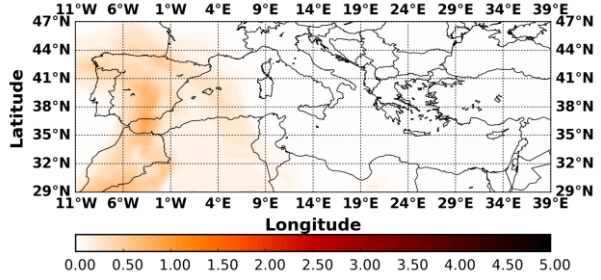
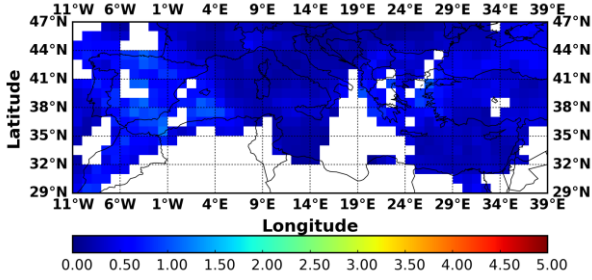
MODIS-Terra (Total AOD at 550nm)   **NMMB-MONARCH (Dust AOD at 550nm)**

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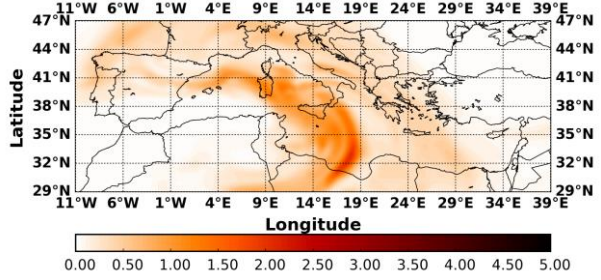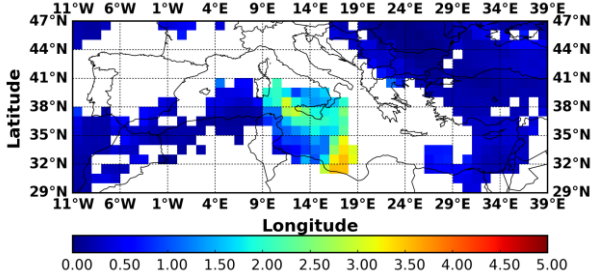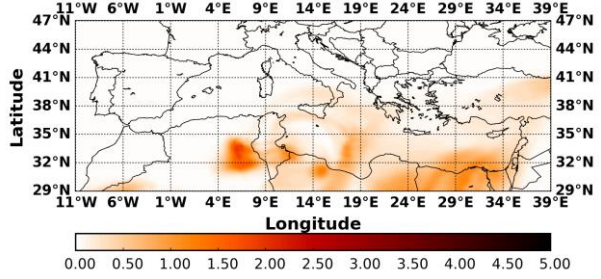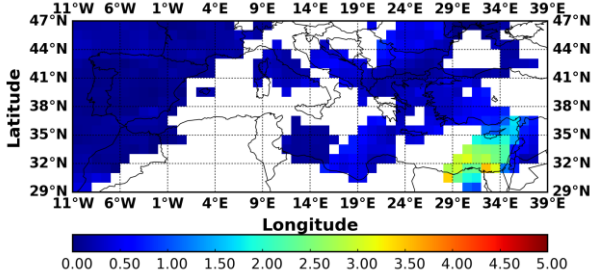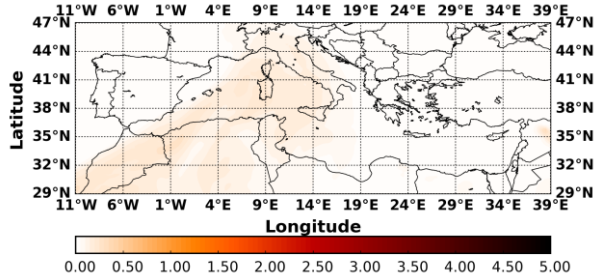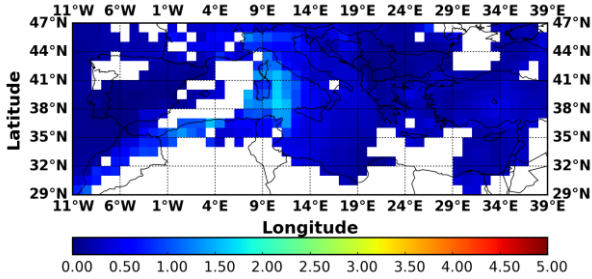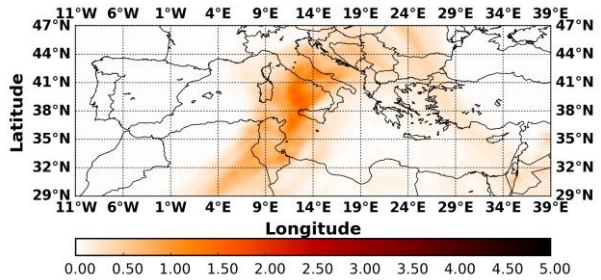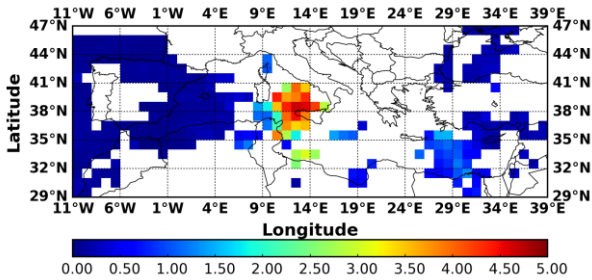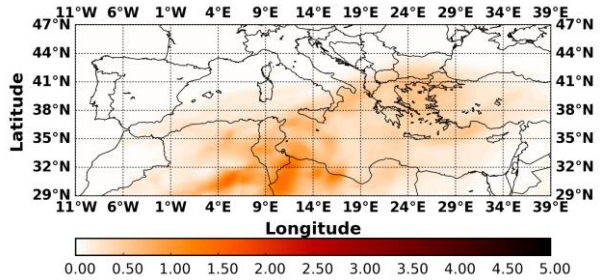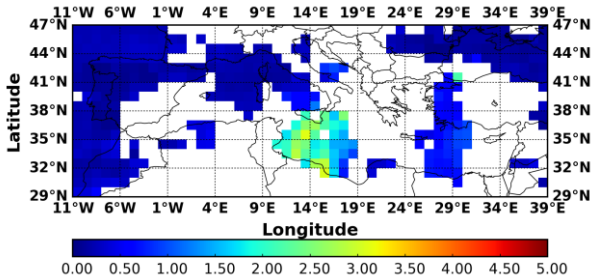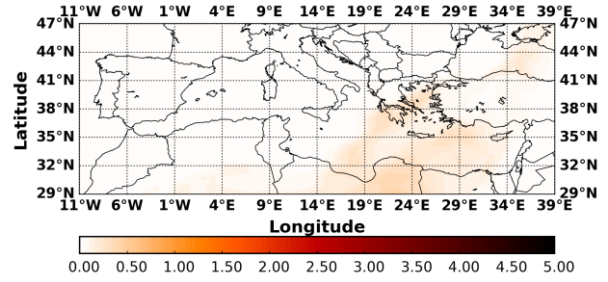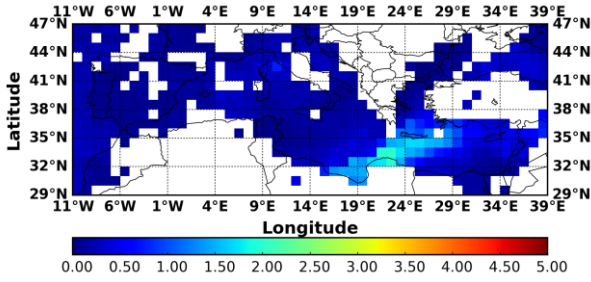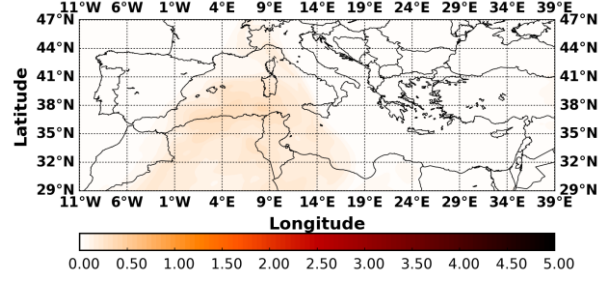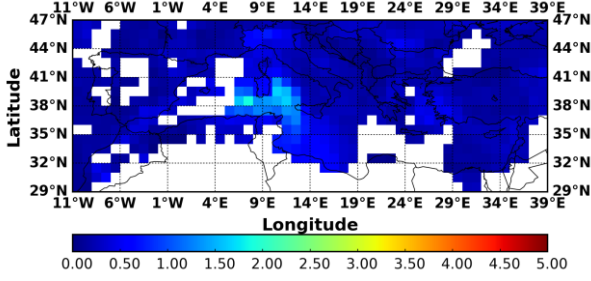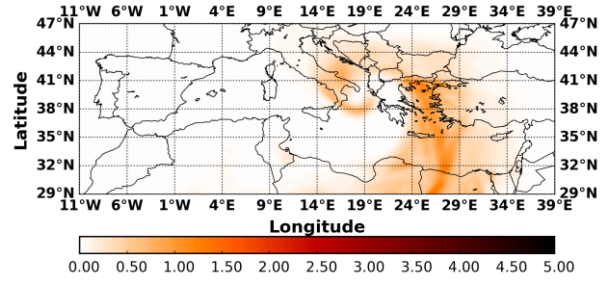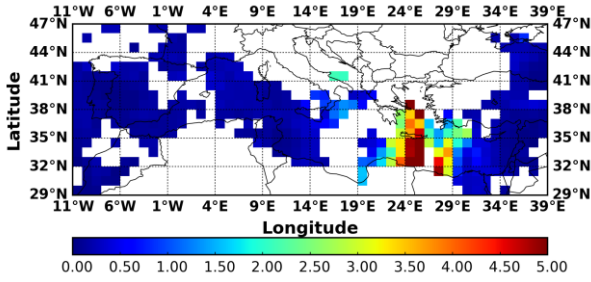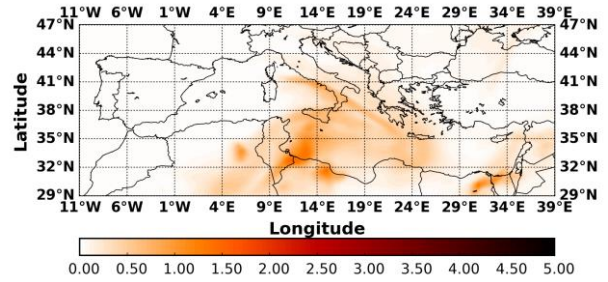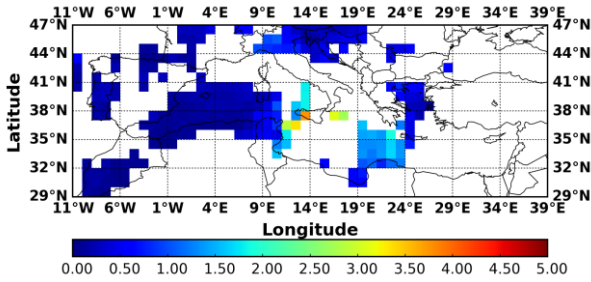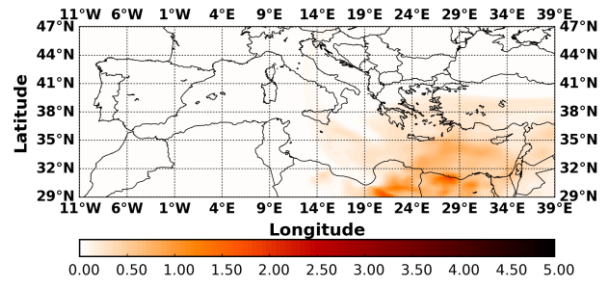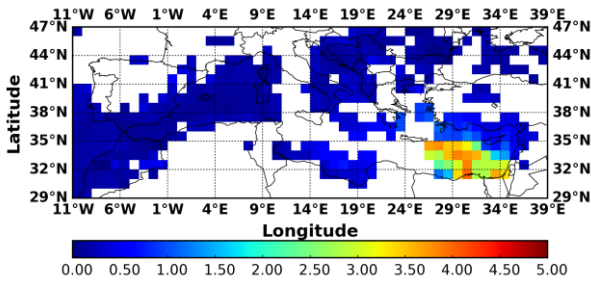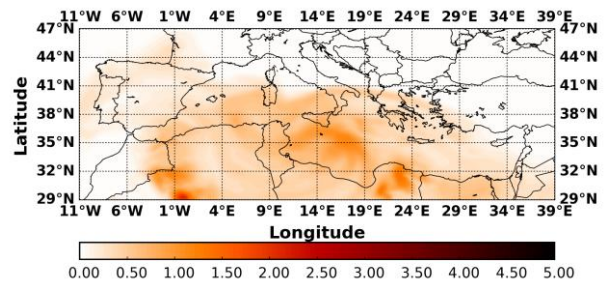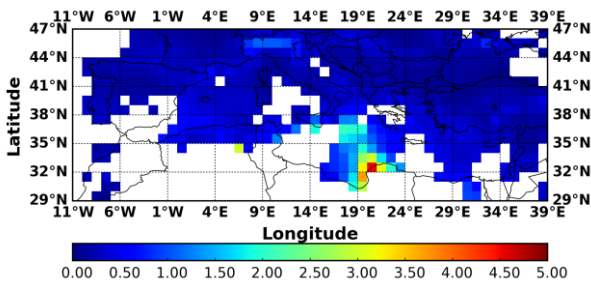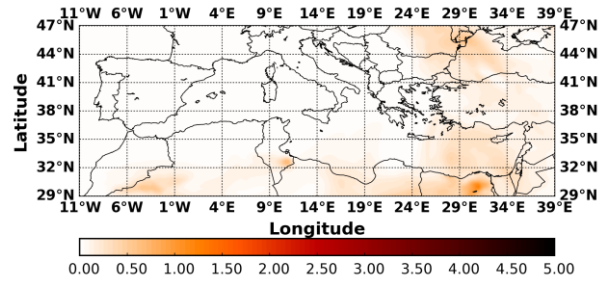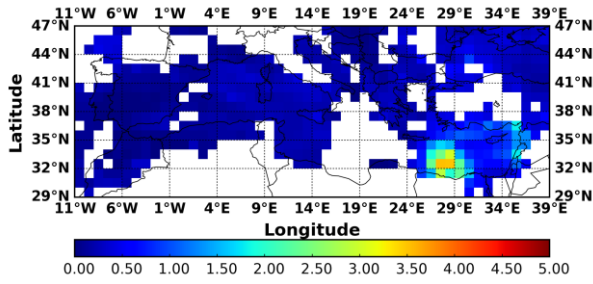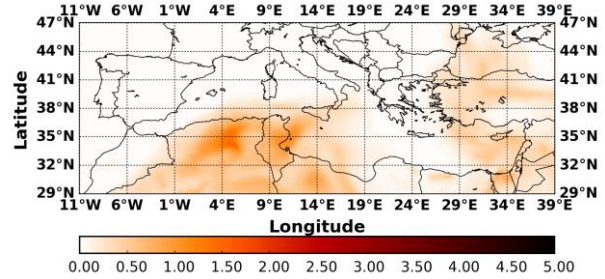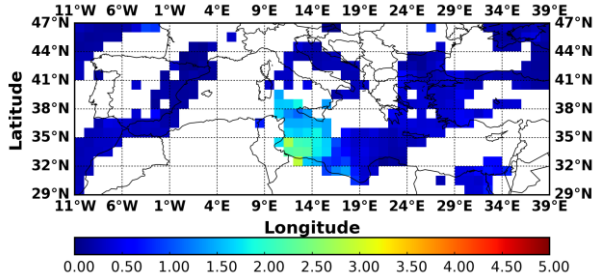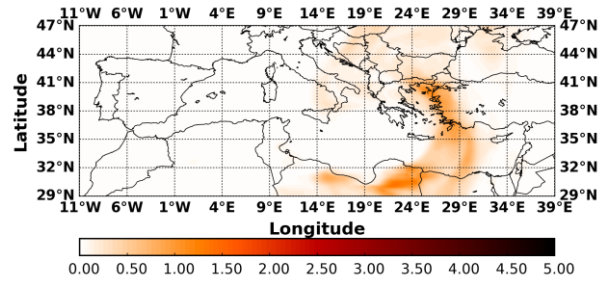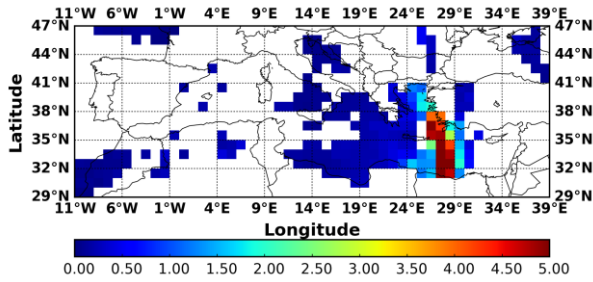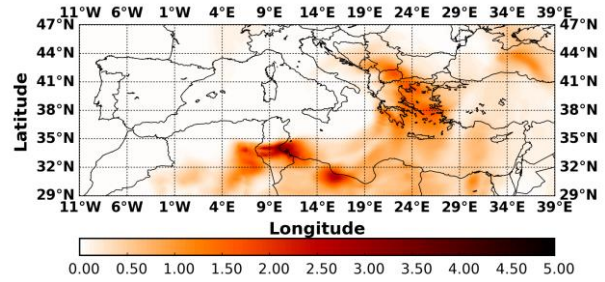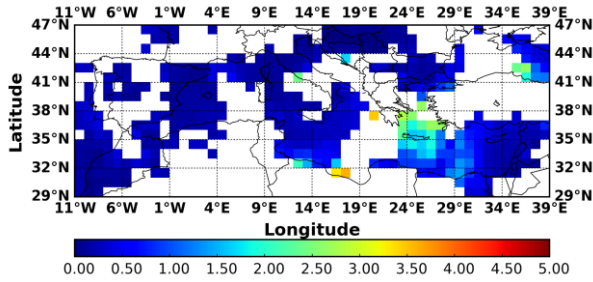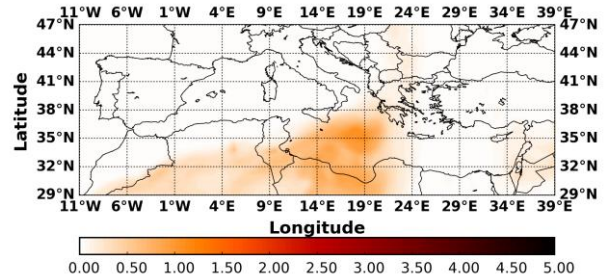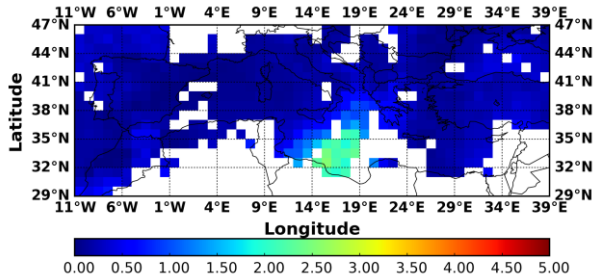
Figure S1: Geographical distributions of the daily averaged MODIS-Terra AOD at 550nm (left column) and the simulated dust AOD at 550nm at 12:00 UTC (right column) for the Mediterranean desert dust outbreaks that took place on 31st July 2001, 8th May 2002, 4th April 2003, 16th July 2003, 22nd February 2004, 26th March 2004, 27th January 2005, 28th July 2005, 24th February 2006, 19th March 2006, 24th February 2007, 21st April 2007, 29th May 2007, 10th April 2008, 23rd January 2009, 6th March 2009 and 27th March 2010.
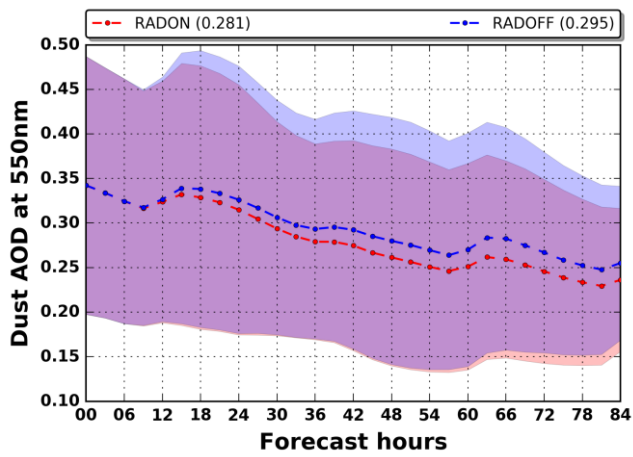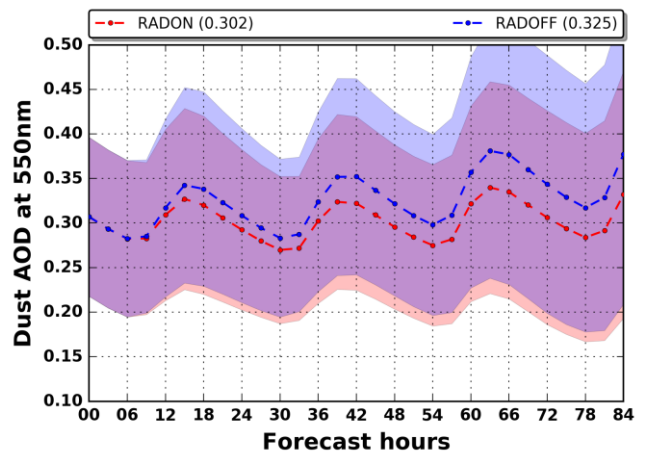
Figure S2: Regional dust AOD at 550nm averaged over: (i) the Mediterranean Satellite Domain (MSD) and (ii) the Sahara Desert Domain (SDD). Blue and red curves correspond to the mean values, calculated from the 20 desert dust outbreaks, for the RADOFF and RADON simulations, respectively, and the shaded areas represent the associated standard deviation.

Table S1: Minimum and maximum clear sky NET (shortwave plus longwave) DREs, in Wm^{-2}, at grid cell level (geographical distributions) for TOA (second column), ATM (third column), SURF (fourth column) and NETSURF (fifth column), over the 84-h simulation period, for each studied desert dust outbreak (first column).

Date	DRE_{TOA}	DRE_{ATM}	DRE_{SURF}	$DRE_{NETSURF}$
31 July 2001	-81/56	-32/228	-377/48	-211/33
8 May 2002	-141/35	-36/129	-272/37	-257/37
4 April 2003	-113/36	-28/141	-220/35	-201/29
16 July 2003	-143/46	-33/195	-338/50	-261/38
22 February 2004	-127/36	-30/118	-205/32	-191/29
26 March 2004	-117/63	-38/185	-296/46	-196/34
27 January 2005	-113/18	-34/104	-206/44	-165/37
2 March 2005	-162/46	-40/204	-363/48	-271/36
28 July 2005	-99/52	-32/235	-410/38	-231/39
24 February 2006	-120/29	-24/89	-196/31	-183/27
19 March 2006	-133/52	-25/143	-225/29	-211/27
24 February 2007	-110/58	-45/258	-500/61	-258/36
21 April 2007	-103/71	-36/205	-345/63	-190/38
29 May 2007	-83/70	-37/253	-480/66	-258/43
10 April 2008	-87/78	-51/239	-378/78	-180/44
19 May 2008	-159/55	-30/148	-313/41	-295/29
23 January 2009	-124/39	-31/155	-320/43	-197/29
6 March 2009	-184/67	-39/319	-589/46	-337/40
27 March 2010	-91/85	-61/285	-485/83	-258/50
2 August 2012	-161/58	-45/189	-308/58	-290/42

Table S2: Averaged differences (biases), calculated over the 84-h simulation period, between model outputs (RADON/RADOFF) and ground measurements (BSRN) of the downwelling SW radiation at the ground. For each desert dust outbreak (rows), the obtained results are provided for the six BSRN stations (columns) considered in the evaluation analysis. Empty cells correspond to cases where the ground measurements were not totally available throughout the simulation period.

Date	Izana	Cener	Palaiseau	Carpentras	Tamanrasset	Sede Boker
31 July 2001				65.9/86.7	56.0/68.6	
8 May 2002				89.5/124.7	69.2/80.5	
4 April 2003				12.4/22.1	12.4/20.4	42.2/75.5
16 July 2003						
22 February 2004					20.2/26.5	33.9/51.1
26 March 2004				-1.7/14.9	47.7/65.7	61.1/78.7
27 January 2005				10.6/17.9	15.7/23.7	37.0/54.3
2 March 2005				21.4/34.6	30.2/57.6	7.2/37.3
28 July 2005				66.6/63.9	34.1/49.9	6.4/21.7
24 February 2006			35.7/39.2	-3.8/2.3	17.2/20.7	
19 March 2006			-0.2/10.1		21.1/32.1	37.0/56.6
24 February 2007			0.9/1.1	15.7/20.9	15.9/21.2	3.1/12.7
21 April 2007					112.1/137.4	40.9/69.0
29 May 2007			5.8/14.1	86.4/105.4	16.5/26.9	2.7/23.3
10 April 2008			-6.0/-6.4	48.3/57.6	14.1/35.8	30.3/50.5
19 May 2008			31.9/36.9		37.6/68.5	16.6/40.7
23 January 2009				0.2/2.5	11.8/17.1	8.3/18.2
6 March 2009			37.9/54.0		27.0/32.2	-17.8/15.0
27 March 2010	-40.7/-33.1	20.0/19.4	-26.5/-15.1	46.1/55.6	17.8/36.6	64.4/71.8
2 August 2012	-76.7/-11.5	-38.3/-31.8	38.5/51.2	16.2/31.3	-24.9/6.2	2.4/15.0

Table S3: As in Table S2 but for the downwelling LW radiation at the ground.

Date	Izana	Cener	Palaiseau	Carpentras	Tamanrasset	Sede Boker
31 July 2001				-19.1/-19.6	-14.7/-16.2	
8 May 2002				-2.5/-6.6	-17.4/-16.8	
4 April 2003				-21.5/-21.7	-7.1/-7.5	-14.0/-16.7
16 July 2003						
22 February 2004					-2.7/-2.8	-23.6/-25.3
26 March 2004				-16.0/-17.3	-3.2/-5.3	-22.3/-23.4
27 January 2005				-11.6/-11.8	-10.2/-10.6	2.2/-3.6
2 March 2005				2.5/4.7	-4.7/-8.3	-7.5/-8.8
28 July 2005				-25.0/-24.6	-22.7/-24.3	
24 February 2006			-15.0/-15.7	0.8/1.0	-4.8/-4.7	
19 March 2006			2.6/3.7		-11.5/-13.1	
24 February 2007			11.9/12.5	-12.0/-15.9	-3.6/-4.0	-14.0/-15.5
21 April 2007					-8.5/-7.2	6.3/0.7
29 May 2007			-9.4/-8.7	-12.0/-12.3	-21.1/-22.5	11.6/8.4
10 April 2008			14.3/11.8	-11.2/-10.6	-14.2/-17.9	-3.0/-7.2
19 May 2008			-13.9/-9.1		-13.4/-15.4	-7.1/-9.4
23 January 2009				-4.2/-3.7	-1.6/-2.1	-1.2/1.1
6 March 2009			2.4/-0.6		-12.7/-12.1	5.5/3.9
27 March 2010	96.9/95.8	-5.1/0.3	3.6/-0.2	-7.9/-14.4	-22.5/-24.3	-9.0/-8.1
2 August 2012	61.2/51.1	16.2/17.6	-1.7/-1.1	-14.7/-13.3	-4.7/-6.7	-3.4/-2.8