Supplementary Materials: The influence of drop size distributions on the relationship between liquid water content and radar reflectivity in radiation fogs

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1 **1. Statistics of meteorological and microphysical variables**

Table S1. Minima of meteorological and microphysical variables.

Nr	Phase	Nt	Nmax	rc	VIS	t	rh	ws
1	F	1.73	4.70×10^{-1}	1.25	8.00×10^{-2}	-0.65	92	0.05
1	M	1.64×10^{1}	1.73	1.25	6.00×10^{-2}	-0.75	96	0.06
1	D	1.09×10^{1}	2.05	1.25	1.00×10^{-1}	-0.75	96	0.04
2	F	3.78	1.42	1.25	5.00×10^{-2}	6.15	92	0.12
2	M	7.90×10^{-1}	3.10×10^{-1}	1.25	2.00×10^{-2}	2.90	93	0.09
2	D	3.20×10^{-1}	3.20×10^{-1}	1.25	1.00×10^{-1}	3.00	96	0.17
3	F	0.00	0.00	1.25	5.00×10^{-2}	-3.42	90	0.02
3	M	0.00	0.00	1.25	5.00×10^{-2}	-2.82	95	0.18
3	D	0.00	0.00	1.25	8.00×10^{-2}	-2.82	96	0.25

Table S2. Maxima of meteorological and microphysical variables.

Nr	Phase	Nt	Nmax	rc	VIS	t	rh	ws
1	F	9.14×10^{3}	2.61×10^{3}	5.25	1.92×10^{1}	4.28	96	1.08
1	M	3.00×10^{3}	6.33×10^{2}	6.75	6.80×10^{-1}	-0.26	96	0.77
1	D	4.53×10^{2}	1.22×10^{2}	5.25	1.55	1.71	97	0.57
2	F	3.99×10^{3}	1.05×10^{3}	2.75	3.08	8.13	94	0.92
2	M	3.32×10^{3}	9.01×10^{2}	6.75	9.80×10^{-1}	6.05	96	0.69
2	D	2.66×10^{3}	6.41×10^{2}	2.75	4.08	6.94	97	3.01
3	F	1.98×10^{3}	4.63×10^{2}	5.25	2.95	-1.25	95	0.64
3	M	7.19×10^{2}	1.33×10^{2}	5.75	1.80×10^{-1}	-1.44	96	1.01
3	D	4.22×10^{2}	8.33×10^{1}	3.25	1.98	-0.85	96	1.15

2 Nr stands for the fog number, the different life cycle phases are abbreviated by F = Formation
3 phase, M = Mature phase and D = Dissipation phase. The columns, from left to right, represent total
4 drop count (N_t in cm^{-3}), mode radius drop count (N_{max} in cm^{-3}), mode radius (r_c in μm), visibility
5 (VIS in km), temperature (t in $°C$), relative humidity (rh in %) as well as wind speeds (ws in ms^{-1}) –
6 always referring to the whole life cycle phase.

7 **2. Derived parameters of the modified gamma distribution**

8 Parameters of the modified gamma distribution (MGD) were derived for each minute-averaged
9 spectrum as well as for the three stage-averaged spectra. Figure S1 depicts r_c, γ and α of fog event 1
10 plotted against each other. Circles represent MGD parameter sets derived from spectra of the formation
11 stage, while crosses those of mature fog and squares those of the dissipation stage. Different gray
12 values mean different "depths" in the cube. Light gray coloring means that the point is in the back of
13 the cube (small r_c, large γ and small α values result in a very light gray) whereas dark gray coloring
14 means that the point is in the front of the cube (large r_c, small γ and large α values result in a very dark
15 gray). The formation stage showed a wide range of r_c (0.003 μm to 3.74 μm) and γ (0.22 μm to 9.99 μm)
16 values, especially for low α values. As α increases the ranges of r_c and γ diminish, resulting in a dense
17 agglomeration for $\alpha = 10$. Most parameter sets of mature fog are distributed along a straight line for
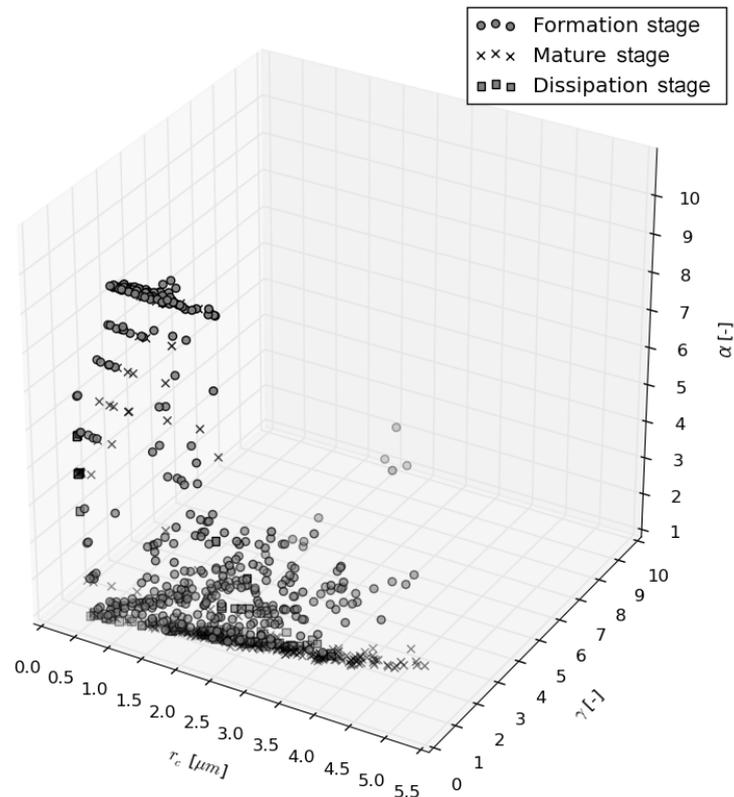
Figure S1. MGD parameters of fog event 1.

$\alpha = 1$ and very few sets for $\alpha > 1$. γ varied between 0.16 and 2.94 whereas r_c varied between 0.07 µm and 4.73 µm. Higher r_c values were significantly correlated with higher γ values. The dissipation and mature stages displayed similar distributions of the parameter sets, although α values only reached 6 in the latter case.

Figure S2 shows the same information for fog event 2. The formation sets were well spread over all α values with maximal occurrence at $\alpha = 1$ and $\alpha = 10$. r_c values varied only between 0.50 µm and 2.50 µm while γ values ranged from 0.19 to 3.17. Parameters of the mature stage were widely spread over all axes (r_c: 0.50 µm to 8.61 µm, γ: 0.14 to 10.00, α: 1 to 10). Parameter sets of the dissipation stage were characterized by a small range in r_c values (0.50 µm to 2.61 µm) and a larger γ range (0.20 to 10.00) while α values still varied between 1 and 10.

Parameters of fog event 3 are plotted in Figure S3. Again, sets of the formation stage were widely spread over all three dimensions with r_c between 0.50 µm and 5.12 µm, γ between 0.22 and 9.99 and α between 1 and 10. The mature stage showed a clear agglomeration at the lower end of the γ-axis, which was most significant for small α values. However, the ranges were approximately the same as during formation. The dissipation stage showed similar distributions with maximum r_c values reaching 5.04 µm.
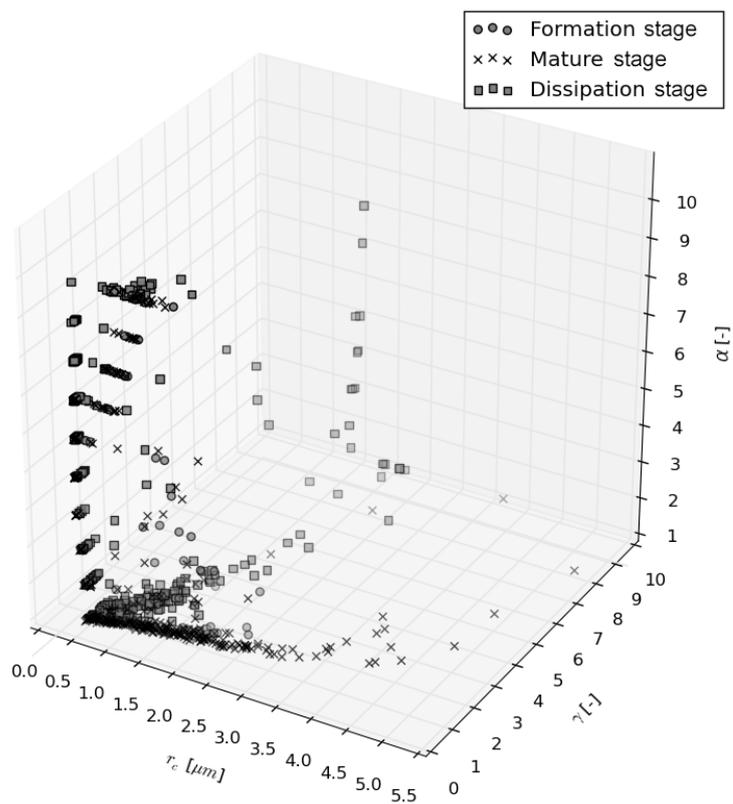
Figure S2. MGD parameters of fog event 2.
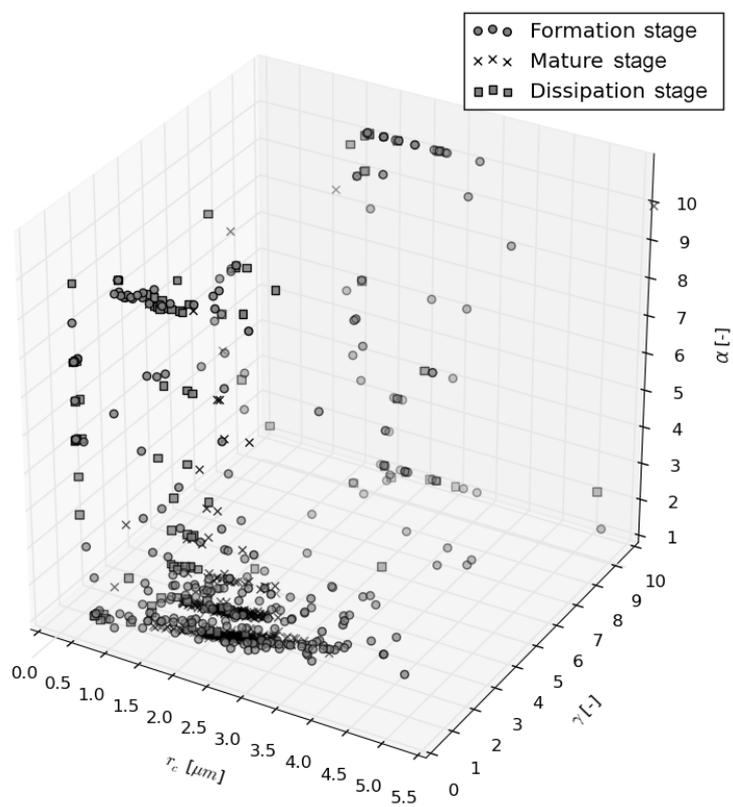
Figure S3. MGD parameters of fog event 3.