

# Aerosol Optical Properties and Direct Radiative Forcing Based on Measurements From the Aerosol Robotic Network (AERONET) in Europe and Mediterranean Area

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## Objectives

- Aerosol optical properties of 41 stations from AERONET v3 to classify aerosols type in Europe and Mediterranean area for 2008-2017.
- Examination of aerosol direct Radiative Forcing (**R<sub>eff</sub>**) at the Top and the Bottom Of the Atmosphere (**TOA and BOA**), based on AERONET inversion product.

## Classification Method

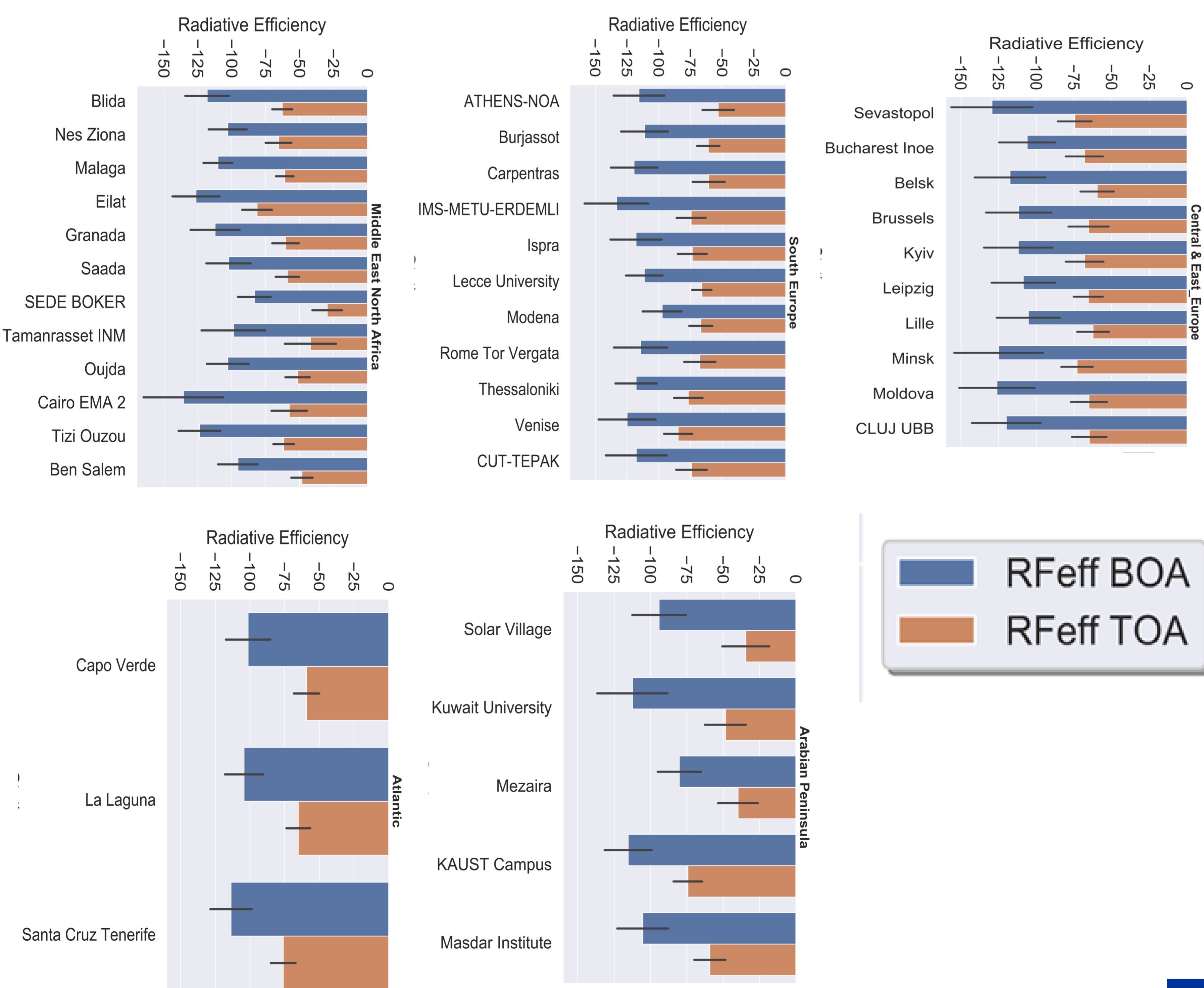
Aerosols are categorized into ten types:

- I. Coarse non-absorbing ( $SSA > 0.95$ ,  $FMF \leq 0.4$  και  $AE \leq 0.6$ ).
- II. Coarse absorbing ( $SSA \leq 0.95$ ,  $FMF \leq 0.4$  και  $AE \leq 0.6$ ).
- III. Mixed non-absorbing ( $SSA > 0.95$ ,  $0.4 \leq FMF < 0.6$  και  $0.6 \leq AE < 1.2$ ).
- IV. Mixed absorbing ( $SSA \leq 0.95$ ,  $0.4 \leq FMF < 0.6$  και  $0.6 \leq AE < 1.2$ ).
- V. Fine non-absorbing ( $SSA > 0.95$ ,  $FMF > 0.6$  και  $AE > 1.2$ ).
- VI. Fine highly absorbing ( $SSA \leq 0.85$ ,  $FMF > 0.6$  και  $AE > 1.2$ ).
- VII. Fine moderately absorbing ( $0.85 \leq SSA < 0.9$ ,  $FMF > 0.6$  και  $AE > 1.2$ ).
- VIII. Fine slightly absorbing ( $0.9 \leq SSA < 0.95$ ,  $FMF > 0.6$  και  $AE > 1.2$ ).
- IX. Other non-absorbing ( $SSA \leq 0.95$ ,  $0.6 \leq AE < 1.2$  and  $FMF < 0.4$  or  $FMF > 0.6$ ,  $0.4 \leq FMF < 0.6$  and  $AE < 0.6$  or  $AE > 1.2$ ).
- X. Other absorbing ( $SSA > 0.95$ ,  $0.6 \leq AE < 1.2$  and  $FMF < 0.4$  or  $FMF > 0.6$ ,  $0.4 \leq FMF < 0.6$  and  $AE < 0.6$  or  $AE > 1.2$ ).

## Classification

	(I)	(II)	(III)	(IV)	(V)	(VI)	(VII)	(VIII)	(IX)	(X)
<b>Atlantic</b>										
Capo Verde	0	0	0	0	0	0	98.36	1.64	0	0
La Laguna	0	0	0	0	0	0	89.32	10.26	0.43	0
Santa Cruz Tenerife	0	0	0	0	0.44	0	96.23	3.33	0	0
<b>Arabian Peninsula</b>										
Solar Village	0	0.11	0.11	0	12.33	0.17	83.48	0.45	3.28	0.06
Kuwait University	0.68	0.54	1.76	1.62	5.82	0.27	86.2	0.54	2.57	0
Mezaira	0	0.14	1.72	1.64	14.15	4.15	68.48	4.29	3.22	2.22
KAUST Campus	0	0	1.36	1.12	25.33	8.52	57.16	3.08	2.01	1.42
Masdar Institute	0	0.44	6.5	3.07	23.79	3.16	55.58	0.97	5.71	0.79
<b>Middle East North Africa</b>										
Blida	0	0.72	2.88	0.72	30.94	1.44	52.52	0	9.35	1.44
Nes Ziona	0	0	4.68	8.51	6.38	7.23	49.79	7.66	6.81	8.94
Malaga	0	0	3.33	2	6	1.33	77.33	0	9.33	0.67
Eilat	0	0.45	4.71	3.14	22.42	1.79	59.87	0	6.05	1.57
Granada	0	4.15	4.66	3.11	4.66	0	82.38	0.52	0.52	0
Saada	0	0	0	0	7.69	0	86.54	0	5.77	0
SEDE BOKER	0	0	3.47	3.85	20.42	6.74	55.11	0.19	7.32	2.89
Tamanrasset INM	0	0	0	0	0.17	0	99.15	0.68	0	0
Oujda	0	0	0	0.79	6.35	0	91.27	0	1.59	0
Cairo EMA 2	3.8	7.65	17.39	2.32	23.74	0.45	25.84	0.06	17.45	1.3
Tizi Ouzou	0	0	1.24	0.62	16.77	0	73.29	0	7.45	0.62
Ben Salem	0	0	0	0	4.44	0	95.56	0	0	0

## Radiative Forcing Efficiency



	(I)	(II)	(III)	(IV)	(V)	(VI)	(VII)	(VIII)	(IX)	(X)
<b>South Europe</b>										
ATHENS-NOA	0.44	7.86	53.28	7.86	6.11	0	18.78	1.31	2.62	1.75
Burjassot	0	1.41	18.31	30.99	7.75	4.23	33.8	0	2.11	1.41
Carpentras	0	1.41	44.37	30.28	7.75	0.7	9.15	0	3.52	2.82
S-METU-ERDEMLI	0.19	0.93	21.79	40.78	10.8	1.68	12.29	0.37	6.33	4.84
Ispra	0	4.38	21.9	48.91	2.19	0	0	0	13.87	8.76
Lecce University	0	0	23.81	43.29	3.9	0.87	22.94	1.73	3.46	0
Modena	0	0	9.32	75.85	1.27	1.27	3.81	0	0.85	7.63
Rome Tor Vergata	0	0.93	24.07	28.7	5.56	0.93	35.19	0	2.78	1.85
Thessaloniki	0	0.45	23.88	62.72	2.68	0.67	4.02	0.22	3.35	2.01
Venise	0	0	15.44	47.06	9.56	0.74	5.88	0.74	8.09	12.5
CUT-TEPAK	0	0	12.5	36.81	7.64	2.08	34.72	2.08	1.39	2.78
<b>Central &amp; East Europe</b>										
Sevastopol	0	6.71	39.02	46.34	2.44	0	1.83	0	1.83	1.83
Bucharest Inoe	0	0.69	33.1	54.48	3.79	2.41	3.45	0.34	1.03	0.69
Belsk	0	2.29	37.16	55.5	0	1.38	0.92	0	1.38	1.38
Brussels	0	2.01	34.23	49.66	0	0	0.67	2.68	4.03	6.71
Kyiv	0	1.82	31.82	59.09	1.82	0.91	0.91	0	3.64	0
Leipzig	0	0	22.49	65.09	4.73	0	4.14	0.59	0	2.96
Lille	0	1.69	22.88	64.83	1.27	0	2.12	0.42	2.54	4.24
Minsk	0	7	32	53	3	1	0	0	3	1
Moldova	0	11.34	40.89	42.51	1.21	0.81	1.62	0	1.21	0.4
CLUJ UBB	0	2.96	35.5	46.15	2.37	1.78	1.78	0	4.73	4.73

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