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Supplemental Material

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Supplemental Figures

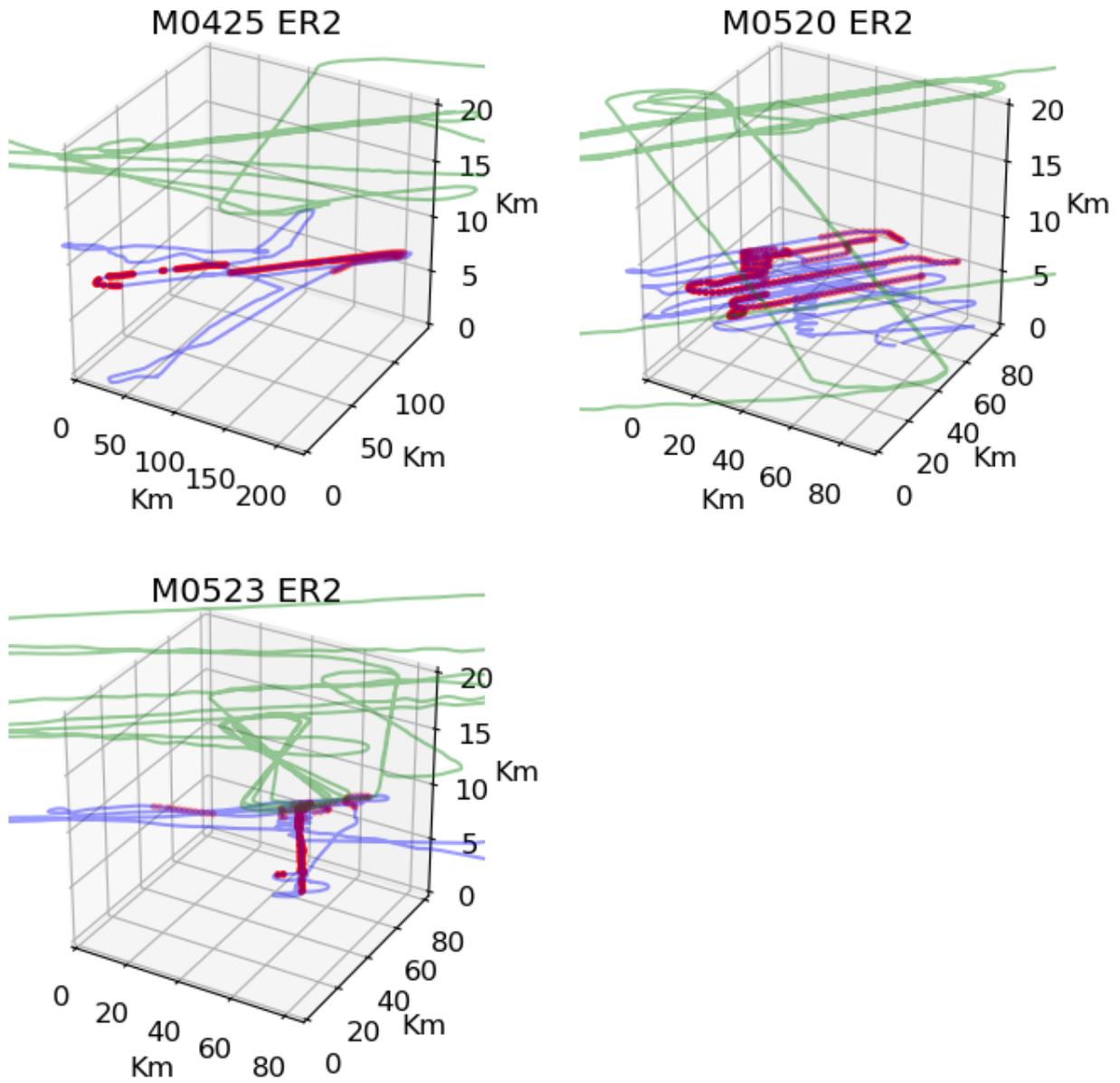


Figure S1

Flight tracks for the radar aircraft (green) and the *in-situ* aircraft (blue) during MC3E IOPs. Collocated observations are highlighted in red.

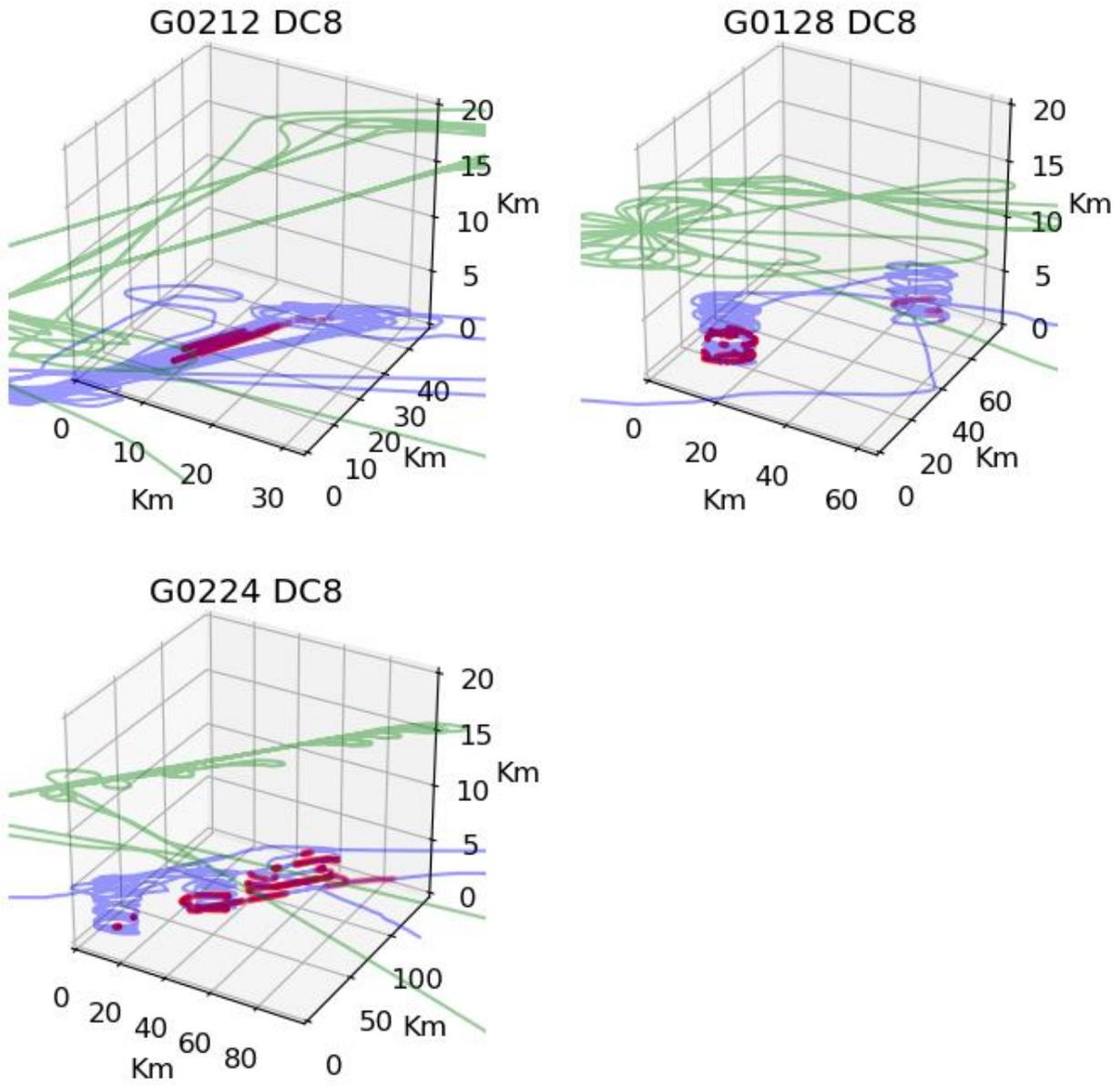


Figure S2

As in Figure S1, but for all GCPEX IOPs.

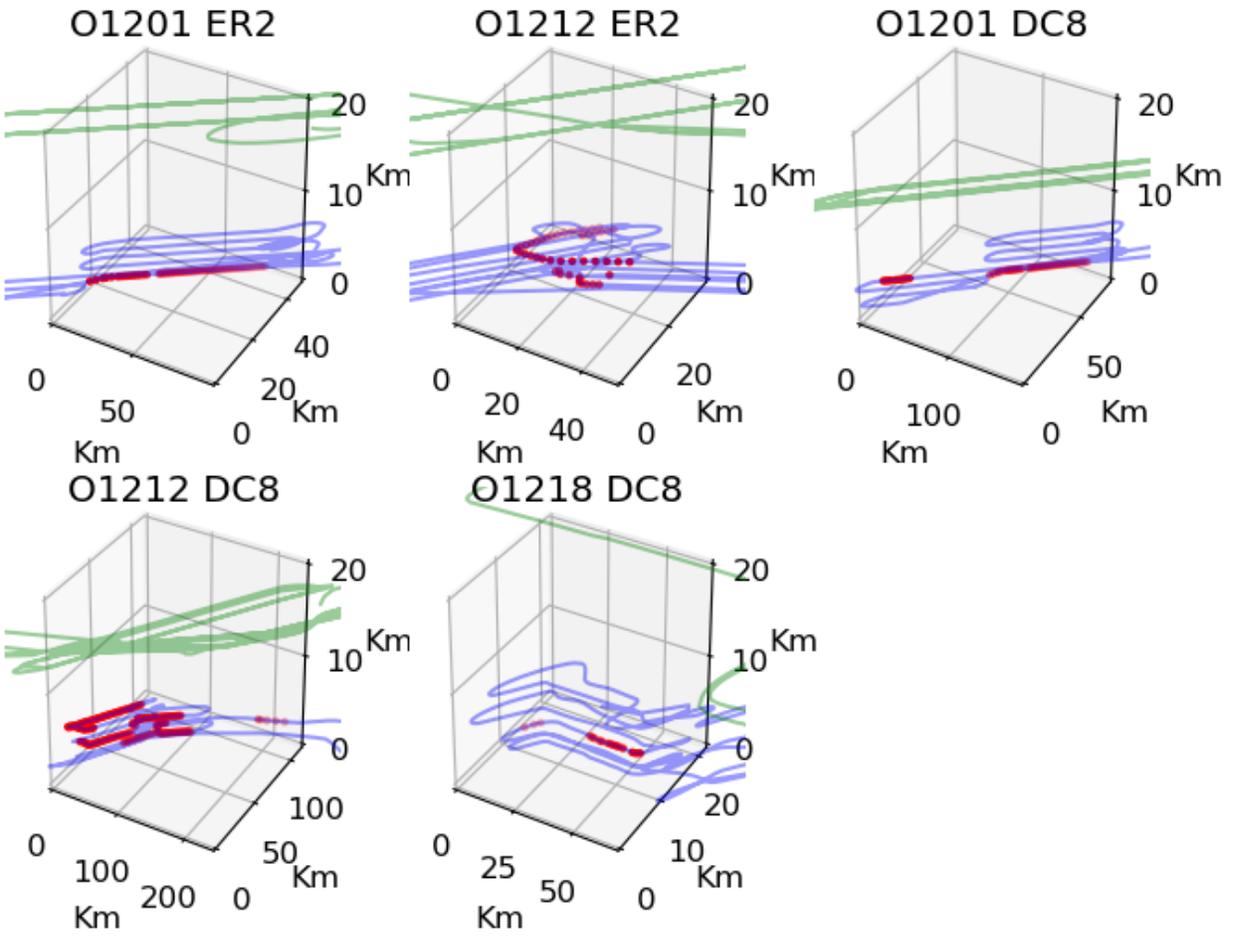


Figure S3

As in Figure S1, for all OLYMPEX IOPs

Supplemental Tables

	C₁ (mm ⁻⁵ m ³) ^{-C₂}	C₂	C₃ dB ^{-C₄}	C₄	C₅ dB ^{-C₆}	C₆
all	0.32	0.19	0.43	0.25	0.06	1.17
GCPEX	0.43	0.18	0.59	0.25	0.01	1.65
MC3E	0.37	0.11	0.42	0.27	0.04	1.00
OLYMPEX	0.29	0.18	0.44	0.25	0.07	1.00
G0128	0.42	0.12	0.56	0.11	0.00	0.00
G0212	0.66	0.10	0.78	0.25	0.01	1.00
G0224	0.43	0.20	0.62	0.25	0.00	2.68
M0425	0.55	0.00	0.51	0.25	0.00	1.00
M0520	0.18	0.27	0.34	0.48	0.00	0.00
M0523	0.70	0.00	0.57	0.24	0.00	0.00
O1201	0.28	0.19	0.52	0.33	0.00	1.00
O1212	0.31	0.16	0.49	0.25	0.01	2.73
O1218	0.13	0.38	0.70	0.25	0.00	3.72
T₄	0.59	0.00	0.52	0.28	0.00	0.00
T₃	0.30	0.17	0.45	0.25	0.04	1.00
T₂	0.26	0.25	0.39	0.25	0.10	1.00
T₁	0.48	0.12	0.42	0.25	0.06	1.10

Table S1

Regression values of $Z_{Ku}-D_m$ and $DWR-D_m$ empirical relationships plotted in this study. c_2 , c_4 , and c_6 are unitless exponents. Only one $Z_{Ka}-D_m$ relationships is provided in this study, for the composite datasite. The c_1 and c_2 for that relationship are 0.56 (mm⁻⁵m³)^{-C₂} and 0.06, respectively.

	D_m min (mm)	D_m max (mm)	DWR min (mm)	DWR max (dB)	Z_{Ku} min (dBZ)	Z_{Ku} max (dBZ)	T min (°C)	T max (°C)
GCPEX	0.3	1.9	-0.2	10.6	7.1	30.2	-23	-4
MC3E	0.2	1.2	-0.2	6.7	3.3	33.2	-43	-5
OLYMPEX	0.3	1.4	0.3	9.0	6.0	30.4	-23	-3
G0128	0.3	0.9	-0.2	3.8	7.1	15.9	-23	-4
G0212	0.4	1.7	-0.2	8.3	10.6	30.2	-18	-11
G0224	0.3	1.9	0.5	10.6	8.3	28.4	-18	-4
M0425	0.3	0.9	0.1	6.7	5.5	24.8	-35	-18
M0520	0.2	0.8	-0.2	3.6	5.8	20.0	-23	-5
M0523	0.4	1.2	0.9	5.7	3.3	33.2	-43	-22
O1201	0.5	1.1	0.7	9.0	15.9	28.8	-6	-3
O1212	0.3	1.4	0.3	4.8	6.0	30.4	-23	-4
O1218	0.4	1.4	1.7	6.4	16.1	27.1	-8	-5
T₄	0.3	1.1	0.2	5.7	5.5	33.2	-40	-30
T₃	0.2	1.2	-0.2	6.7	5.8	24.8	-30	-20
T₂	0.3	1.7	-0.2	10.3	7.0	30.2	-20	-10
T₁	0.3	1.9	0.7	10.6	7.6	30.4	-10	-3

Table S2

Ranges of radar measurements and *in-situ* properties for different data subsets