

Table S1. Instrument performance summary for the King Air and HU-25 Falcon during ACTIVATE. OK = functioned well during the entire flight; “So So” = some loss of data quantity/quality; N/A = no usable data. Deployments are separated by blank rows: Deployment 1 (RF1-RF22), Deployment 2 (RF23-RF40), Deployment 3 (RF41-RF61), Deployment 4 (RF62-RF93), Deployment 5 (RF94-RF148), Deployment 6 (RF149-RF179).

RF	Date	King Air			Falcon												
		AVAPS	HSRL-2	RSP	DLH	Trace Gas	TAMMS	LARGE CDP/CAS	FCDP/2DS	LARGE Microphysics	LARGE Optical	CCN	AMS	PILS	AC3 Cloud Water	CVI	State Variables
1	2/14/2020	OK	OK	OK	OK	So So	OK	So So	OK	OK	OK	OK	OK	OK	OK	N/A	OK
2	2/15/2020	OK	OK	OK	OK	So So	OK	So So	OK	OK	OK	OK	OK	OK	OK	OK	OK
3	2/17/2020	OK	OK	OK	OK	So So	OK	So So	OK	OK	OK	OK	OK	OK	OK	OK	OK
4	2/21/2020	N/A	N/A	N/A	OK	So So	OK	So So	OK	OK	OK	OK	OK	OK	N/A	OK	OK
5	2/22/2020	N/A	N/A	N/A	OK	So So	OK	So So	OK	OK	OK	OK	OK	OK	OK	OK	OK
6	2/22/2020	N/A	N/A	N/A	OK	So So	OK	So So	OK	OK	OK	OK	OK	OK	OK	OK	OK
7	2/23/2020	N/A	N/A	N/A	OK	So So	OK	So So	OK	OK	OK	OK	OK	OK	N/A	OK	OK
8	2/23/2020	N/A	N/A	N/A	OK	So So	OK	So So	OK	OK	OK	OK	OK	OK	N/A	OK	OK
9	2/27/2020	OK	OK	OK	OK	So So	OK	So So	OK	OK	OK	OK	OK	OK	OK	OK	OK
10	2/28/2020	OK	OK	OK	OK	OK	OK	So So	OK	OK	OK	OK	OK	OK	OK	OK	OK
11	2/28/2020	OK	OK	OK	OK	OK	OK	So So	OK	OK	OK	OK	OK	OK	OK	OK	OK
12	2/29/2020	OK	OK	OK	OK	OK	OK	So So	OK	OK	OK	OK	OK	OK	OK	OK	OK
13	3/1/2020	OK	OK	OK	OK	OK	OK	So So	OK	OK	OK	OK	OK	OK	OK	OK	OK
14	3/1/2020	OK	OK	OK	OK	OK	OK	So So	OK	OK	OK	OK	OK	OK	OK	OK	OK
15	3/2/2020	OK	OK	OK	OK	OK	OK	So So	OK	OK	OK	OK	OK	OK	OK	OK	OK
16	3/6/2020	OK	OK	OK	OK	OK	OK	So So	OK	OK	OK	OK	OK	OK	OK	OK	OK
17	3/8/2020	OK	OK	N/A	OK	OK	OK	So So	So So	OK	OK	OK	OK	OK	OK	OK	OK
18	3/8/2020	OK	OK	N/A	OK	OK	OK	So So	So So	OK	OK	OK	OK	OK	OK	OK	OK
19	3/9/2020	OK	OK	OK	OK	OK	OK	So So	So So	OK	OK	OK	OK	OK	OK	OK	OK
20	3/11/2020	OK	OK	OK	OK	OK	OK	So So	So So	OK	OK	OK	So So	OK	OK	OK	OK
21	3/12/2020	OK	OK	OK	OK	OK	OK	So So	So So	OK	OK	OK	So So	OK	OK	OK	OK
22	3/12/2020	OK	OK	OK	OK	OK	OK	So So	So So	OK	OK	OK	So So	OK	OK	OK	OK

23	8/13/2020	OK	OK	OK	OK	OK	OK	OK	OK	OK	OK	OK	OK	N/A	OK	OK	OK
24	8/17/2020	OK	OK	OK	OK	OK	OK	OK	OK	OK	OK	OK	OK	OK	OK	OK	OK
25	8/20/2020	OK	OK	OK	OK	OK	OK	OK	OK	OK	OK	OK	OK	OK	OK	OK	OK
26	8/21/2020	OK	OK	OK	OK	OK	OK	OK	OK	OK	So So	OK	OK	OK	OK	OK	OK
27	8/25/2020	OK	OK	OK	OK	OK	OK	OK	OK	OK	So So	OK	OK	OK	OK	OK	OK
28	8/26/2020	OK	OK	OK	OK	OK	OK	OK	OK	OK	So So	OK	OK	OK	OK	OK	OK
29	8/28/2020	OK	OK	OK	OK	OK	OK	OK	OK	OK	So So	OK	OK	OK	OK	OK	OK
30	9/2/2020	OK	OK	OK	OK	OK	OK	OK	OK	OK	OK	OK	OK	OK	OK	OK	OK
31	9/3/2020	OK	OK	OK	OK	OK	OK	OK	OK	OK	OK	OK	OK	OK	OK	OK	OK
32	9/10/2020	OK	OK	OK	OK	OK	OK	OK	OK	OK	OK	OK	OK	OK	OK	OK	OK
33	9/11/2020	OK	OK	OK	OK	OK	OK	OK	OK	OK	OK	OK	OK	OK	OK	OK	OK
34	9/15/2020	OK	OK	OK	OK	OK	OK	OK	OK	OK	OK	N/A	OK	OK	OK	OK	OK
35	9/16/2020	N/A	N/A	OK	OK	OK	OK	OK	OK	OK	OK	N/A	OK	OK	OK	OK	OK
36	9/21/2020	OK	OK	OK	OK	OK	OK	OK	OK	OK	OK	N/A	OK	OK	OK	OK	OK
37	9/22/2020	OK	OK	OK	OK	OK	OK	OK	OK	OK	OK	So So	OK	OK	OK	OK	OK
38	9/23/2020	OK	OK	OK	OK	OK	OK	OK	OK	OK	OK	So So	OK	OK	OK	OK	OK
39	9/29/2020	OK	OK	OK	OK	OK	OK	OK	OK	OK	OK	So So	OK	OK	OK	OK	OK
40	9/30/2020	OK	OK	OK	OK	OK	OK	OK	OK	OK	OK	So So	OK	OK	OK	OK	OK

41	1/27/2021	N/A	N/A	N/A	OK	OK	OK	So So	OK	So So	OK	OK	N/A	OK	OK	So So	OK
42	1/29/2021	OK	OK	OK	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A
43	1/29/2021	N/A	N/A	N/A	OK	OK	OK	So So	OK	OK	OK	OK	OK	OK	OK	OK	OK
44	2/3/2021	OK	OK	OK	OK	OK	OK	So So	OK	OK	OK	OK	OK	OK	OK	OK	OK
45	2/10/2021	OK	OK	OK	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A
46	2/20/2021	OK	OK	OK	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A
47	2/21/2021	OK	OK	OK	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A
48	3/4/2021	OK	OK	OK	OK	N/A	OK	So So	OK	OK	OK	OK	N/A	N/A	OK	N/A	OK

49	3/5/2021	OK	OK	OK	OK	N/A	OK	So So	OK	OK	OK	OK	N/A	N/A	OK	N/A	OK
50	3/5/2021	OK	OK	OK	OK	N/A	OK	So So	OK	OK	OK	OK	N/A	N/A	OK	N/A	OK
51	3/8/2021	OK	OK	OK	OK	N/A	OK	So So	OK	OK	OK	OK	N/A	N/A	OK	N/A	OK
52	3/9/2021	OK	OK	OK	OK	N/A	OK	So So	OK	OK	OK	OK	N/A	N/A	OK	N/A	OK
53	3/12/2021	OK	OK	OK	OK	N/A	OK	So So	OK	OK	OK	OK	N/A	N/A	OK	N/A	OK
54	3/12/2021	OK	OK	OK	OK	N/A	OK	So So	OK	OK	OK	OK	N/A	N/A	OK	N/A	OK
55	3/20/2021	OK	OK	OK	OK	N/A	OK	So So	OK	OK	OK	OK	N/A	N/A	OK	N/A	OK
56	3/23/2021	OK	OK	OK	OK	N/A	OK	So So	OK	OK	OK	OK	N/A	N/A	OK	N/A	OK
57	3/29/2021	OK	OK	OK	OK	N/A	OK	So So	OK	OK	OK	OK	N/A	N/A	OK	N/A	OK
58	3/30/2021	OK	OK	OK	OK	N/A	OK	So So	OK	OK	OK	OK	N/A	N/A	OK	N/A	OK
59	3/30/2021	OK	OK	OK	OK	N/A	OK	So So	OK	OK	OK	OK	N/A	N/A	OK	N/A	OK
60	4/2/2021	OK	OK	OK	OK	N/A	OK	So So	OK	OK	OK	OK	N/A	N/A	OK	N/A	OK
61	4/2/2021	OK	OK	N/A	OK	N/A	OK	So So	OK	OK	OK	OK	N/A	N/A	OK	N/A	OK

62	5/13/2021	OK	OK	OK	OK	OK	OK	So So	OK	OK	OK	OK	OK	OK	OK	N/A	OK
63	5/14/2021	OK	OK	OK	OK	OK	OK	So So	OK	OK	OK	OK	OK	OK	N/A	OK	OK
64	5/14/2021	OK	OK	OK	OK	OK	OK	So So	OK	OK	OK	OK	OK	OK	N/A	OK	OK
65	5/15/2021	OK	OK	OK	OK	OK	OK	So So	OK	OK	OK	OK	OK	OK	N/A	OK	OK
66	5/18/2021	OK	OK	OK	OK	OK	OK	So So	OK	OK	OK	OK	OK	OK	OK	OK	OK
67	5/19/2021	OK	OK	OK	OK	OK	OK	So So	OK	OK	OK	OK	OK	OK	OK	OK	OK
68	5/19/2021	OK	OK	OK	OK	OK	OK	So So	OK	OK	OK	OK	OK	OK	OK	OK	OK
69	5/20/2021	OK	OK	OK	OK	OK	OK	So So	OK	OK	OK	OK	OK	OK	OK	OK	OK
70	5/21/2021	OK	OK	OK	OK	OK	OK	So So	OK	OK	OK	OK	OK	OK	OK	OK	OK
71	5/21/2021	OK	OK	OK	OK	OK	OK	So So	OK	OK	OK	OK	OK	OK	OK	OK	OK
72	5/25/2021	OK	OK	OK	OK	OK	OK	So So	OK	OK	OK	OK	OK	OK	OK	OK	OK
73	5/26/2021	OK	OK	OK	OK	OK	OK	So So	OK	OK	OK	OK	OK	OK	OK	OK	OK
74	5/26/2021	OK	OK	OK	OK	OK	OK	So So	OK	OK	OK	OK	OK	OK	OK	OK	OK
75	6/1/2021	OK	OK	OK	OK	OK	OK	So So	OK	OK	OK	OK	OK	OK	OK	OK	OK
76	6/2/2021	OK	OK	OK	OK	OK	OK	So So	OK	OK	OK	OK	OK	OK	OK	OK	OK
77	6/2/2021	OK	OK	OK	OK	OK	OK	So So	OK	So So	OK	OK	OK	OK	OK	OK	OK
78	6/5/2021	OK	OK	OK	OK	OK	OK	So So	OK	So So	OK	OK	OK	OK	OK	OK	OK
79	6/7/2021	OK	OK	OK	OK	OK	OK	So So	OK	So So	OK	OK	OK	OK	OK	OK	OK

111	1/26/2022	OK	OK	OK	OK	OK	OK	OK	OK	OK	OK	OK	OK	OK	OK	OK	OK
112	1/26/2022	OK	OK	OK	OK	OK	OK	OK	OK	OK	OK	OK	OK	OK	OK	OK	OK
113	1/27/2022	OK	OK	OK	OK	OK	OK	OK	OK	OK	OK	OK	OK	OK	OK	OK	OK
114	1/27/2022	OK	OK	N/A	OK	OK	OK	OK	OK	OK	OK	OK	OK	OK	OK	OK	OK
115	2/1/2022	OK	OK	OK	OK	OK	OK	OK	OK	OK	OK	OK	OK	OK	OK	OK	OK
116	2/2/2022	OK	OK	OK	OK	OK	OK	OK	OK	OK	OK	OK	OK	OK	OK	OK	OK
117	2/3/2022	OK	OK	OK	OK	OK	OK	OK	OK	OK	OK	OK	OK	OK	OK	OK	OK
118	2/3/2022	OK	OK	OK	OK	OK	OK	OK	OK	OK	OK	OK	N/A	OK	OK	So So	OK
119	2/5/2022	OK	OK	OK	OK	OK	OK	OK	OK	OK	OK	OK	OK	OK	OK	OK	OK
120	2/15/2022	OK	OK	OK	OK	OK	OK	OK	OK	OK	OK	OK	OK	OK	OK	OK	OK
121	2/15/2022	OK	OK	OK	OK	OK	OK	OK	OK	OK	OK	OK	OK	OK	OK	OK	OK
122	2/16/2022	OK	OK	OK	OK	OK	OK	OK	OK	OK	OK	OK	OK	OK	OK	OK	OK
123	2/16/2022	OK	OK	OK	OK	OK	OK	OK	OK	OK	OK	OK	OK	OK	OK	OK	OK
124	2/19/2022	OK	OK	OK	OK	OK	OK	OK	OK	OK	OK	OK	OK	OK	OK	OK	OK
125	2/19/2022	OK	OK	OK	OK	OK	OK	OK	OK	OK	OK	OK	OK	OK	OK	OK	OK
126	2/22/2022	OK	OK	OK	OK	OK	OK	OK	OK	OK	OK	OK	OK	OK	OK	OK	OK
127	2/22/2022	OK	OK	OK	OK	OK	OK	OK	OK	OK	OK	OK	OK	OK	OK	OK	OK
128	2/26/2022	OK	OK	OK	OK	OK	OK	OK	OK	OK	OK	OK	OK	OK	OK	OK	OK
129	2/26/2022	N/A	N/A	OK	OK	OK	OK	OK	OK	OK	OK	OK	OK	OK	OK	OK	OK
130	3/2/2022	OK	OK	OK	OK	OK	OK	OK	OK	OK	OK	OK	OK	OK	OK	OK	OK
131	3/3/2022	OK	OK	OK	OK	OK	OK	OK	OK	OK	OK	OK	OK	OK	OK	OK	OK
132	3/3/2022	OK	OK	OK	OK	OK	OK	OK	OK	OK	OK	OK	OK	OK	OK	OK	OK
133	3/4/2022	OK	OK	OK	OK	OK	OK	OK	OK	OK	OK	OK	OK	OK	OK	OK	OK
134	3/4/2022	OK	OK	OK	OK	OK	OK	OK	OK	OK	OK	OK	OK	OK	OK	OK	OK
135	3/7/2022	OK	OK	OK	OK	OK	OK	OK	OK	OK	OK	OK	OK	So So	OK	OK	OK
136	3/7/2022	N/A	N/A	N/A	OK	OK	OK	OK	OK	OK	OK	OK	OK	So So	OK	OK	OK
137	3/13/2022	OK	OK	OK	OK	So So	OK	OK	OK	OK	OK	So So	OK	OK	OK	OK	OK
138	3/13/2022	OK	OK	OK	OK	OK	OK	OK	OK	OK	OK	So So	OK	OK	OK	OK	OK

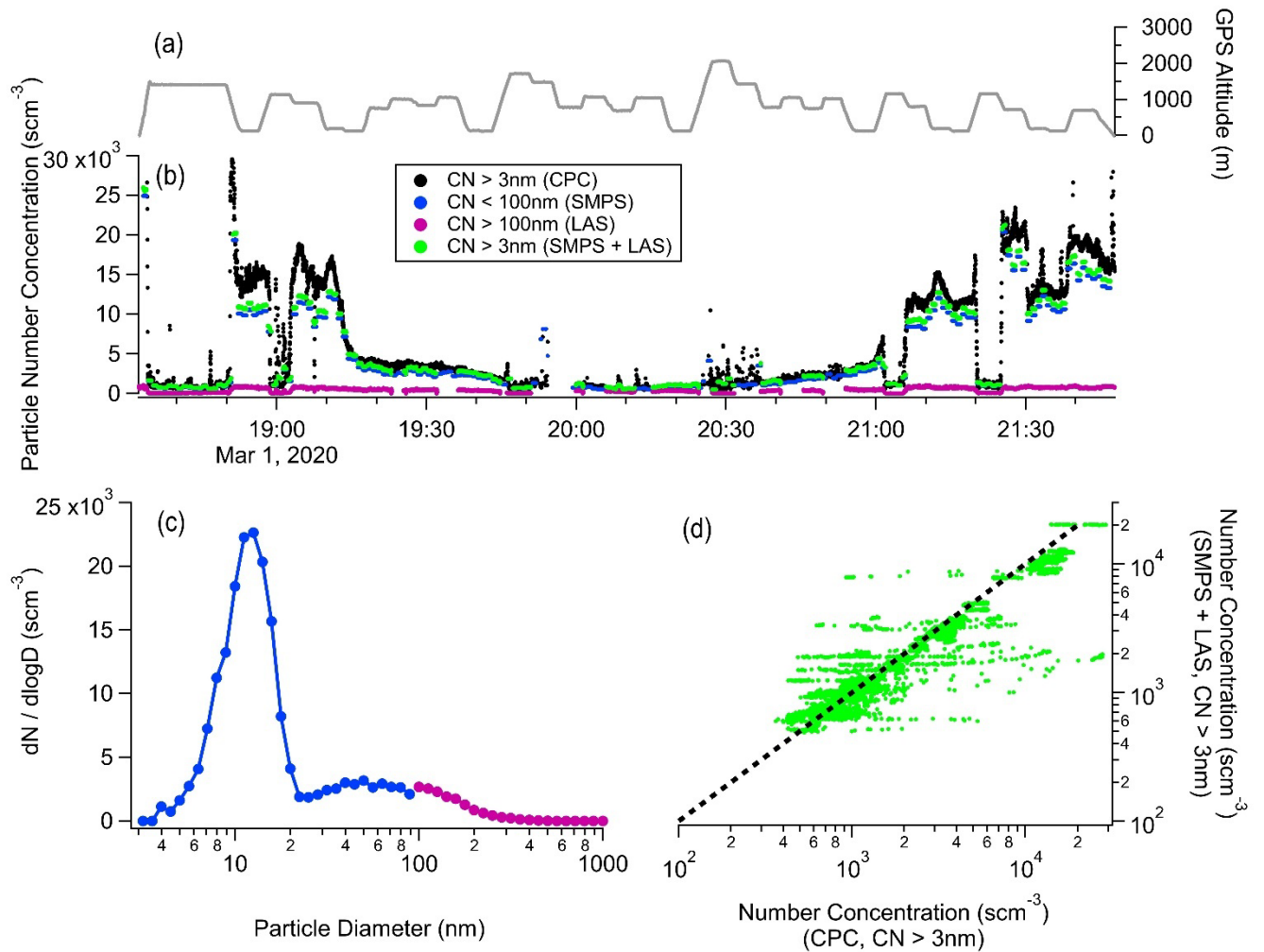


Figure S1: Closure analysis for particle number concentration measurements derived from an ultrafine CPC, SMPS, and LAS. (a-b) Timeseries data are shown for Research Flight 14 (1 March 2020), (c) an average size distribution during a MinAlt leg at approximately UTC 21:17, and (d) a scatterplot of the integrated number concentration derived from LAS+SMPS instruments against number concentration directly measured by a CPC.