

Supplementary Material (ACP-2022-380)

5 **Table S1.** The daily Dust Optical Depth at 532 nm (DOD^{532}) for dust fine (D_f), dust coarse (D_c) and total dust (DD) along the particular dust periods for the five lidar stations (ARN, GRA, EVO, TRJ and BCN). The standard deviation values are in brackets. The D_f -to-total dust DOD^{532} ratio (ftr_DOD) is also included.

	DOD^{532}	25 Mar	26 Mar	27 Mar	28 Mar	29 Mar	30 Mar	31 Mar	1 Apr	2 Apr	3 Apr	4 Apr	5 Apr	6 Apr	7 Apr	25 mar - 7 Apr
ARN	DD	0.07 (0.03)	0.44 (0.16)	0.77 (0.13)	0.17 (0.03)	1.02 (0.26)	0.66 (0.04)	0.78 (0.27)	-	0.09 (0.04)	0.15 (0.04)	0.09 (0.04)	0.08 (0.02)	0.07 (0.01)	0.05 (0.02)	0.34 (0.35)
	D_c	0.05 (0.02)	0.31 (0.11)	0.55 (0.08)	0.12 (0.02)	0.76 (0.16)	0.47 (0.04)	0.54 (0.18)	-	0.06 (0.03)	0.10 (0.03)	0.06 (0.03)	0.05 (0.01)	0.05 (0.01)	0.03 (0.01)	0.24 (0.25)
	D_f	0.02 (0.01)	0.13 (0.05)	0.22 (0.06)	0.05 (0.01)	0.26 (0.11)	0.19 (0.01)	0.24 (0.09)	-	0.03 (0.01)	0.05 (0.01)	0.03 (0.01)	0.03 (0.01)	0.02 (0.01)	0.02 (0.01)	0.10 (0.10)
	ftr_DOD (%)	28.6	29.5	28.6	29.4	25.5	28.8	30.8	-	33.3	33.3	33.3	37.5	28.6	40.0	29.4
GRA	DD	-	0.17 (0.07)	0.15 (0.03)	0.12 (0.04)	0.60 (0.04)	0.55 (0.05)	0.32 (0.07)	-	-	-	-	0.06 (0.01)	-	-	0.28 (0.22)
	D_c	-	0.12 (0.05)	0.10 (0.02)	0.09 (0.25)	0.43 (0.05)	0.43 (0.04)	0.22 (0.05)	-	-	-	-	0.04 (0.01)	-	-	0.20 (0.16)
	D_f	-	0.05 (0.02)	0.05 (0.01)	0.03 (0.02)	0.17 (0.02)	0.12 (0.1)	0.10 (0.02)	-	-	-	-	0.02 (0.01)	-	-	0.08 (0.06)
	ftr_DOD (%)	-	29.4	33.3	25.0	28.3	21.8	31.3	-	-	-	-	33.3	-	-	28.6
EVO	DD	0.13 (0.02)	0.32 (0.11)	0.33 (0.05)	0.15 (0.06)	0.26 (0.15)	0.36 (0.11)	0.24 (0.07)	-	0.09 (0.08)	0.09 (0.04)	0.14 (0.08)	0.06 (0.03)	-	-	0.20 (0.11)
	D_c	0.09 (0.01)	0.24 (0.07)	0.23 (0.03)	0.10 (0.04)	0.18 (0.11)	0.25 (0.08)	0.17 (0.04)	-	0.06 (0.05)	0.06 (0.03)	0.10 (0.06)	0.04 (0.02)	-	-	0.15 (0.08)

	<i>Df</i>	0.04 (0.01)	0.08 (0.05)	0.10 (0.02)	0.05 (0.02)	0.08 (0.05)	0.11 (0.03)	0.07 (0.02)	-	0.03 (0.02)	0.03 (0.01)	0.04 (0.02)	0.02 (0.01)	-	-	0.06 (0.03)
	<i>ftr_DOD (%)</i>	30.8	25.0	30.3	33.3	30.8	30.6	29.2	-	33.3	33.3	28.6	33.3	-	-	30.0
TRJ	<i>DD</i>	-	0.14 (0.10)	-	0.22 (0.05)	0.66 (0.03)	0.49 (0.06)	0.48 (0.21)	0.24 (0.13)	-	0.15 (0.07)	0.08 (0.03)	0.03 (0.01)	-	-	0.28 (0.22)
	<i>Dc</i>	-	0.10 (0.07)	-	0.15 (0.03)	0.46 (0.02)	0.35 (0.05)	0.33 (0.15)	0.17 (0.09)	-	0.11 (0.05)	0.05 (0.02)	0.02 (0.01)	-	-	0.19 (0.15)
	<i>Df</i>	-	0.04 (0.03)	-	0.07 (0.02)	0.20 (0.01)	0.14 (0.02)	0.15 (0.06)	0.07 (0.04)	-	0.04 (0.02)	0.03 (0.01)	0.01 (0.01)	-	-	0.08 (0.07)
	<i>ftr_DOD (%)</i>	-	28.6	-	31.8	30.3	28.6	31.3	29.2	-	26.7	37.5	33.3	-	-	28.5
BCN	<i>DD</i>	-	-	-	0.07 (0.02)	0.14 (0.07)	0.17 (0.04)	0.06 (0.01)	0.27 (0.20)	0.19 (0.05)	0.22 (0.05)	0.09 (0.02)	0.08 (0.05)	-	-	0.14 (0.08)
	<i>Dc</i>	-	-	-	0.05 (0.01)	0.10 (0.05)	0.13 (0.02)	0.04 (0.01)	0.20 (0.15)	0.14 (0.04)	0.16 (0.04)	0.06 (0.02)	0.05 (0.03)	-	-	0.10 (0.06)
	<i>Df</i>	-	-	-	0.02 (0.01)	0.04 (0.02)	0.04 (0.02)	0.02 (0.01)	0.07 (0.05)	0.05 (0.01)	0.06 (0.02)	0.03 (0.01)	0.03 (0.01)	-	-	0.04 (0.02)
	<i>ftr_DOD (%)</i>	-	-	-	28.6	28.6	23.5	33.3	25.9	26.6	27.5	33.3	37.5	-	-	28.6

Table S2. Daily mass loading (M_L in mg m^{-2}) for dust fine (Df), dust coarse (Dc) and total dust (DD) along the particular dust periods for the five lidar stations (ARN, GRA, EVO, TRJ and BCN). The standard deviation values are in brackets. The Df-to-total dust M_{DD} ratio (ftr_M_{DD}) is also included.

M_L	25 Mar	26 Mar	27 Mar	28 Mar	29 Mar	30 Mar	31 Mar	1 Apr	2 Apr	3 Apr	4 Apr	5 Apr	6 Apr	7 Apr	25 Mar - 7 Apr
ARN															
DD	109 (49)	751 (266)	1318 (201)	284 (49)	1809 (396)	1134 (84)	1306 (440)	-	151 (67)	256 (63)	161 (29)	133 (29)	120 (16)	82 (26)	586 (602)
Dc	97 (43)	672 (239)	1187 (167)	257 (41)	1656 (336)	1020 (83)	1166 (389)	-	136 (59)	228 (58)	145 (56)	116 (26)	107 (14)	72 (24)	528 (546)
Df	12 (5)	79 (27)	131 (34)	27 (9)	153 (63)	114 (2)	140 (52)	-	15 (7)	28 (7)	16 (7)	17 (4)	13 (2)	10 (2)	58 (57)
ftr_M_{DD} (%)	11.0	10.5	9.9	9.5	8.5	10.1	10.7	-	9.9	10.9	9.9	12.8	10.8	12.2	9.9
GRA															
DD	-	283 (118)	246 (57)	213 (64)	1018 (96)	1000 (124)	542 (8)	-	-	-	-	82 (2)	-	-	483 (385)
Dc	-	253 (108)	219 (52)	197 (54)	918 (99)	930 (91)	484 (111)	-	-	-	-	73 (2)	-	-	439 (353)
Df	-	30 (10)	27 (5)	16 (10)	100 (10)	70 (68)	58 (14)	-	-	-	-	9 (2)	-	-	44 (33)
ftr_M_{DD} (%)	-	10.6	11.0	7.5	9.8	7.0	10.7	-	-	-	-	11.0	-	-	9.1
EVO															
DD	212 (32)	572 (156)	546 (75)	243 (95)	430 (253)	605 (183)	403 (108)	-	156 (126)	147 (62)	232 (136)	102 (52)	-	-	332 (185)
Dc	189 (29)	524 (134)	489 (63)	215 (85)	384 (227)	541 (163)	359 (95)	-	139 (112)	131 (56)	207 (121)	90 (47)	-	-	297 (168)
Df	23 (3)	48 (28)	57 (13)	28 (10)	46 (27)	64 (20)	44 (13)	-	17 (14)	16 (7)	25 (14)	12 (5)	-	-	35 (18)
ftr_M_{DD} (%)	10.8	8.4	10.4	11.5	10.7	10.6	10.9	-	10.9	10.9	10.8	11.8	-	-	10.5
TRJ															
DD	-	230 (163)	-	364 (77)	1104 (47)	832 (107)	814 (362)	402 (210)	-	244 (123)	140 (45)	43 (12)	-	-	464 (365)

	<i>Dc</i>	-	204 (146)	-	324 (68)	983 (41)	747 (97)	727 (324)	358 (187)	-	218 (109)	125 (40)	36 (11)	-	-	414 (327)
	<i>Df</i>	-	26 (17)	-	40 (9)	121 (6)	85 (10)	87 (38)	44 (23)	-	26 (14)	15 (5)	7 (1)	-	-	50 (40)
	<i>ftr</i> _{<i>M</i><i>DD</i>} (%)	-	11.2	-	11.1	11.0	10.2	10.7	10.9	-	10.8	10.9	15.2	-	-	11.3
BCN	<i>DD</i>	-	-	-	123 (23)	240 (125)	296 (53)	104 (8)	478 (350)	335 (96)	383 (88)	142 (43)	128 (76)	-	-	248 (134)
	<i>Dc</i>	-	-	-	111 (20)	217 (113)	272 (44)	95 (7)	436 (319)	307 (91)	347 (79)	126 (39)	114 (68)	-	-	225 (120)
	<i>Df</i>	-	-	-	12 (4)	23 (12)	24 (10)	9 (2)	42 (32)	28 (5)	36 (11)	16 (4)	14 (8)	-	-	23 (11)
	<i>ftr</i> _{<i>M</i><i>DD</i>} (%)	-	-	-	9.8	9.7	8.1	8.6	8.7	8.3	9.5	11.4	10.8	-	-	9.4

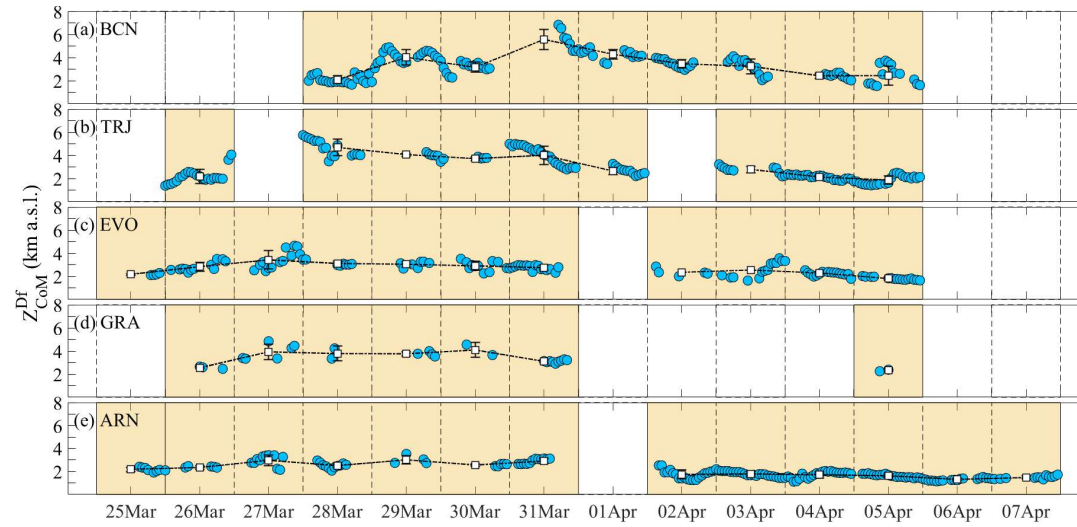


Figure S1: Temporal evolution of the dust outbreak by crossing the Iberian Peninsula in springtime 2021 in terms of the fine dust CoM height (Z_{CoM}^{Df}) for the five Iberian lidar stations as latitude decreases (from up to down panels): (a) BCN, (b) TRJ, (c) EVO, (d) GRA and (e) ARN. Hourly and daily values are shown by blue circles and white squares, respectively.

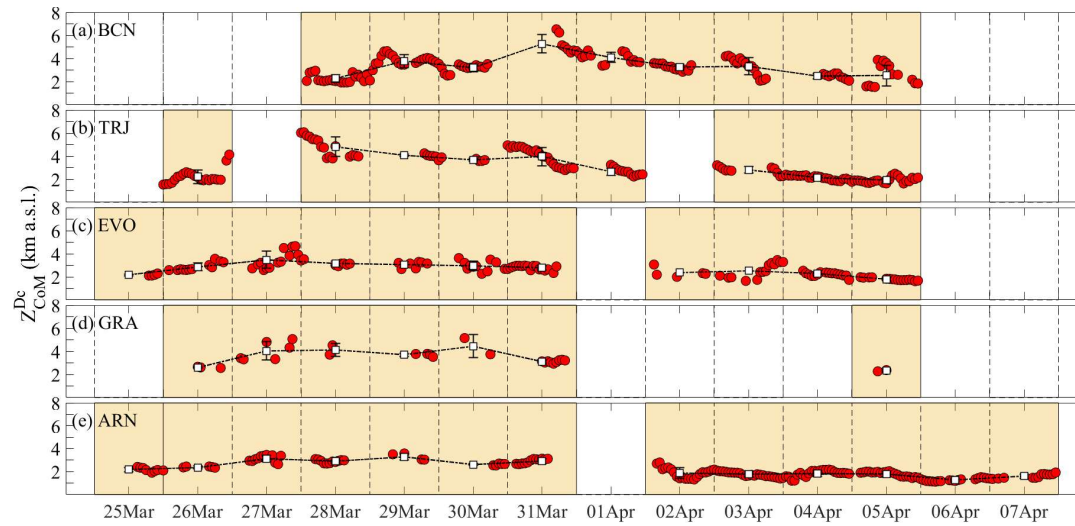


Figure S2: The same as Fig. S1, but for the coarse dust CoM height (Z_{CoM}^{Dc}). Hourly and daily values are shown by red circles and white squares, respectively.