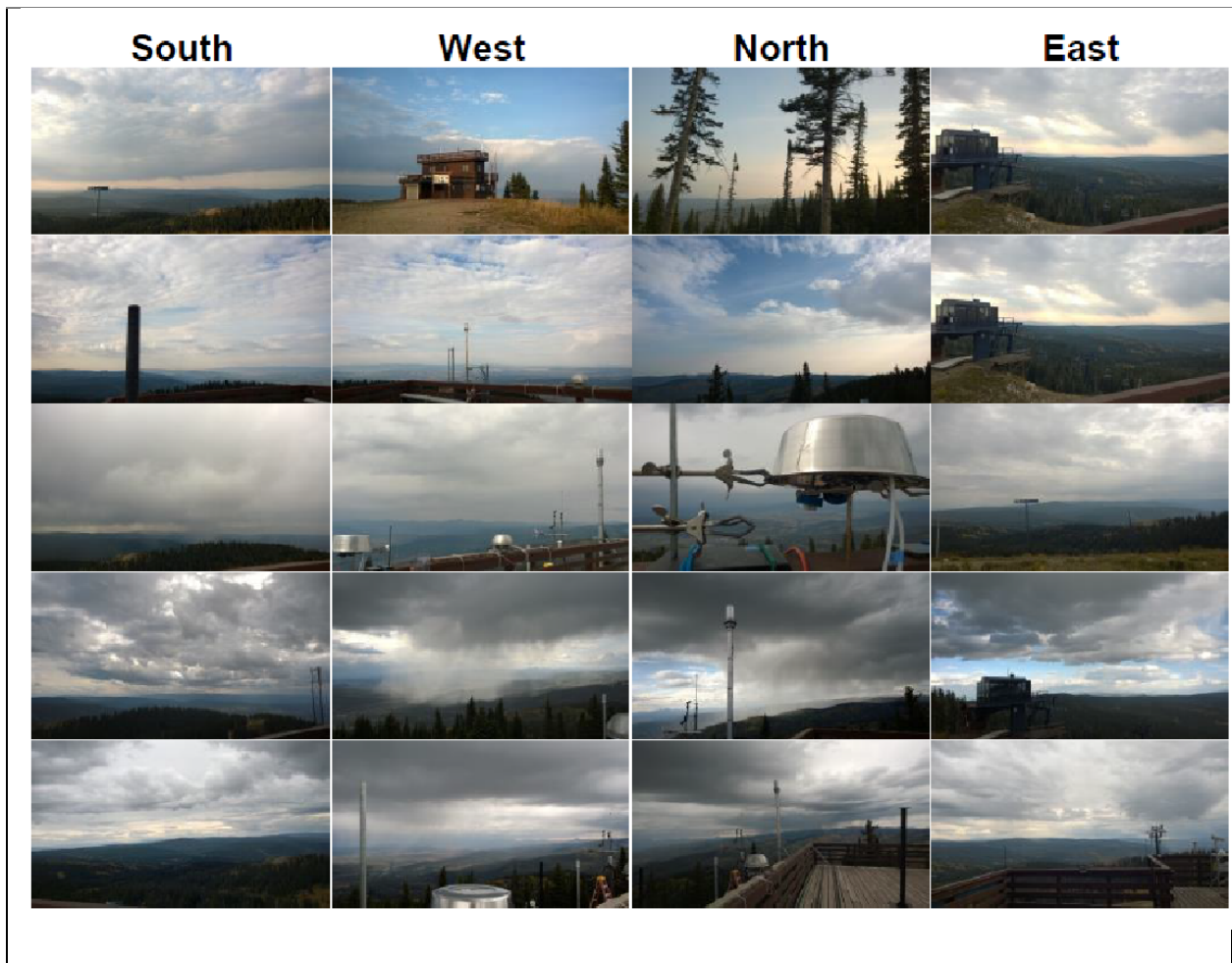
Date: September 12, 2015

Observations

Sky 100% clear, warm, dry.
First day of sampling.

Date: September 13, 2015

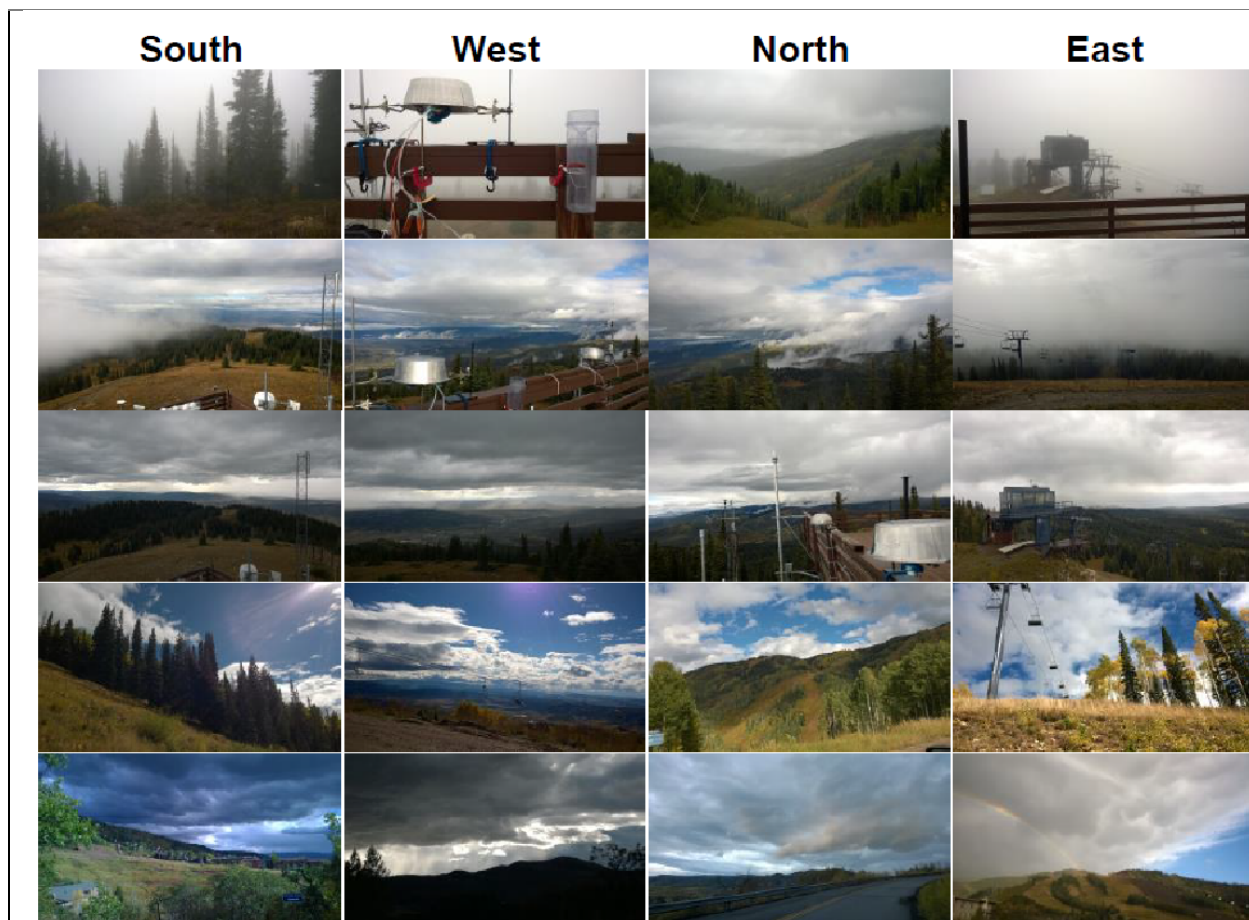
Observations

Clouds arriving. The road was again dusty in the morning (not pictured). Brown haze layer is present.
Stronger winds from West in the daytime (10 AM - 4 PM).
1 PM: Very hazy now, thicker cirrostratus
3 PM: Very breezy. 70-80% coverage with altostratus.

| South | West | North | East |

Date: September 14, 2015

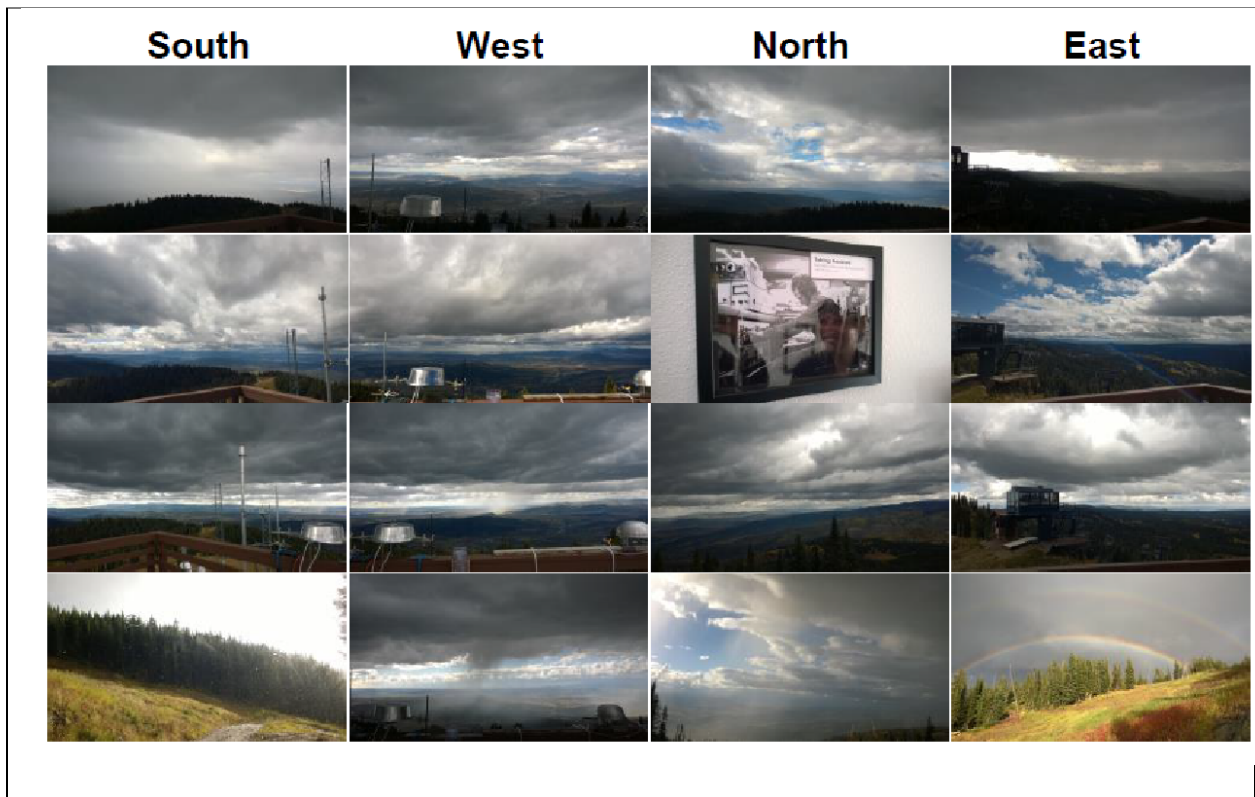
Observations

Arrival of rain. Wind picked up after 6pm.
8-8:30 AM: Wind from direction of anvil cloud; transition to overcast; continued wind, clouds break up
8:45-9 AM: Vehicles arriving on dirt road; 8:50 AM: Sun breaking behind Skilift, patches of broken stratocumulus
9 AM: Clear in valley, hazy; 10:28,10:58 AM: Vehicles on dirt road; 1:20-1:50 PM: Wind dies, first drops of rain; rain stops
5:02 PM: Rain (8 minutes); 5:30 PM: Meeting. For road dust, later arrivals will park lower on road;
6:11 PM: Rain begins again, stays

| South | West | North | East |

Date: September 15, 2015

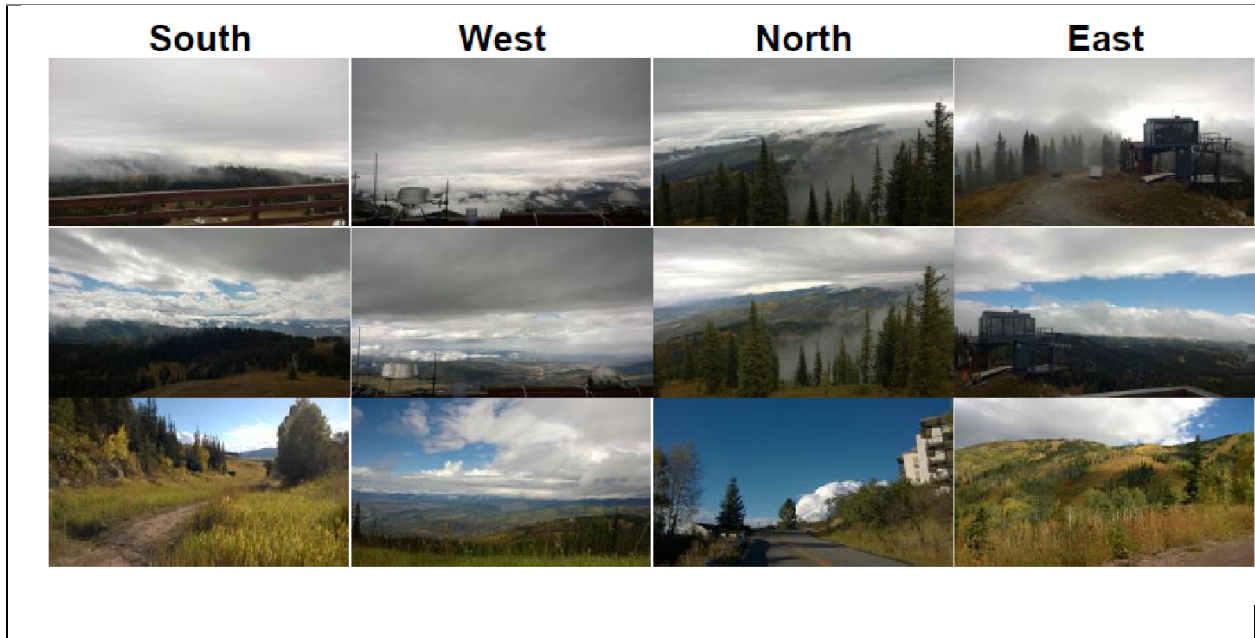
Observations

Rain predicted through 2:30 PM, "elective downtime" today (intercomparison cancelled due to road conditions).
1:35 PM: Rain
1:45 PM: Raining quite hard, sideways
2:10 PM: Separation of cloud layers

South	West	North	East

Date: September 16, 2015

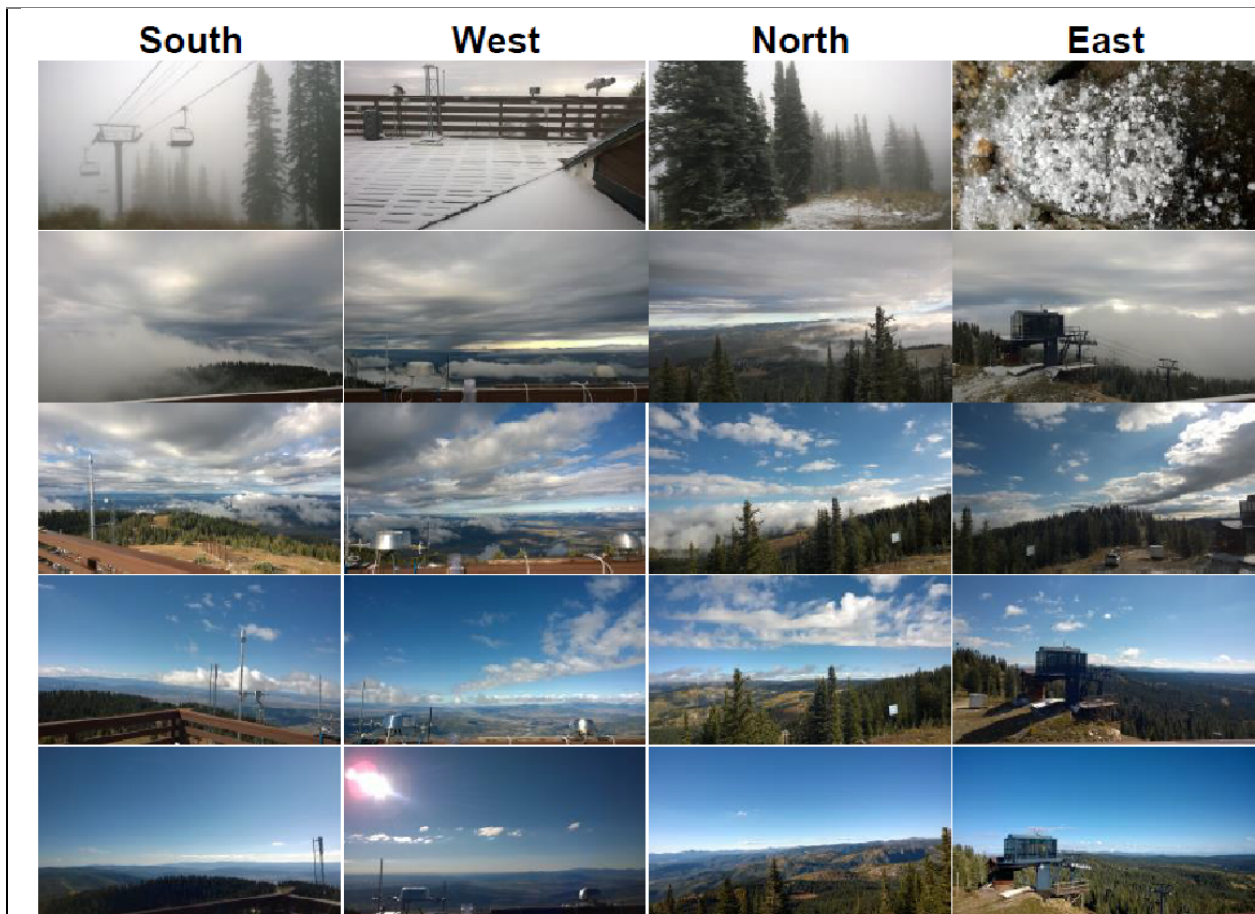
Observations

Rain intermittently.
8:44 AM: Rain approaching; wind coming from downpour to west; 9 AM: Rain has begun and stopped
9 AM: Meeting: Bike race on dirt road over weekend; Free troposphere peaks at 6am; Starting this weekend there will be smoke from California on the West wind; Children will visit on Monday
1:06 PM: Raining again; 3:18 PM: 1-mm hail, roundish, for a couple of minutes; 3:25 PM: Small amount of rain
3:40 PM: Intercomparison cancelled; SPIN background issues; 3:41 PM: Hail again, 5 minutes
4:40 PM: Rain has stopped in valley, patchy cumulus
5:05 PM: 2 minutes of hail

| South | West | North | East |

Date: September 17, 2015

Observations

Site closed after half day due to weather.
10 AM: Arrive in fog/rain/snow; everything is wet
10:30 AM: Rain has stopped
11 AM: Snow and sleet again
12:40 PM: Still raining

South	West	North	East

Date: September 18, 2015

Observations

Early snow, clear later.
8 AM: Arrive in snow/graupel; 8:20 AM: Snow depth 1/2 inch; 8:26 AM: Fog arrives, visibility low
9 AM: Sun is out; power plant plumes clearly visible in valley
10:32 AM: Clear sky above high cloud, clumpy low cumulus (much lower than past couple days), generally clear above, sunny, RH 51%
11:38 AM: Sunny, scattered cumulus in valley. Upper level cumulus height above mountain is constant (to East)
1:00 PM: Vehicles departing; 2:40 PM: Sunny, small amount of haze; 3:25 PM: Vehicles; 4:15 PM: Vehicle

South	West	North	East

Date: September 19, 2015

Observations

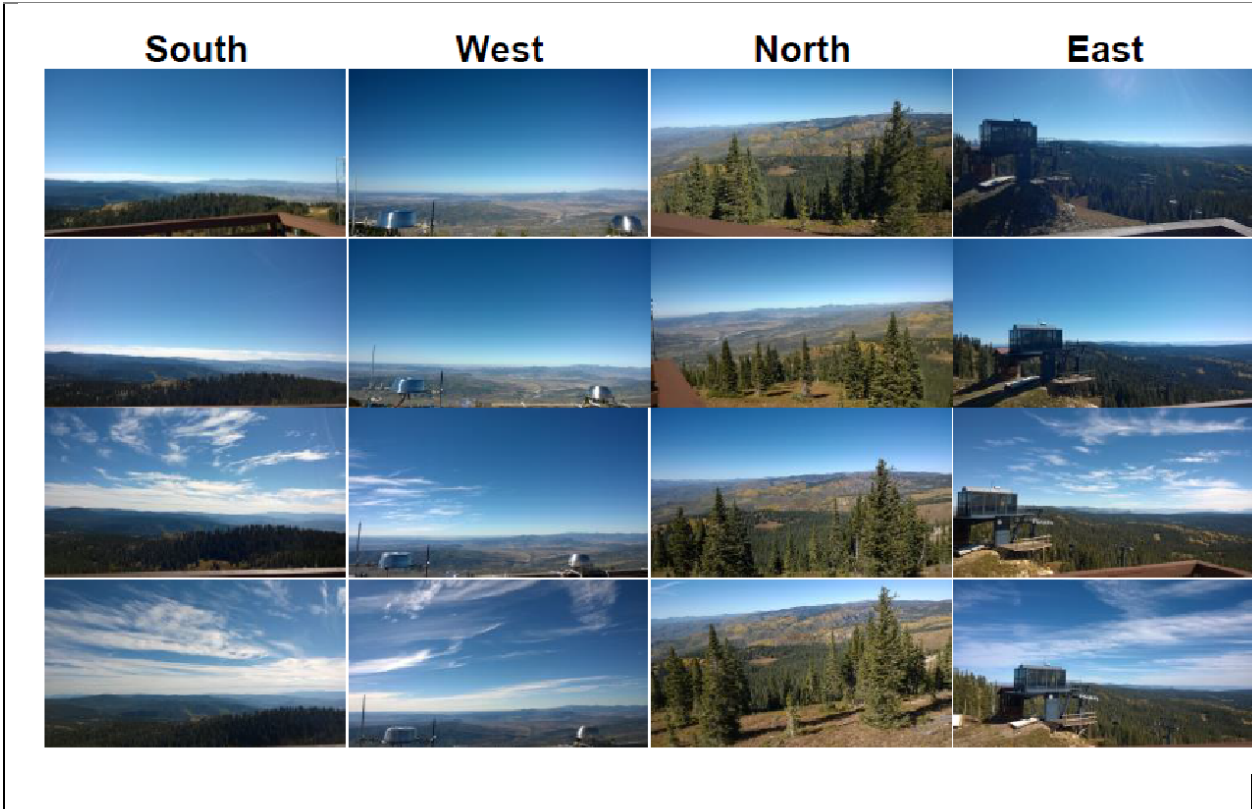
Winds from West 10am-9pm. No precipitation was anticipated.
12 PM: No rain/snow overnight

No photos taken

Date: September 20, 2015

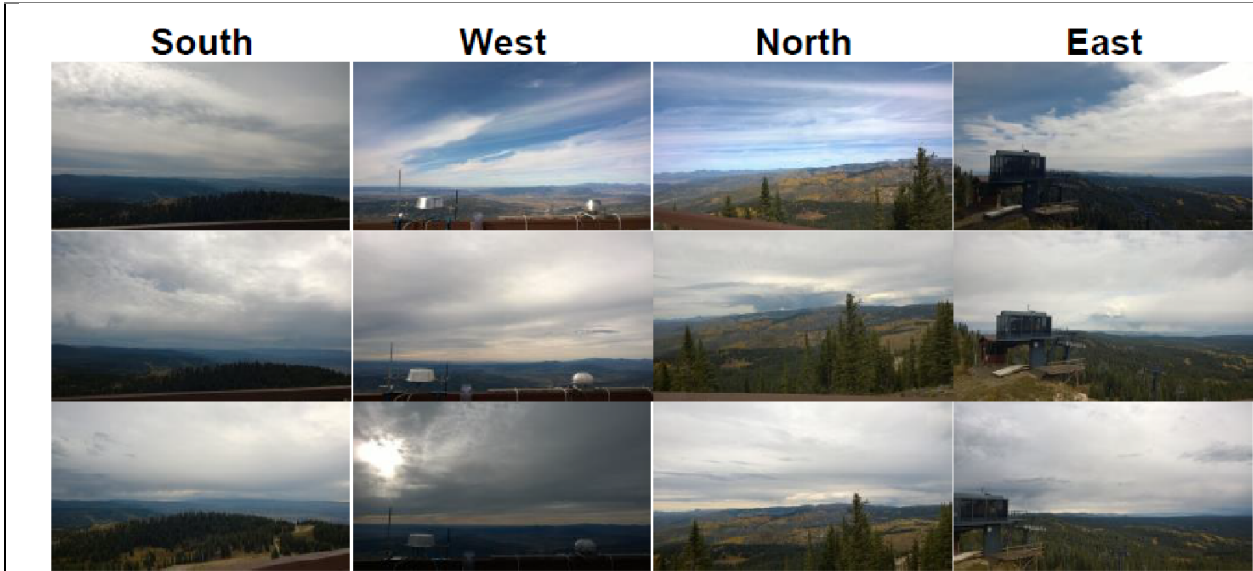
Observations

None

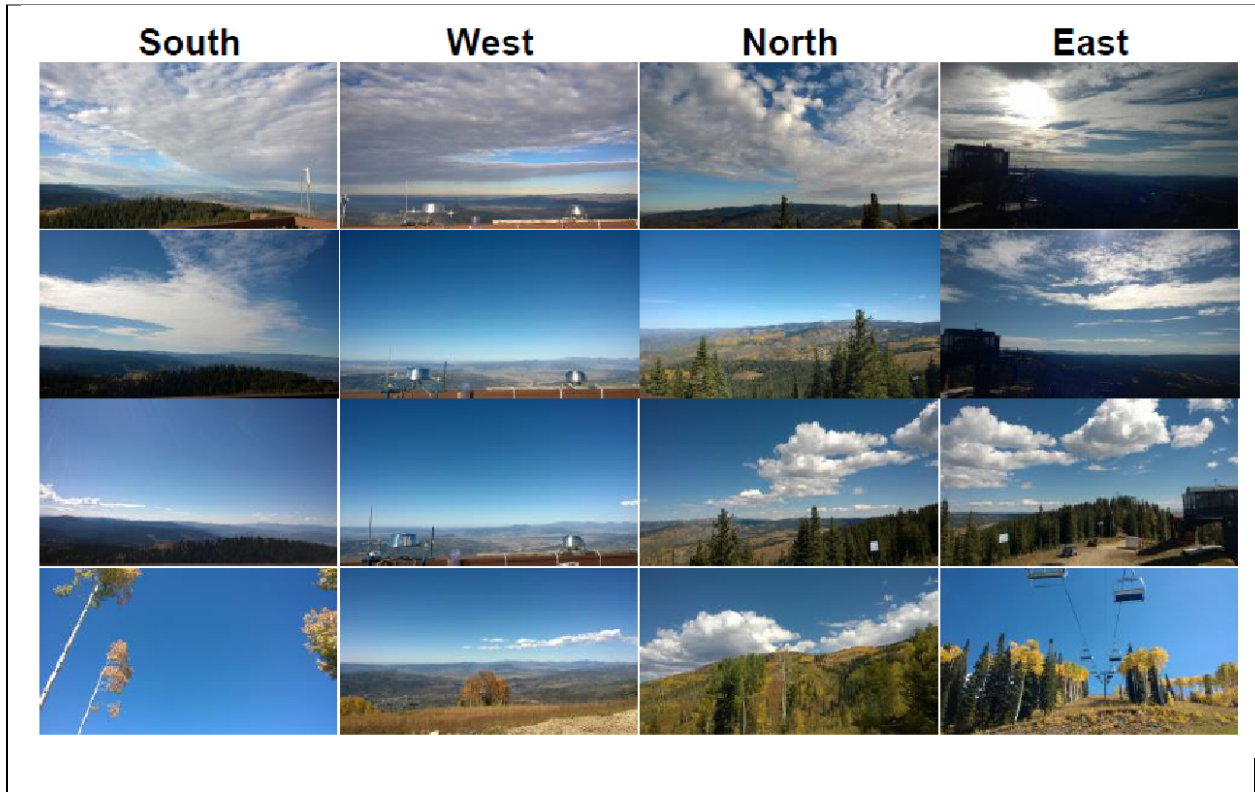
| South | West | North | East |

Date: September 21, 2015

Observations

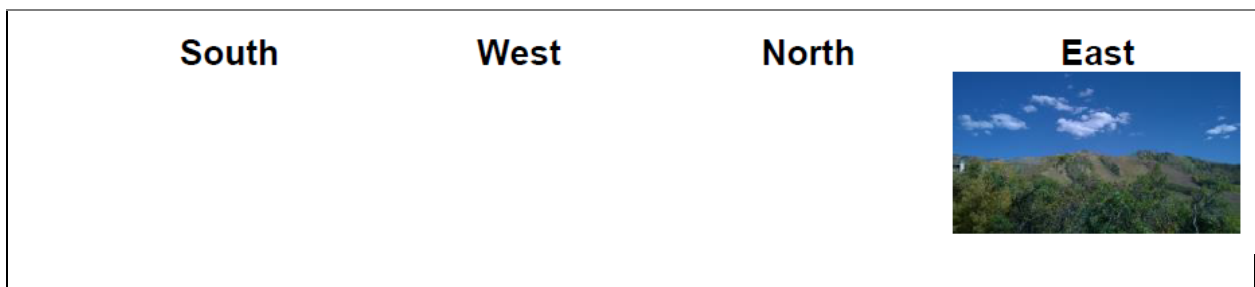
Clear with high clouds.
10 AM: Clear and slightly hazy
11 AM: Vehicles

South	West	North	East

Date: September 22, 2015

Observations

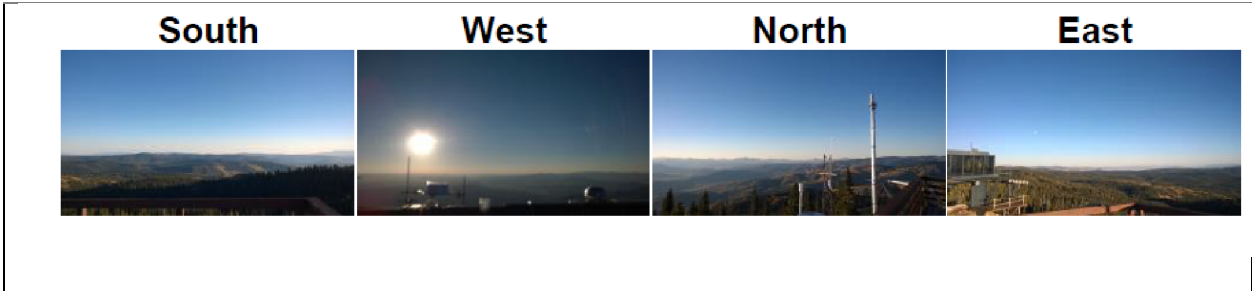
Overcast without rain.
2 PM: Hazy with a couple of clouds downwind; Ian goes to block road after some discussions with Forest Service
3:48 PM: Virga descending on horizon; wind has died; thunderstorm downwind

Date: September 23, 2015

Observations

Breezy, scattered clouds.

Date: September 24, 2015

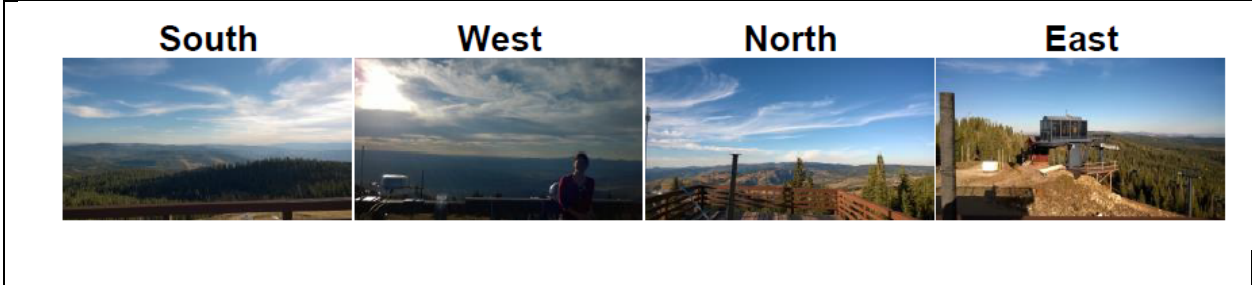
Observations

None (mandatory downtime)

South	West	North	East

Date: September 25, 2015

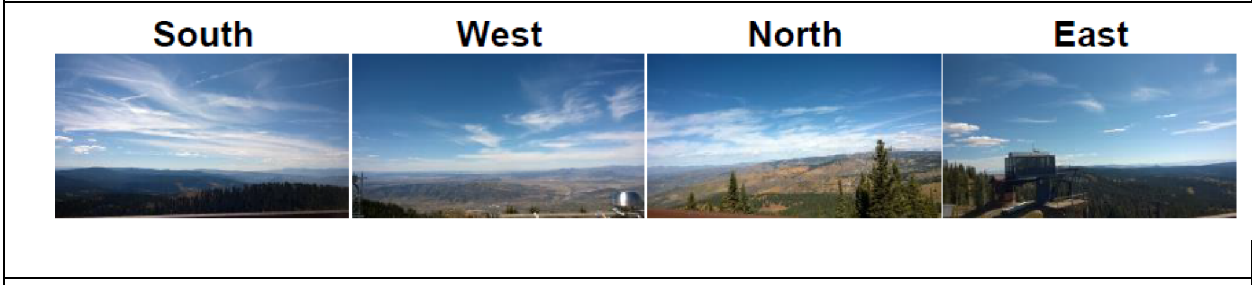
Observations

Hazy day. Wind from NW after 10am.
8 AM: Sunny and hazy
11:30 AM: Fairly hazy
6:20 PM: Very hazy, slight breeze, no clouds

South	West	North	East

Date: September 26, 2015

Observations

Scattered high clouds.

South	West	North	East

Date: September 27, 2015

Observations

Scattered high clouds.

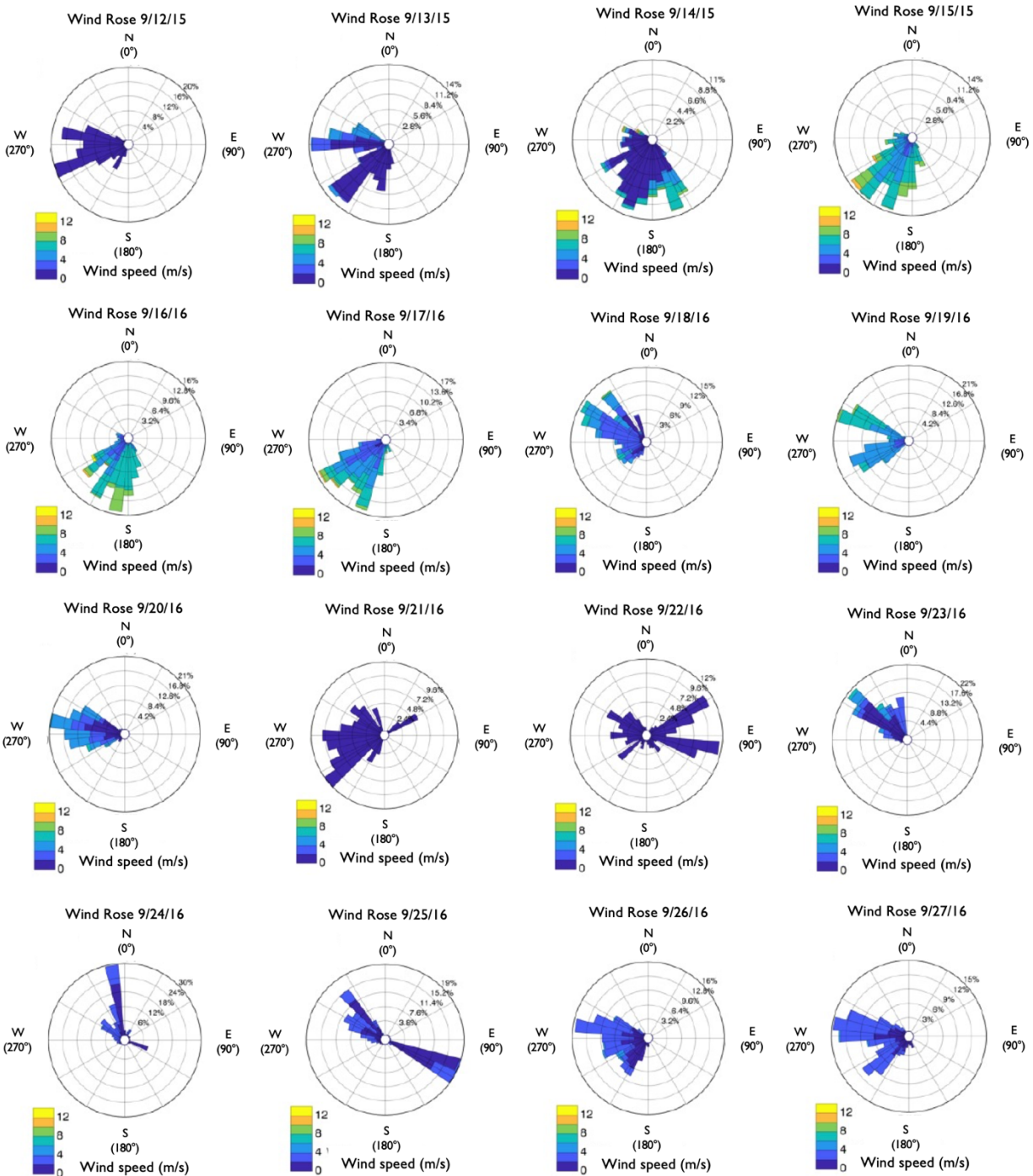



Figure S1. Wind roses displaying wind speed throughout FIN-03.

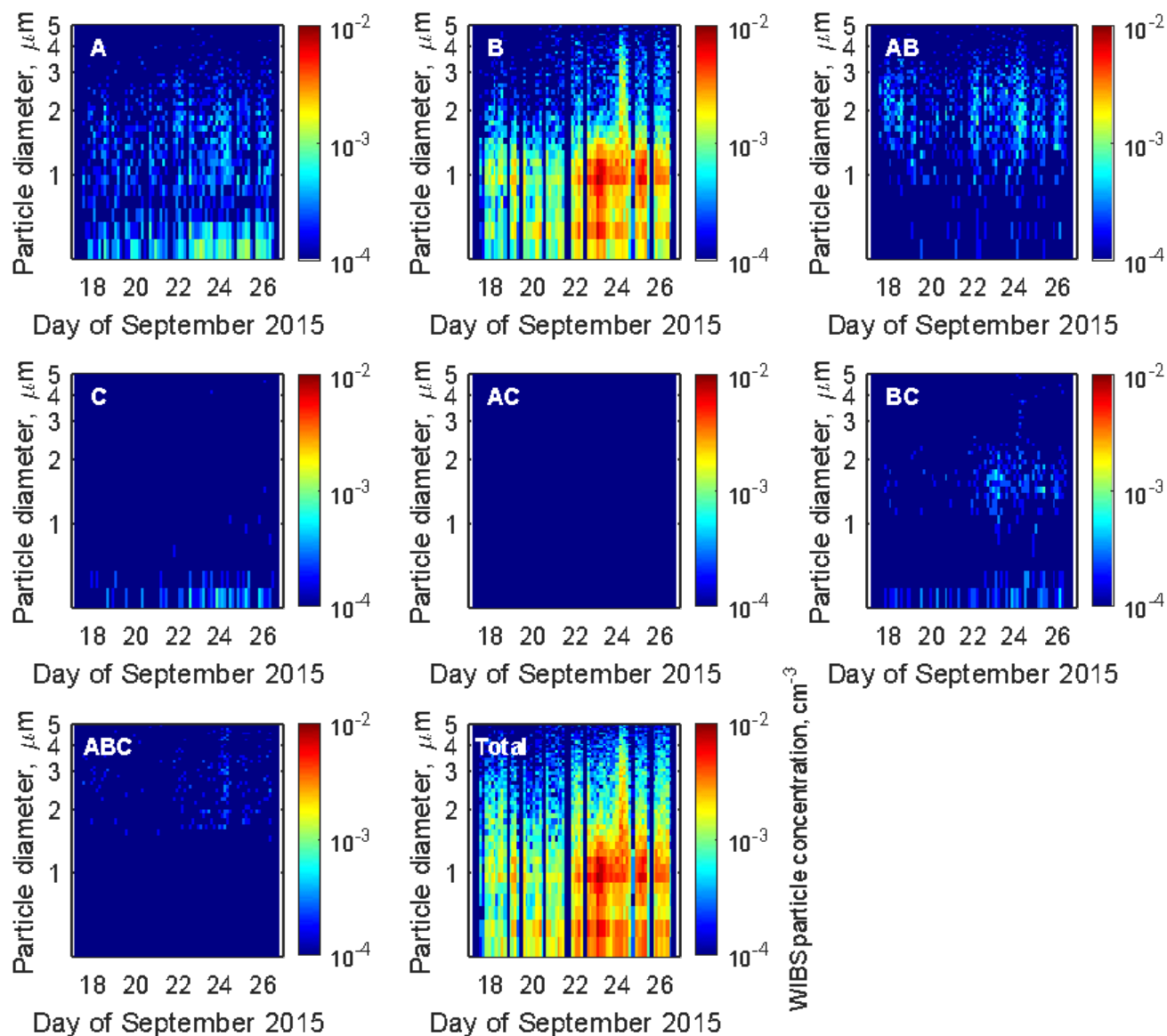



Figure S2. WIBS time series heatmaps by particle type (A, B, AB, C, AC, BC, and ABC) as well as total (all fluorescing particles measured by the WIBS which are categorized into one of the seven types). The WIBS measures the concentration of particles with diameter 0.4 - 20 μm, but the y-axis has been truncated at 5 μm to show more detail in the range that held most particles.

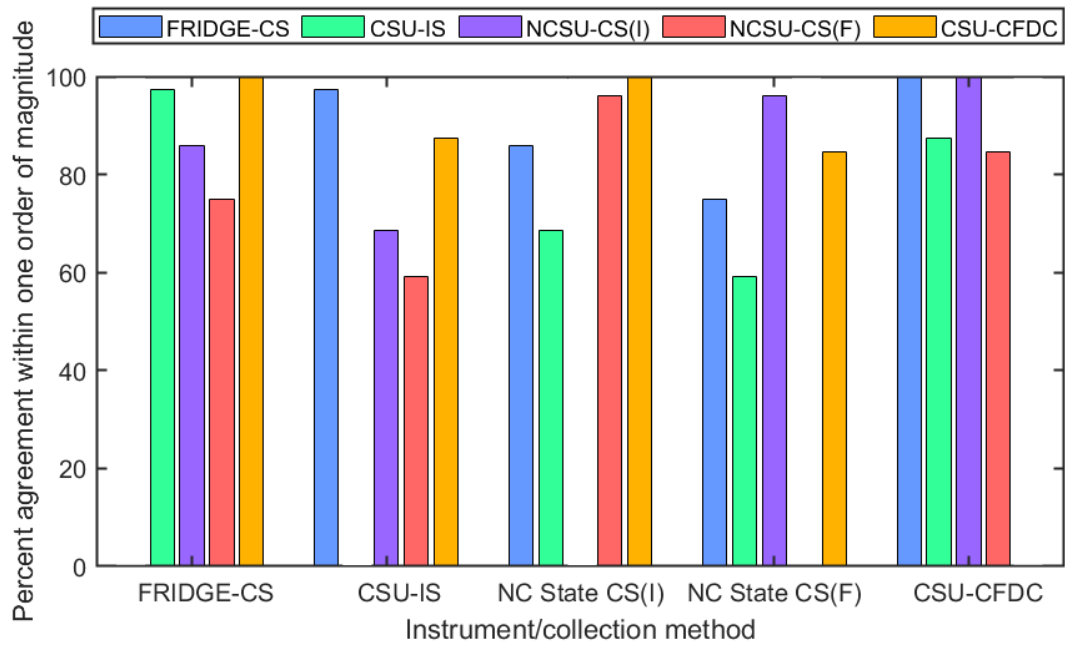



Figure S3. The percent of immersion INP measurements in which all instrument pairs agreed within one order of magnitude are shown for each pair of ice nucleation instruments.

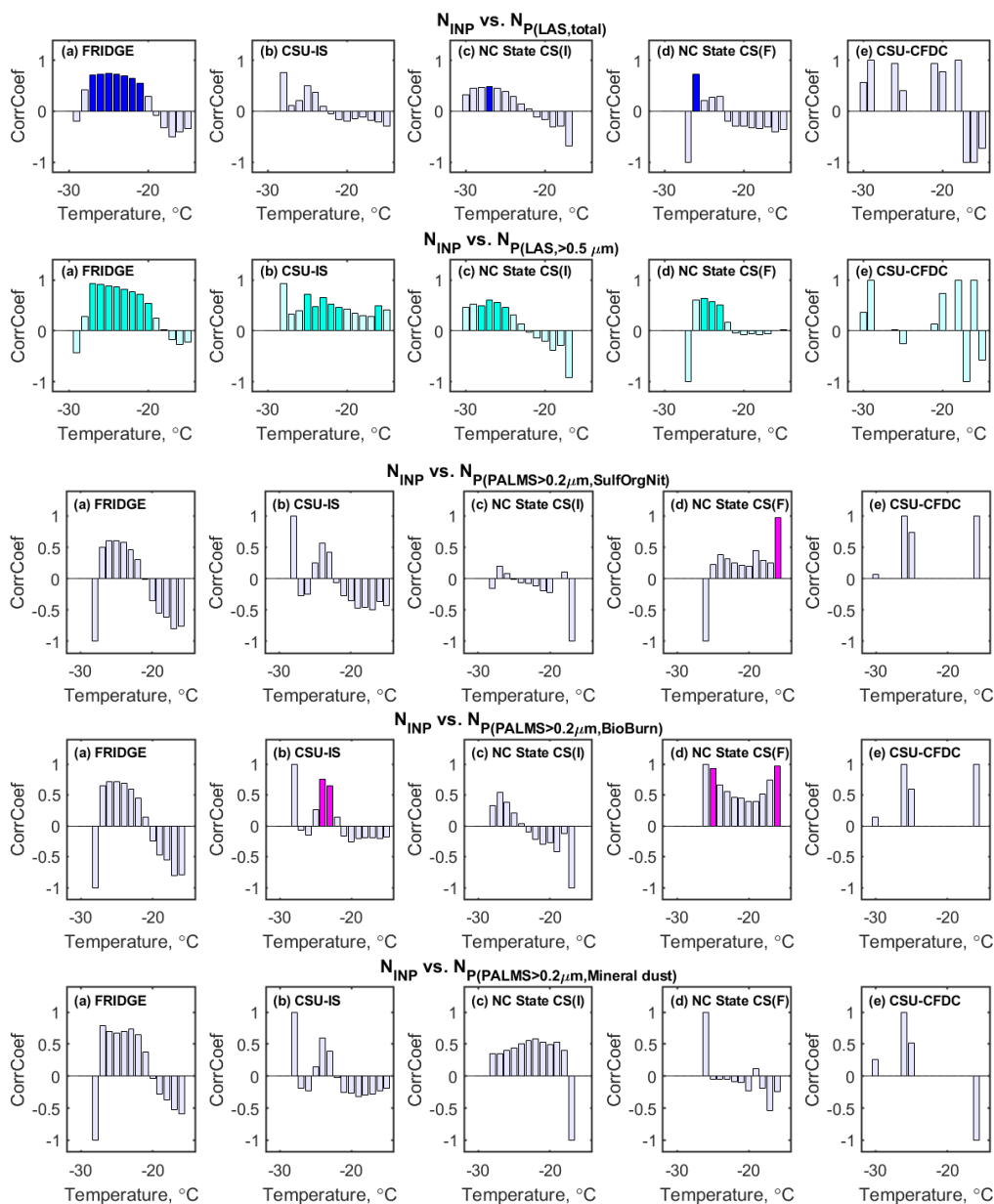



Figure S4a. Correlation coefficients in 1°C temperature bins for INPs measured by different methods with aerosol number concentrations from the LAS in all size bins and at sizes > 0.5 μm, and with number concentrations of PALMS sulfate/organic/nitrate, biomass burning and mineral dust particle particle types at sizes > 0.2 μm (Bright-colored bar = p < 0.05, Light-colored bar = p > 0.10 or p = NaN when there were too few samples per bin to derive the p-value)

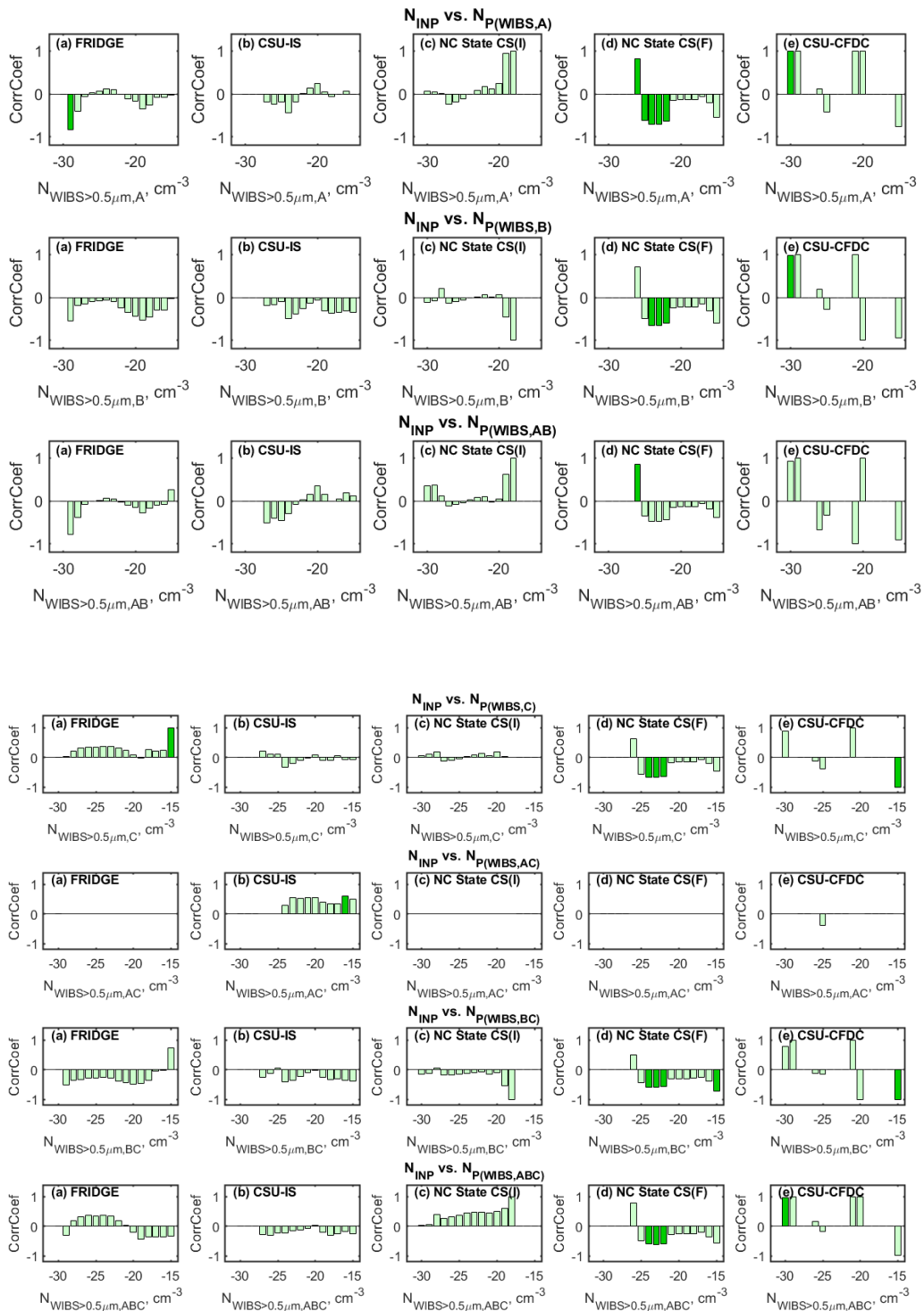



Figure S4b. Correlation coefficients in 1°C temperature bins for INPs measured by different methods with WIBS category concentrations at sizes > 0.5 μm (Bright-colored bar = p < 0.05, Light-colored bar = p > 0.10 or p = NaN)

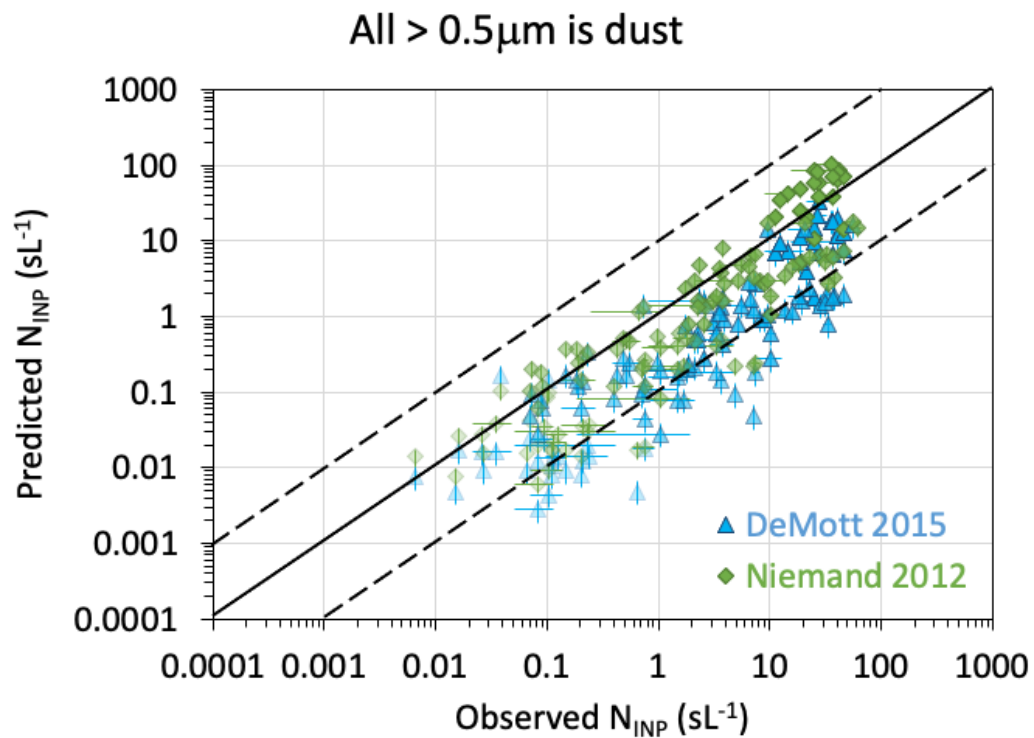



Figure S5. As in Figure 8 of the main manuscript, but for dust INP parameterizations on the assumption that all particles at sizes above 0.5 μm are dust particles.