Supplement of Atmos. Chem. Phys., 23, 143–161, 2023
https://doi.org/10.5194/acp-23-143-2023-supplement

Atmospheric Chemistry and Physics
Open Access
EGU

Supplement of

Vertical characterization of fine and coarse dust particles during an intense Saharan dust outbreak over the Iberian Peninsula in springtime 2021

María Ángeles López-Cayuela et al.

Correspondence to: Carmen Córdoba-Jabonero (cordobajc@inta.es)

Table S1. Daily dust optical depth at 532 nm (DOD^{532}) for fine dust (Df), coarse dust (Dc) and total dust (DD) along the particular dust periods for the five Iberian lidar stations (ARN, GRA, EVO, TRJ and BCN). The standard deviation values are in brackets. The Df-to-total dust DOD 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)
	Dc	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)
	Df	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)
	Dc	-	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)
	Df	-	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)
	Dc	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)
	Df	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)
	ftr_DOD (%)	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	DD	-	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)
	Dc	-	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)

	Df	-	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)
	ftr_DOD (%)	-	28.6	-	31.8	30.3	28.6	31.3	29.2	-	26.7	37.5	33.3	-	-	28.5
BCN	DD	-	-	-	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)
	Dc	-	-	-	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)
	Df	-	-	-	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)
	ftr_DOD (%)	-	-	-	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 fine dust (Df), coarse dust (Dc) and total dust (DD) along the particular dust periods for the five Iberian lidar stations (ARN, GRA, EVO, TRJ and BCN). The standard deviation values are in brackets. The Df-to-total dust mass 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)

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

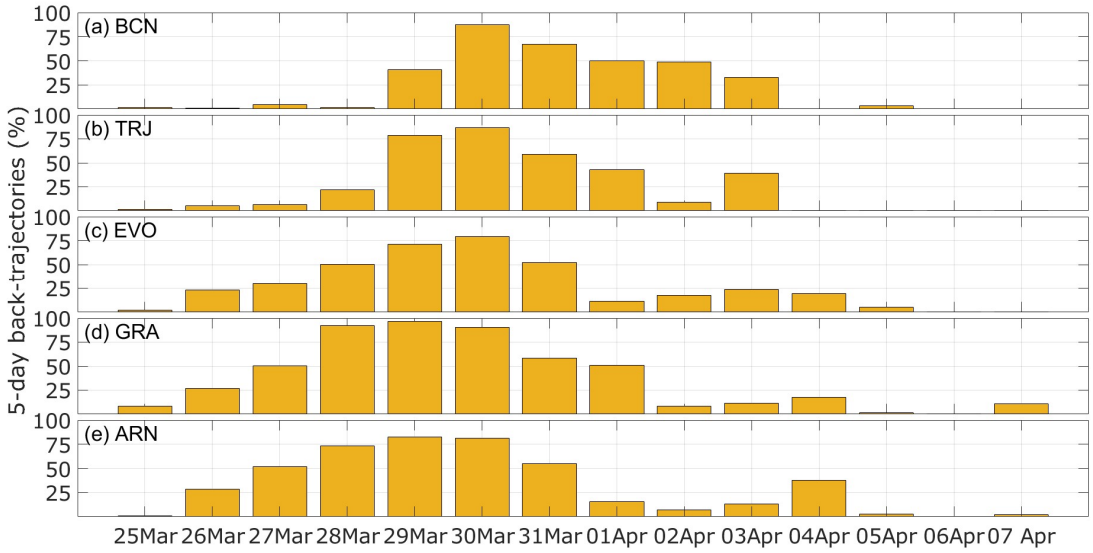

Figure S1. Percent of HYSPLIT 5-day back-trajectories originated in the Sahara desert area and arrived at each station (from NE to SW, by decreasing latitude): (a) Barcelona (BCN), (b) Torrejón/Madrid (TRJ), (c) Évora (EVO), (d) Granada (GRA) and (e) El Arenosillo/Huelva (ARN).

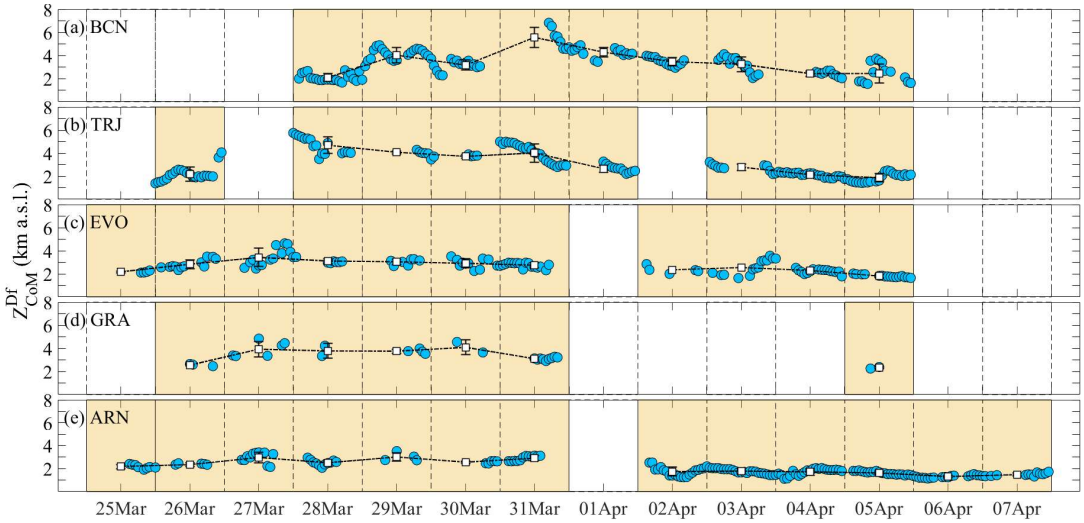

Figure S2. Temporal evolution of the dust outbreak by crossing the Iberian Peninsula in springtime 2021 in terms of the hourly fine dust CoM height (Z^{Df}_{CoM}, blue circles), and their daily values (white squares), for the five Iberian lidar stations as latitude decreases (from up to down panels): (a) BCN, (b) TRJ, (c) EVO, (d) GRA and (e) ARN.

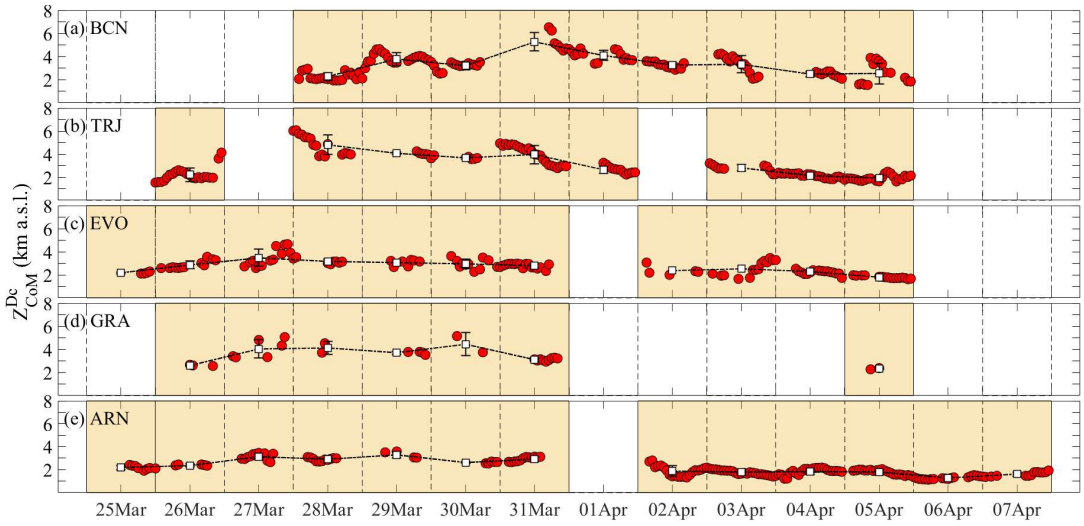

Figure S3. The same as Fig. S2, but for the coarse dust CoM height (Z^{Dc}_{CoM}). Hourly and daily values are shown by red circles and white squares, respectively.