



Preliminary results of the source apportionment inter-comparison exercise 2015-2016 (part 2)

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and the Fairmode community

Fairmode Technical meeting

Zagreb, 27-29 June 2016

Organization of the IE

- ❑ Data distributed in July 2015
- ❑ Update in November 2015
- ❑ Receptors for CTM in January 2016

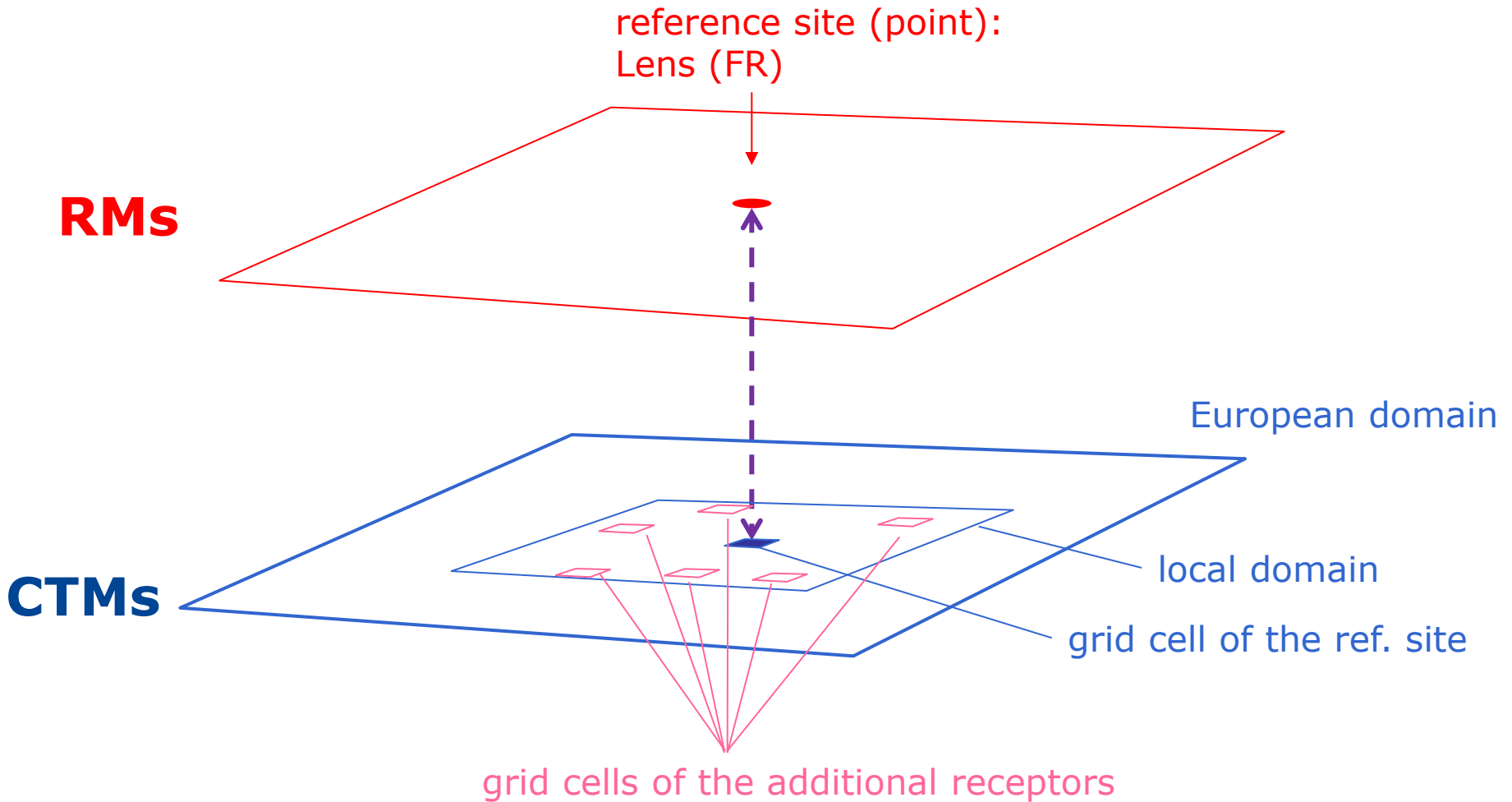
Applications: 79
Withdrawed: 39
delivered: 40 teams (33 RM, 7 CTM)

- ❑ RM results reported 33 teams
- ❑ CTM results reported by 7 teams
- ❑ Many defections and delay in submission of results
- ❑ Many requests of clarifications and correction of inconsistencies needed
- ❑ These problems impacted on the timing of data processing

CTM CONSORTIA

ENEA /ARIANET/ ARPA PIEMONTE	joint result
CIEMAT/LISA -CNRS	jont result
RIER- UNI KOLN	independent result
TNO	independent result
ARPAV	coodinated result
RSE	coordinated results
UNI AVEIRO	coordinated results

Domains



Intercomparison set up



European
Commission

- **Common input dataset**
ECMWF meteorology
TNO emissions with fuel detail
MACC chemical fields
- **MPE using ca. 200 Airbase stations (not centralized)**

Study Period

Summer:

from 1/6/2011 to 1/08/2011

Winter:

from 15/11/2011 to 5/2/2012

Receptors for SA results ----->

Station Code	Station Name	Region	Station Type	Area Type
LENS_SA	Lens-CARA	FRANCE	Background	urban
CALAIS_SA	Sangatte	FRANCE	Background	suburban
LE_HAVRE_SA	Le Havre Henri Fabre	FRANCE	Background	urban
PARIS_SA	PARIS 6eme	FRANCE	Background	urban
LONDON_SA	LONDON N. KENSINGTON	UNITED KINGDOM	Background	urban
BRUXELLES_SA	41R012 - UCCLE	BELGIUM	Background	suburban
GENT_SA	Gent	BELGIUM	Background	urban
SUBU_BKGD_SA	40MN01 - MENEN	BELGIUM	Background	suburban
RUR_BKGD1_SA	REVIN	FRANCE	Background	rural
RUR_BKGD2_SA	Vredepeel-Vredeweg	NETHERLANDS	Background	rural

Definition of sources



SNAP		Mandatory 8 sources	Optional 14 sources
1	Energy industry	01_ENI	01_ENI
21	R & C combustion, coal	99_OTH	02_OTH
22	R & C combustion, light liquid fuel	99_OTH	02_OTH
23	R & C combustion, medium liquid fuel	99_OTH	02_OTH
24	R & C combustion, heavy liquid fuel	99_OTH	02_OTH
25	R & C combustion, gas	99_OTH	02_OTH
26	R & C combustion, solid biomass (wood)	02_BIO	02_BIO
34	Industry (combustion & processes)	34_IND	34_IND
5	Fugitive emissions from fuels	99_OTH	99_OTH
6	Product use including solvents	99_OTH	99_OTH
71	Road transport, exhaust, gasoline	07_RTR	71_RTG
72	Road transport, exhaust, diesel	07_RTR	72_RTD
73	Road transport, exhaust, LPG/natural gas	07_RTR	07_RTR
74	Road transport, non-exhaust, evaporation	07_RTR	07_RTR
75	Road transport, non-exhaust, wear	07_RTR	75_RTW
8	Non-road transport	99_OTH	99_OTH
81	International shipping, marine diesel oil	08_SHP	08_SHP
82	International shipping, heavy fuel oil	08_SHP	08_SHP
9	Waste treatment	99_OTH	99_OTH
10	Agriculture	10_AGR	10_AGR
11P	Dust	11_DST	11_DST
11	Sea Salt	99_OTH	11_SLT
11	Biogenic SOA	99_OTH	11_BSO

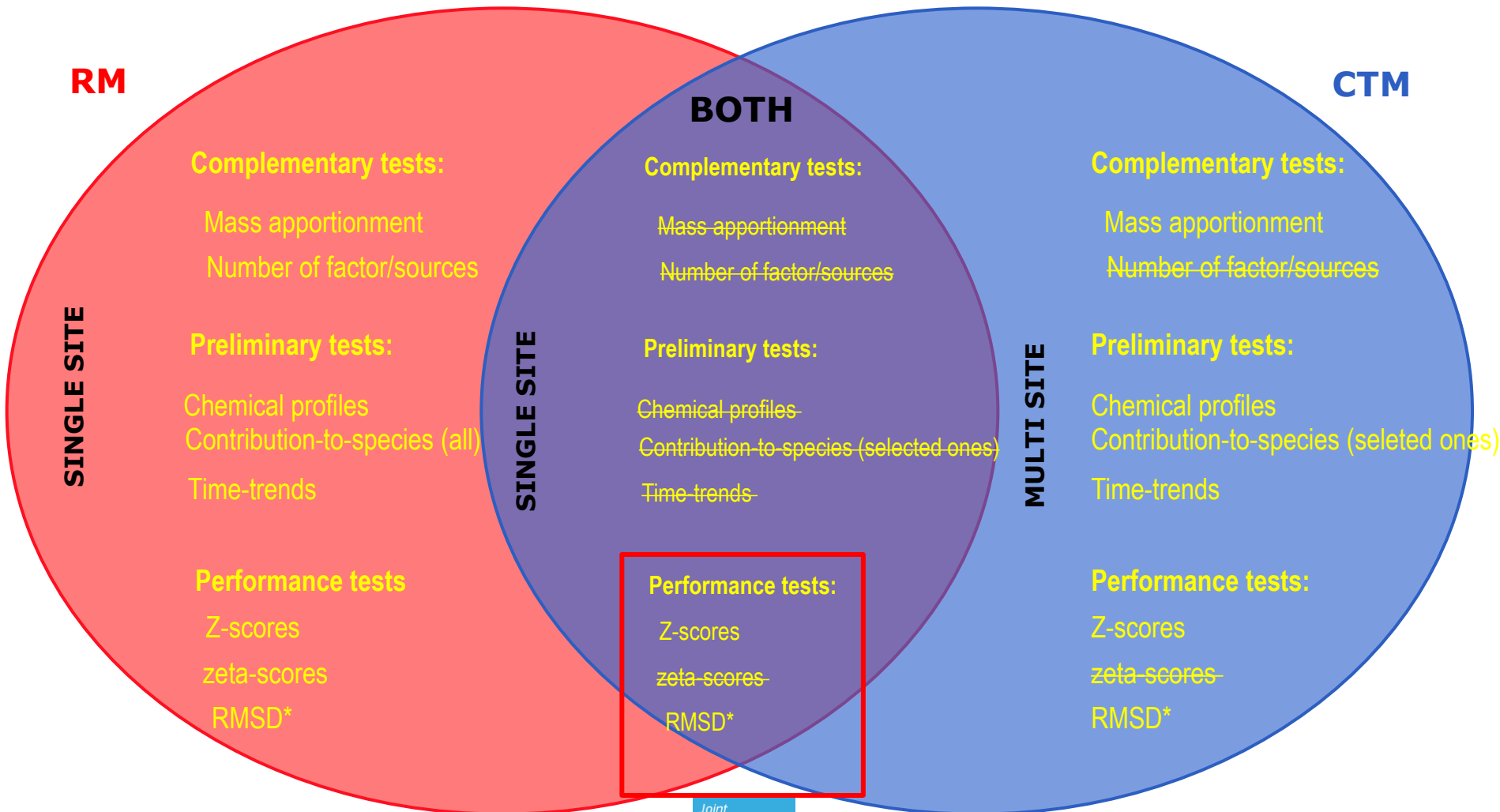
8 - 14 source categories defined for comparability with RM source categories (SPECIEUROPE used as reference)

The optional set with higher detail on domestic, traffic and primary inorganic aerosol (dust/salt)

**3 + 3 summer/winter months
Hourly concentrations
(current evaluation for daily averages)**

**Primary and secondary PM
PM precursors**

Evaluation in this IE



Introduction to CTM tests

CTM RESULTS

id	model	method	MANDATORY	OPTIONAL
cA	CAMx	CTM	selected for reference	
cAo	CAMx	CTM		selected for reference
cAs	CAMx	CTM	sensitivity test	sensitivity test
cAso	CAMx	CTM	sensitivity test	sensitivity test
cAs2	CAMx	CTM	sensitivity test	sensitivity test
cB	FARM	CTM	selected for reference	
cBo	FARM	CTM		selected for reference
cD	LOTOS	CTM	selected for reference	
cDo	LOTOS	CTM		selected for reference
cE	EURAD	CTM	selected for reference	
cF	CHIMERE	CTM	NH4 and NO3 not reported	NH4 and NO3 not reported

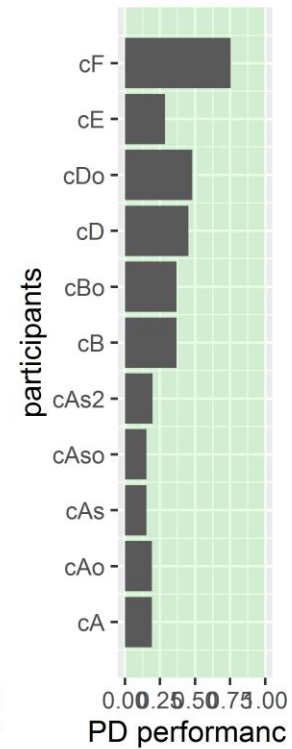
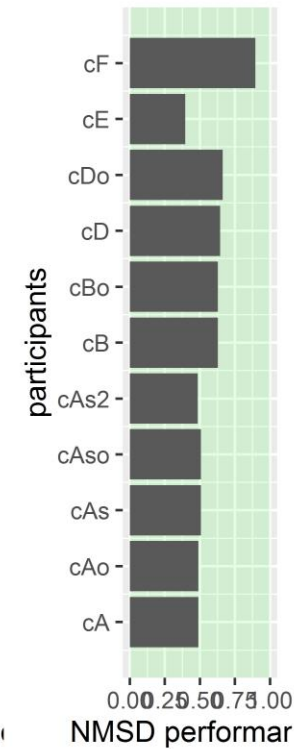
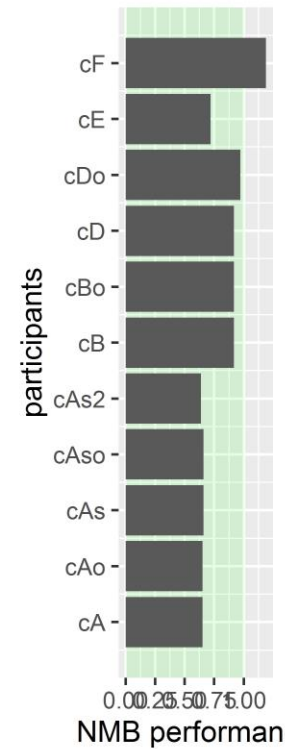
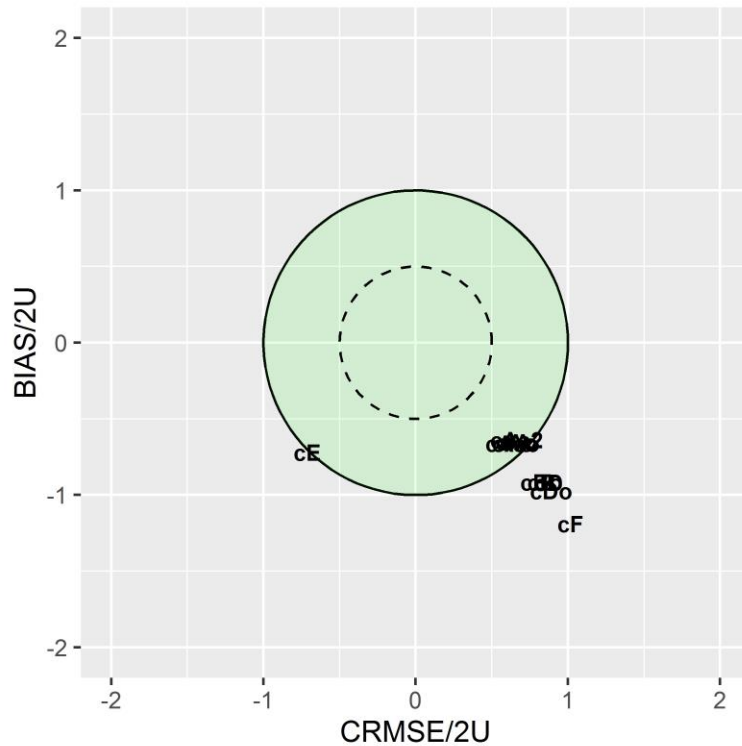
Mandatory: few sources, all participants
Optional: many sources, few participants

CTM results indicated with letters from A to F preceded by c (low case).
 o: optional; s: sensitivity run

Green background indicates results used to calculate the reference for mandatory and optional respectively. Sensitivity runs not used for reference.

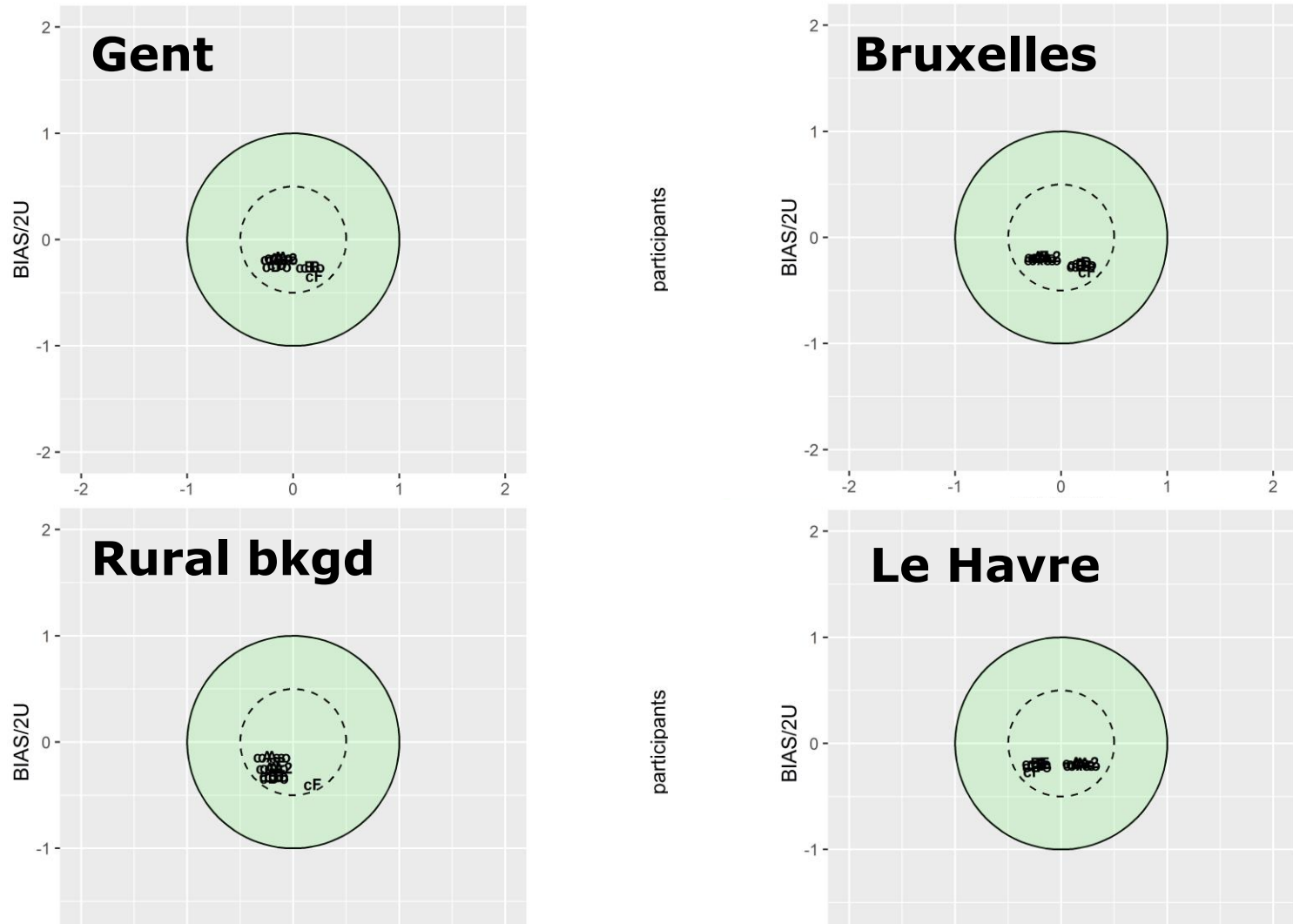
CTM preliminary tests

Lens



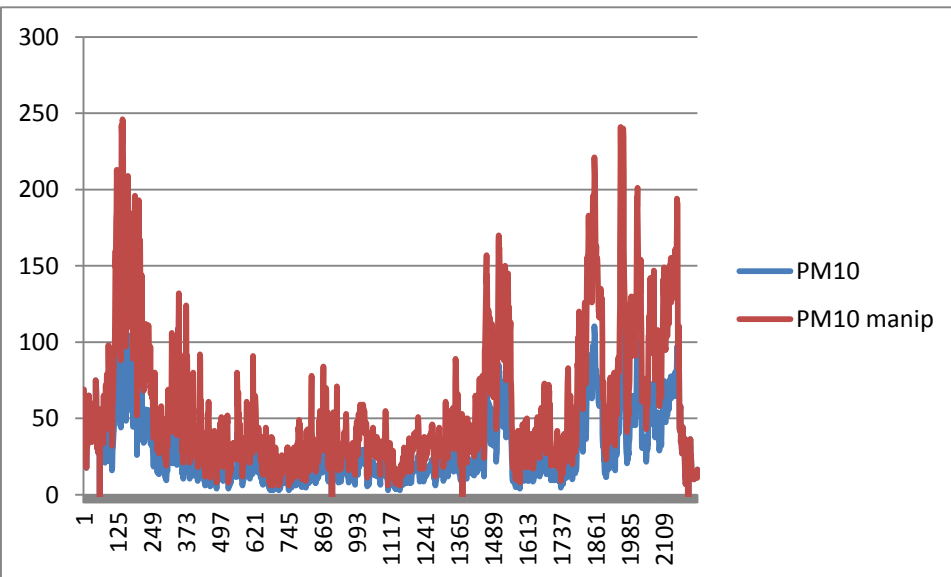
In Lens, the sum of the source contributions are below the gravimetric mass and in some cases falls beyond the limit for the target values

MASS CLOSURE

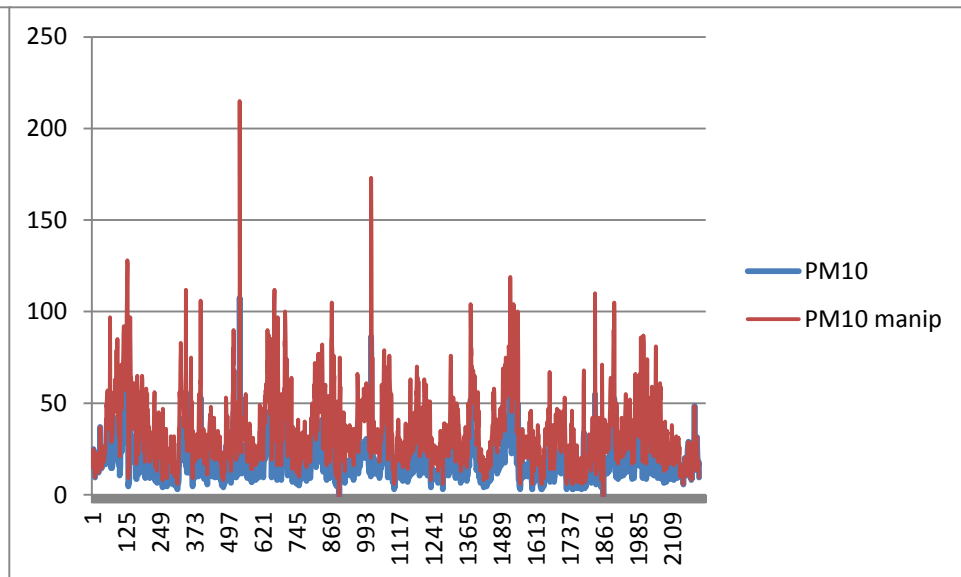


In the other sites, the sum of the source contributions are slightly below the gravimetric mass indicating very good mass closure

Suburban bkgrd. Winter

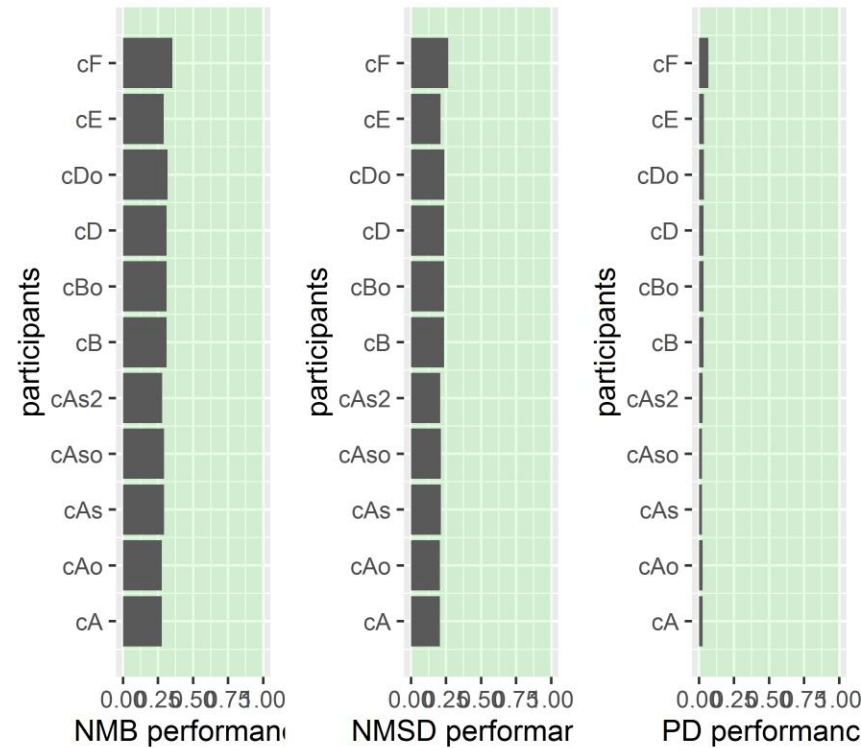
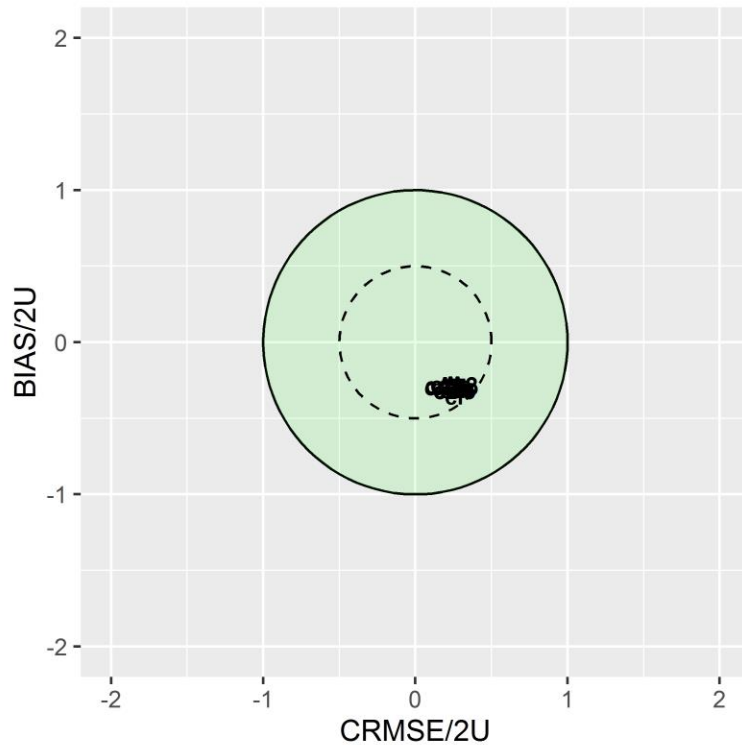


Summer



The concentrations of the airbase site BELMN01 were doubled on purpose to test what would have been the impact on the SA results.

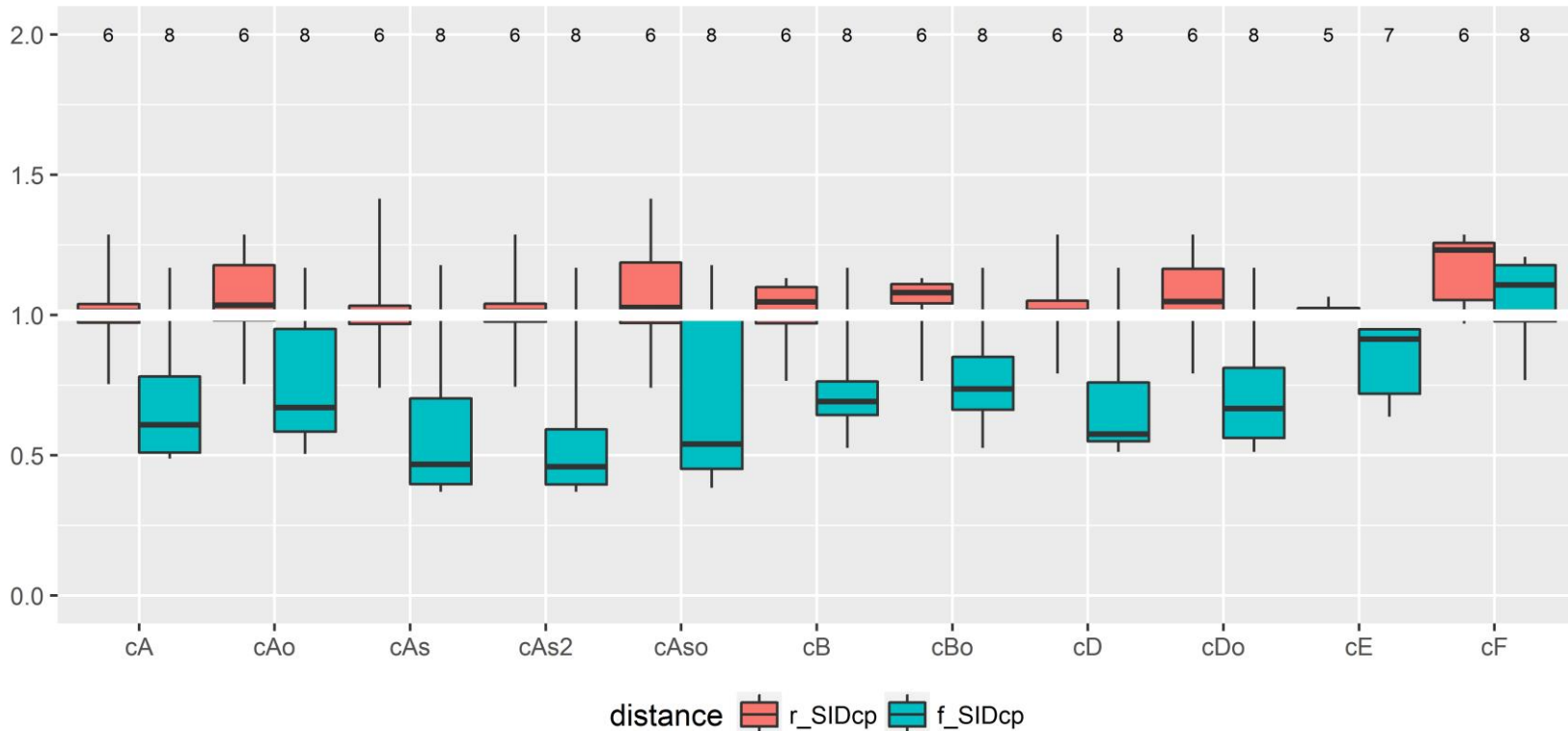
Suburban bkgrd.



No significant differences were observed between this and the other airbase sites.

CTM similarity tests

Lens



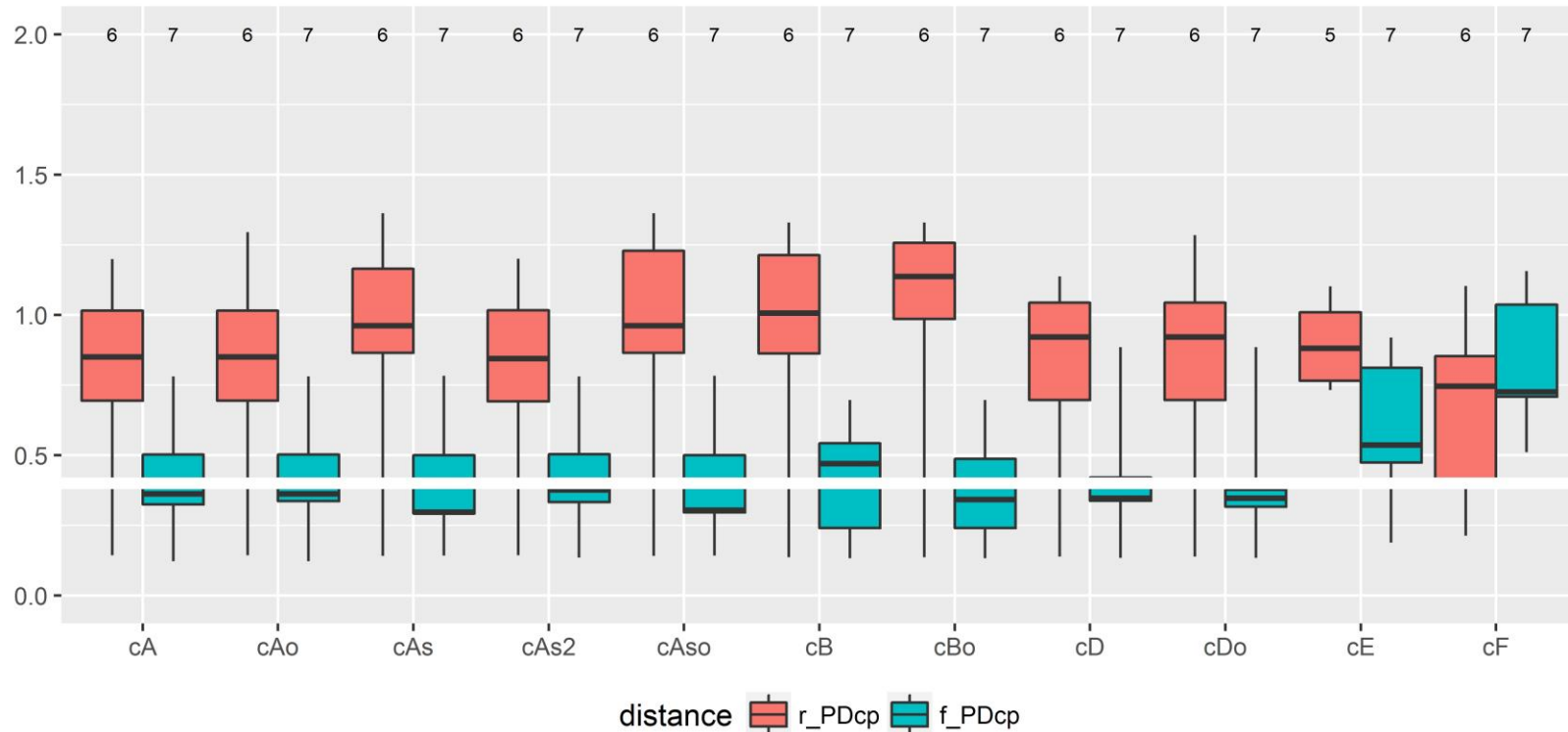
r = distances to the reference chemical profiles (cp) in SPECIATE/SPECIEUROPE

f = distances among the candidate sources

top = number of candidate sources, horizontal line (white)= acceptability threshold, not normalized distances

Candidate sources comparable among each other but no with the reference cp. There are no significant differences between results with mandatory and optional set of sources. cF is not similar to the other results.

Lens



r = distances to the reference chemical profiles (cp) in SPECIATE/SPECIEUROPE

f = distances among the candidate sources

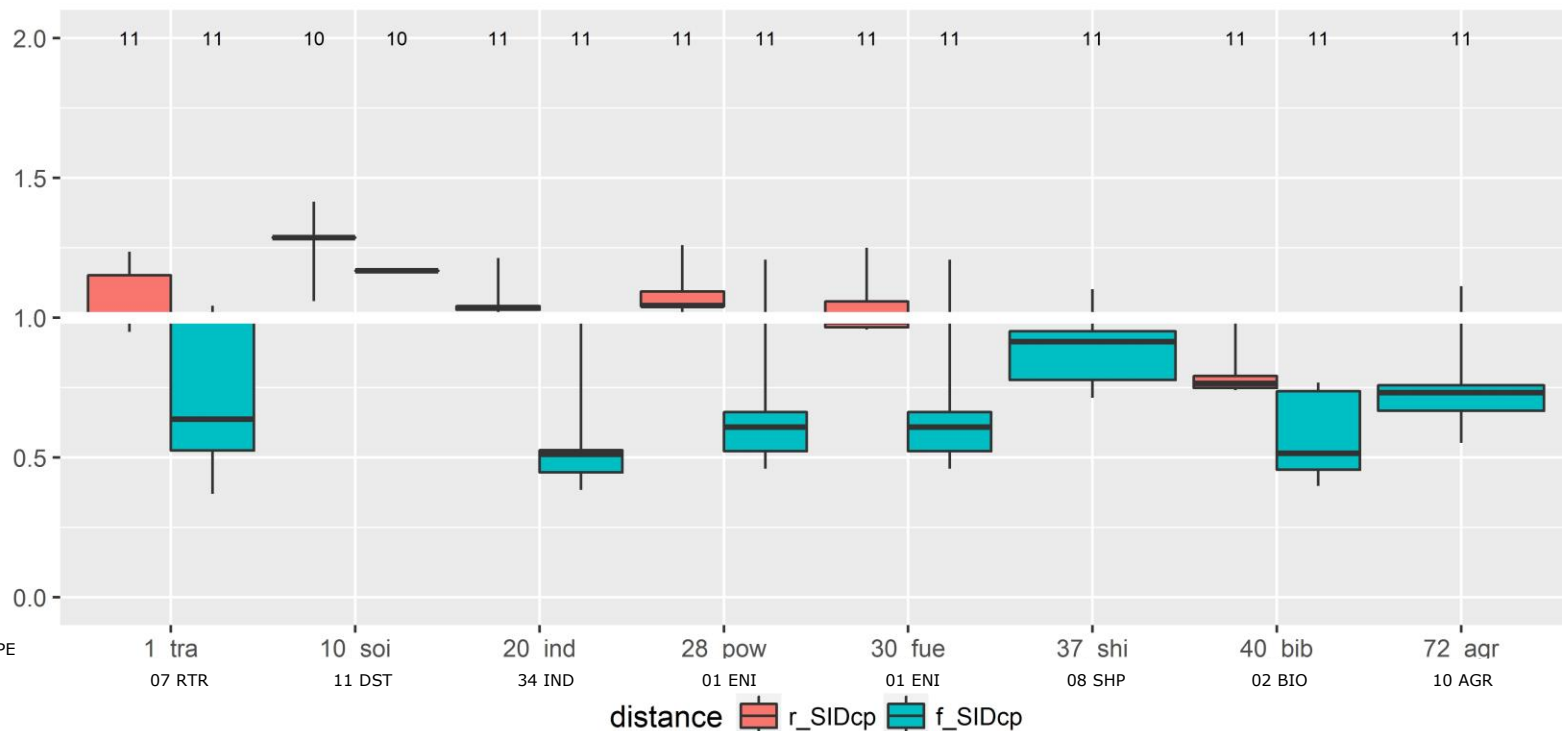
top = number of candidate sources, horizontal line (white)= acceptability threshold

Candidate sources comparable among each other but no with the reference cp. There are no significant differences between results with mandatory and optional set of sources. cE and cF are not similar to the other results.

SID by sources mandatory



Lens



r = distances to the reference chemical profiles (cp) in SPECIATE and SPECIEUROPE

f = distances among the candidate sources

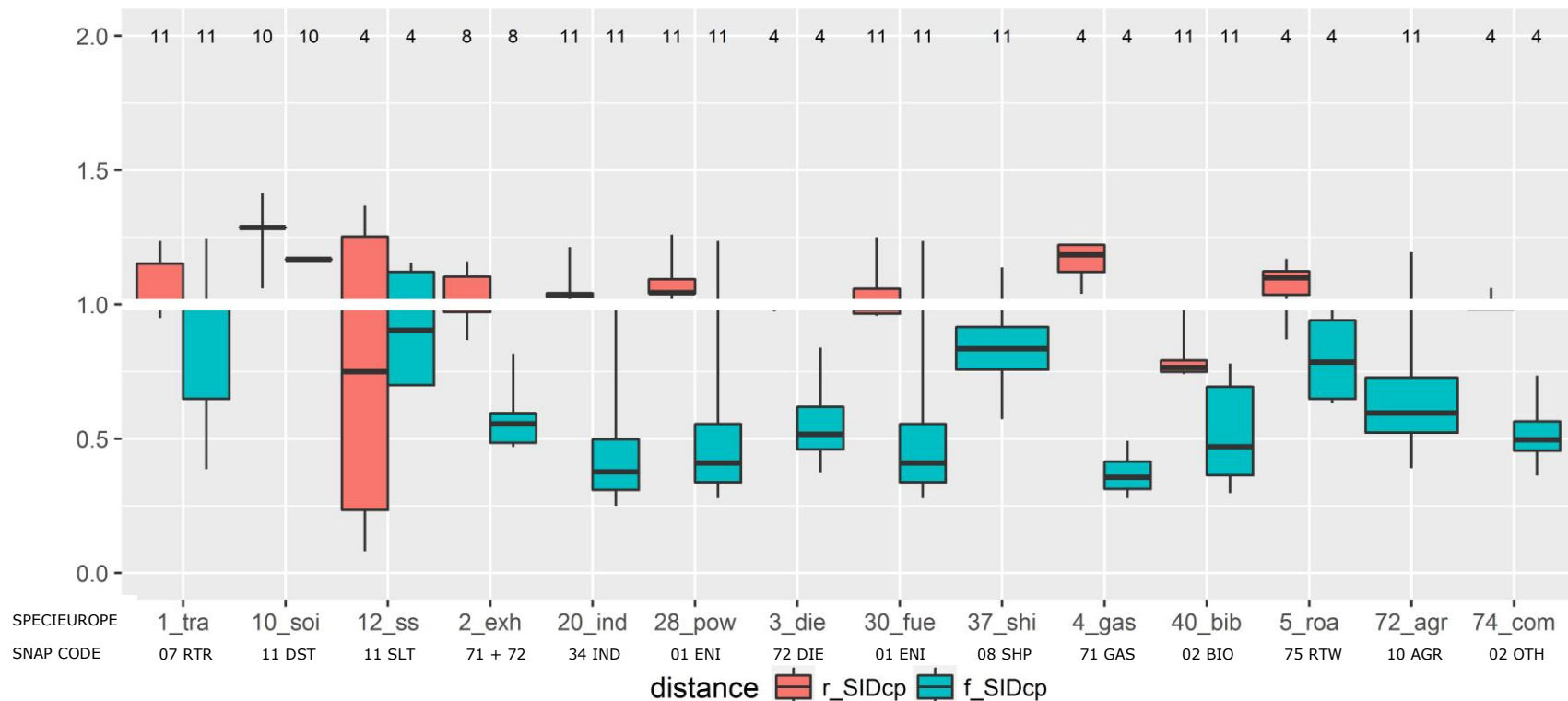
top = number of candidate sources, horizontal line (white)= acceptability threshold, not normalized distances

Soil not comparable with the reference and among participants. Traffic, industry and power plant, not comparable with the reference.

SID by sources optional



Lens



r = distances to the reference chemical profiles (cp) in SPECIATE and SPECIEUROPE

f = distances among the candidate sources

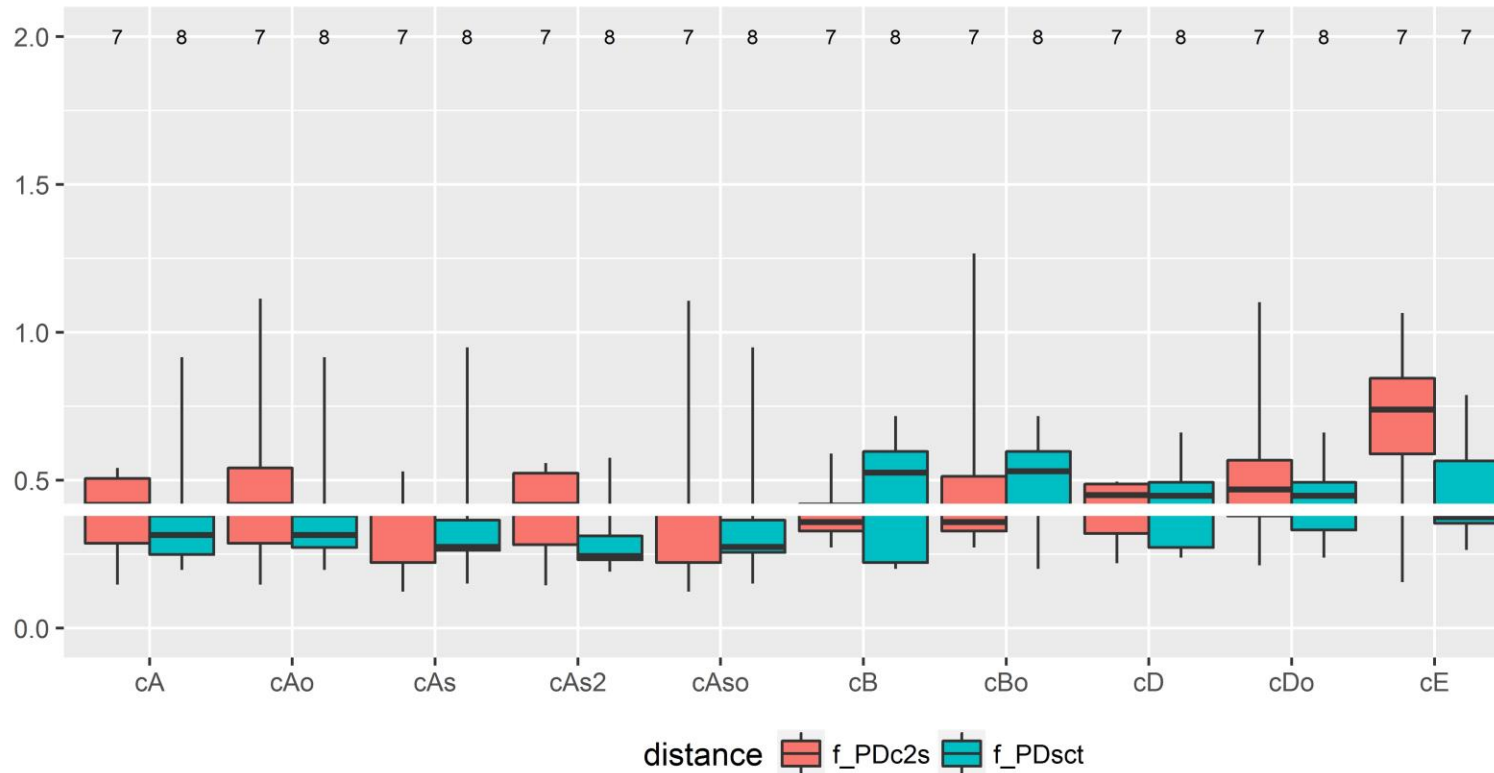
top = number of candidate sources, horizontal line (white)= acceptability threshold, not normalized distances

Sea salt variable scores. Traffic, soil, gasoline, road dust and power plant not comparable with the reference. Soil cps are not comparable among results.

PD time trend and contribution to source



Lens



f = distances among the candidate sources

top = number of candidate sources , horizontal line (white)= acceptability threshold

Time trends and c2s of sensitivity tests comparable among different results other models less comparable among each other and with the reference.

cF result not plotted because of different number of species.

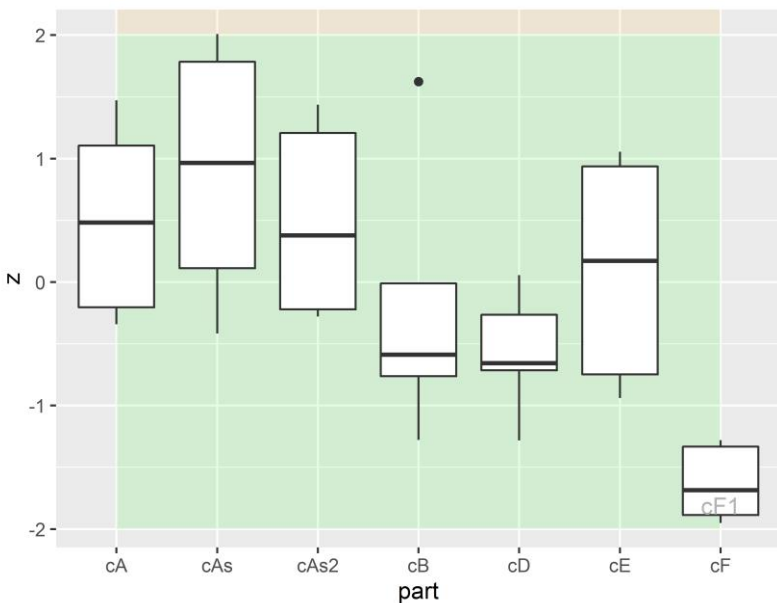
CTM performance tests

Performance CTMs z-score (overall sce)

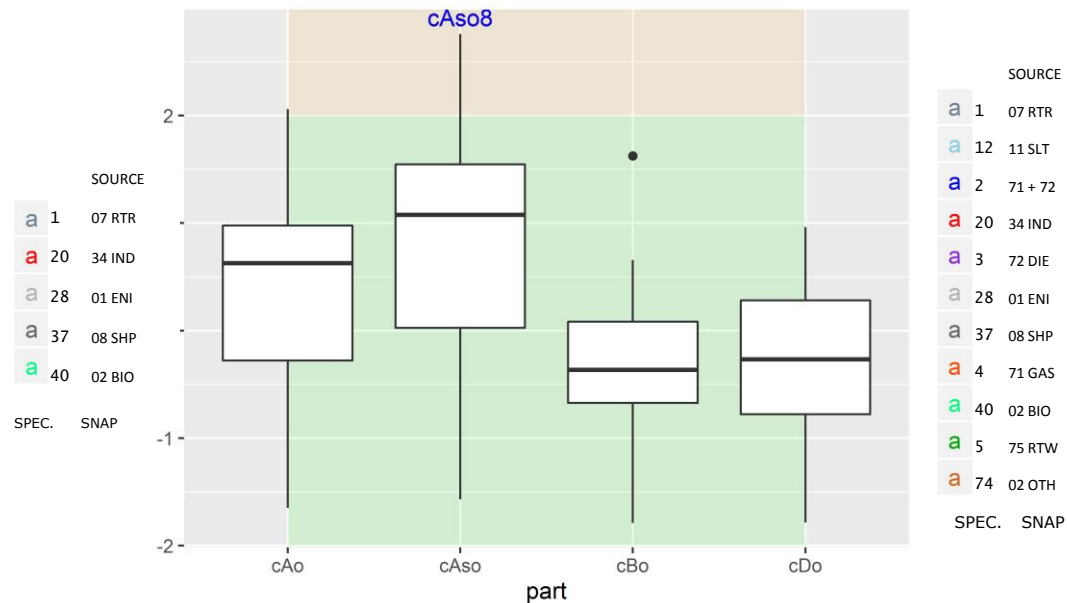


Lens

mandatory



optional



Exhaust overestimated in one result of the optional set and power plant underestimated in mandatory set by a model reporting result without amm. nitrate.

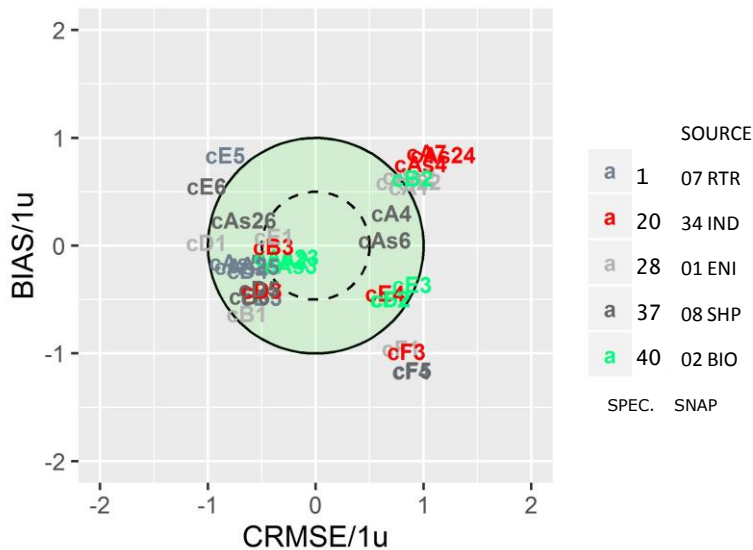
Agriculture and soil not shown

Performance RMs Target plot (sce time series)

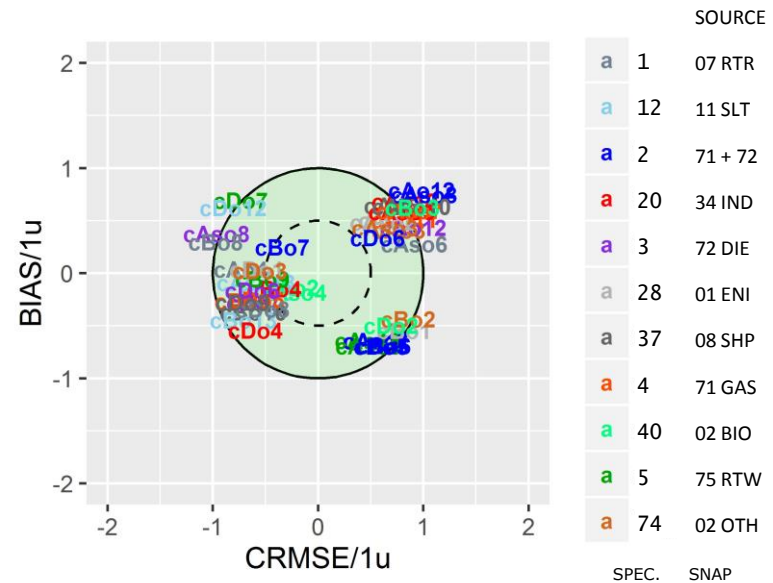


Lens

mandatory



optional



Target values normalized by 1 x (not 2x) uncertainty of the reference -> more stringent criteria

Mandatory: industry often scoring out of the acceptability area. Optional: exhaust, diesel, industry outside the acceptability area in some cases.

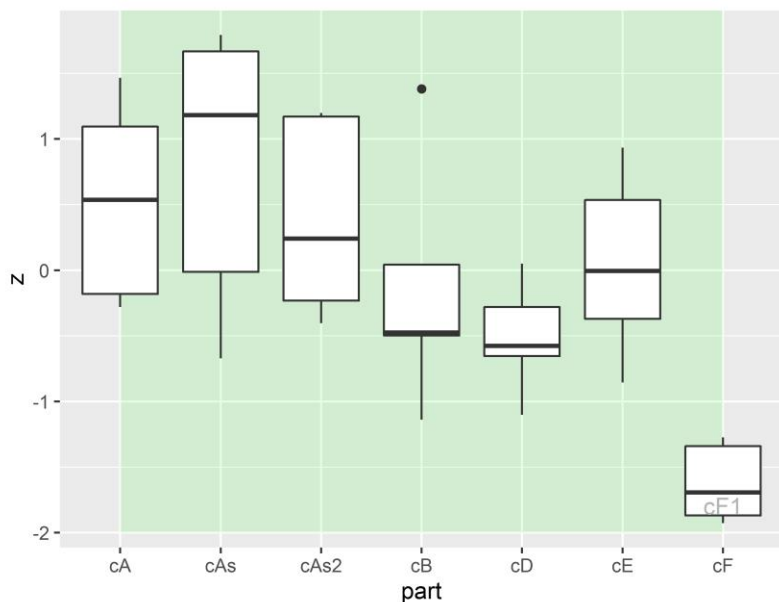
Agriculture and soil not shown

Performance CTMs z-score (overall sce)

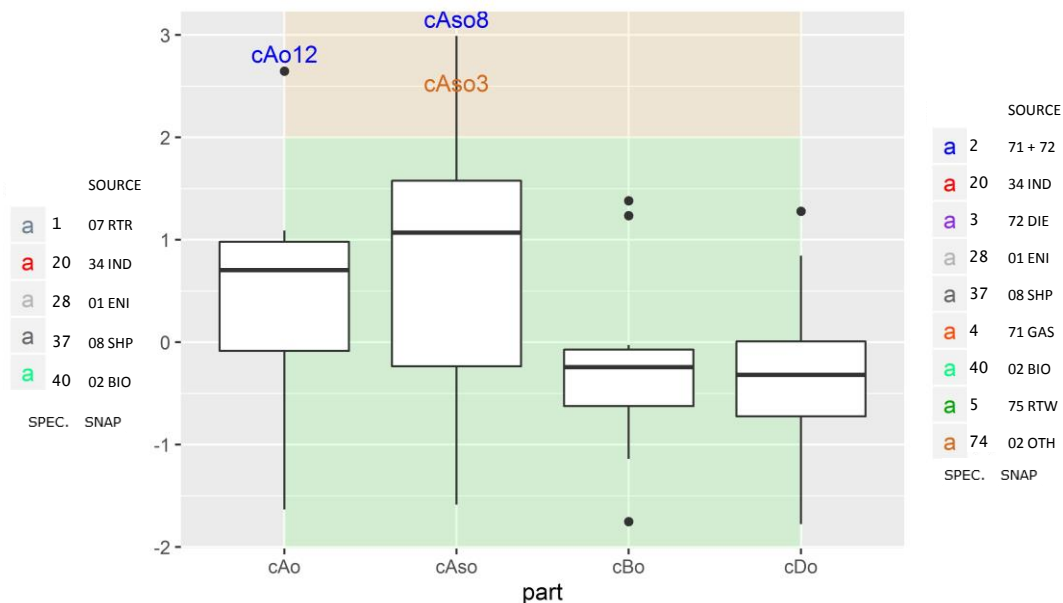


Suburban background

mandatory



optional



Exhaust and domestic combustion overestimated in the optional set and power plant underestimated by a model reporting results without amm. nitrate in the mandatory set.

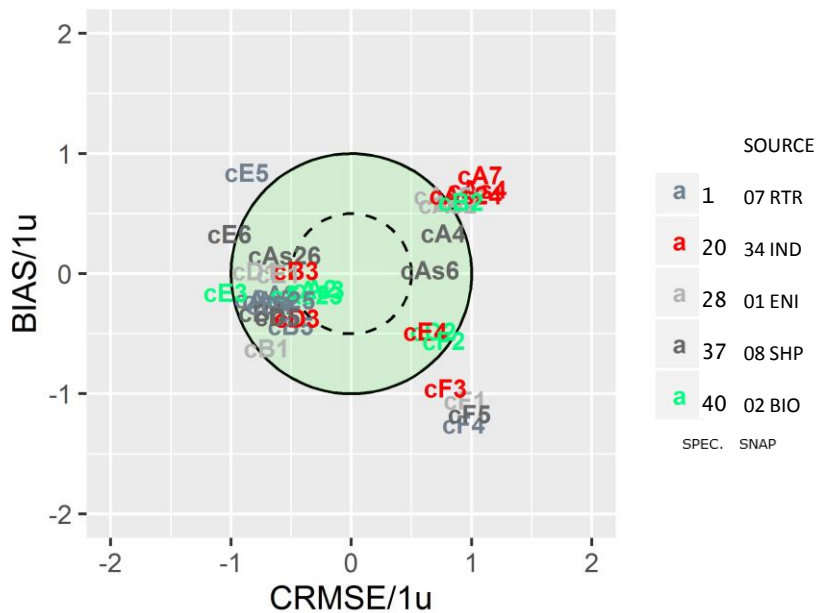
Agriculture and soil not shown

Performance CTMs Target plot (sce time series)

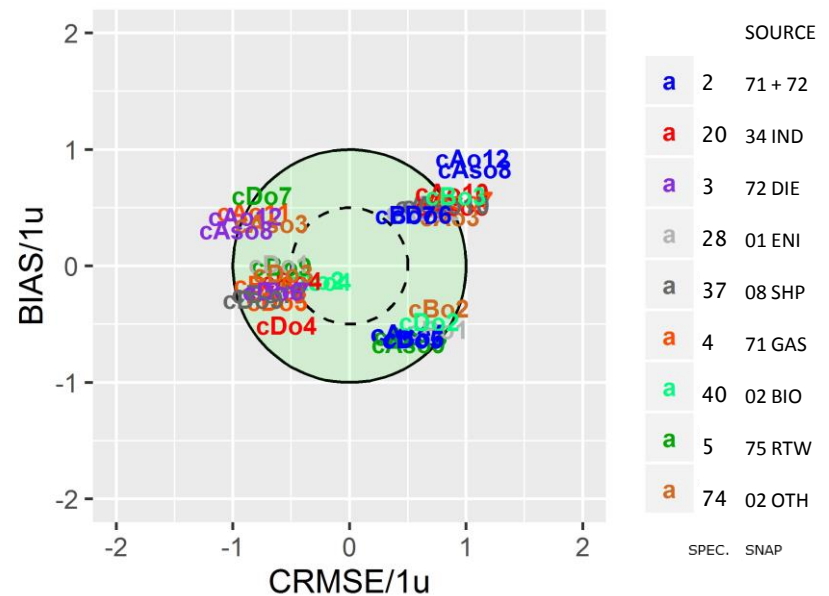


Suburban background

mandatory



optional



Target values normalized by 1 x (not 2x) uncertainty of the reference -> more stringent criteria

Performances similar to those observed in Lens

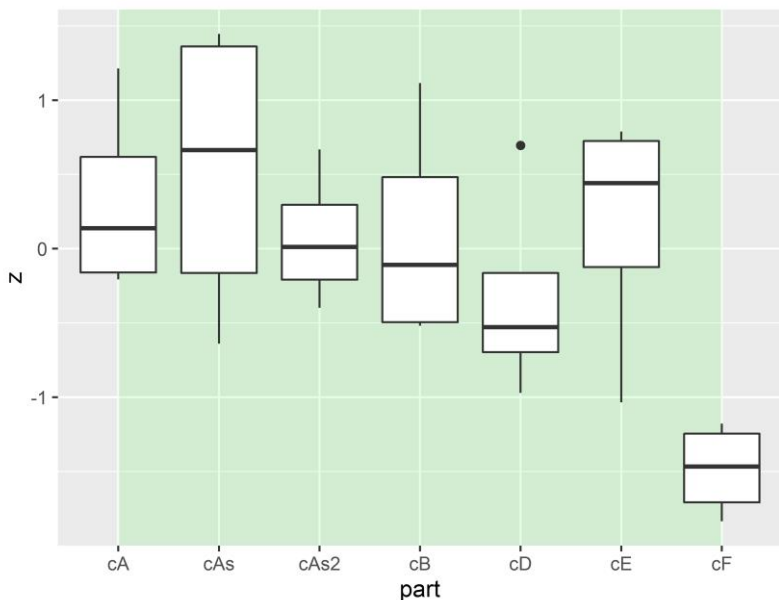
Agriculture and soil not shown

Performance CTMs z-score (overall sce)

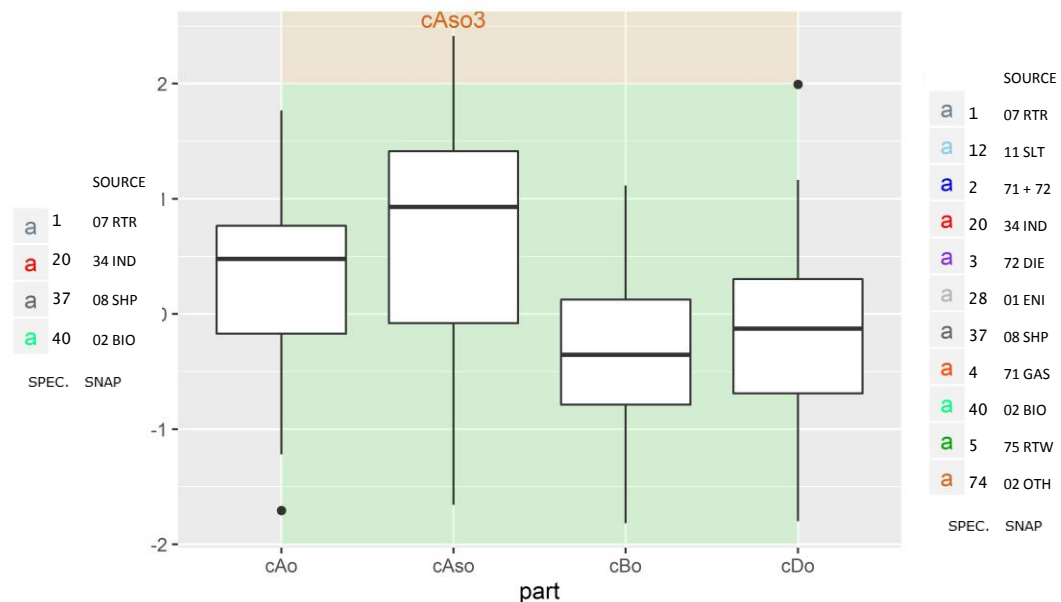


Gent

mandatory



optional



Domestic combustion overestimated in one result of the optional set and power plant underestimated by model without amm. nitrate in the mandatory set.

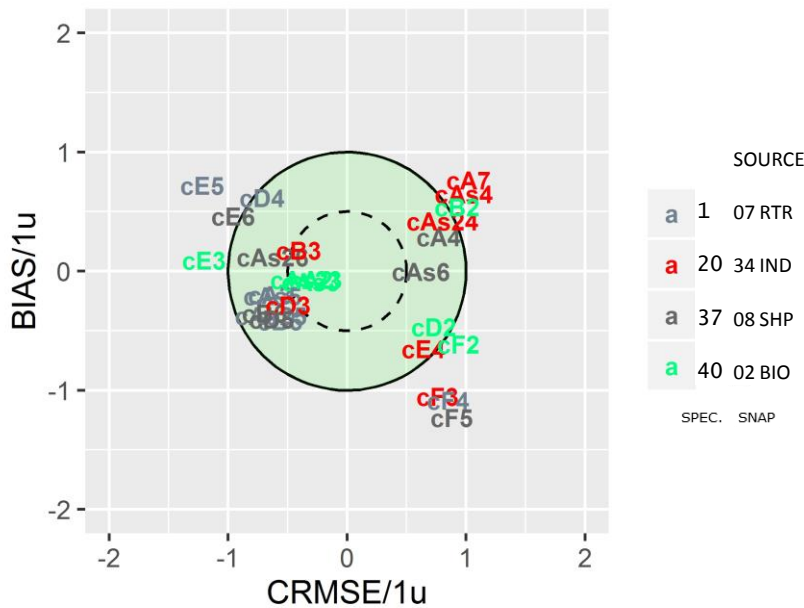
Agriculture and soil not shown.

Performance CTMs Target plot (sce time series)

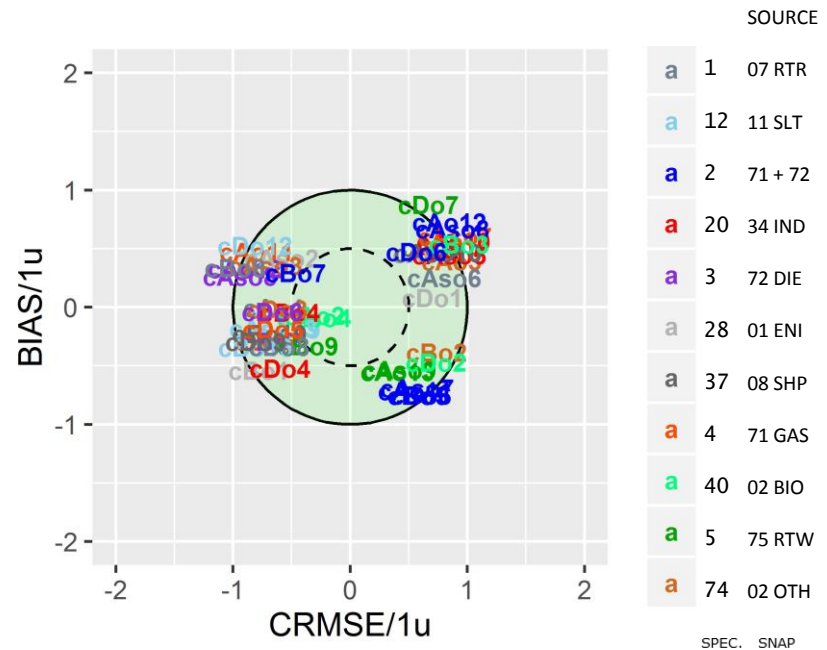


Gent

mandatory



optional



Target values normalized by 1 x (not 2x) uncertainty of the reference -> more stringent criteria

In the mandatory set, industry and traffic often out of the threshold for target values.

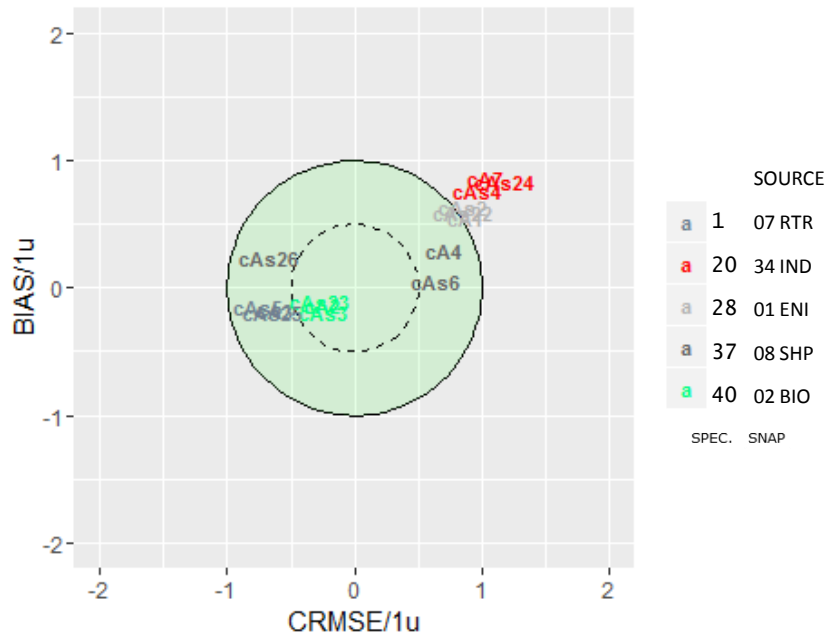
Agriculture and soil not shown

Sensitivity tests Target plot (sce time series)

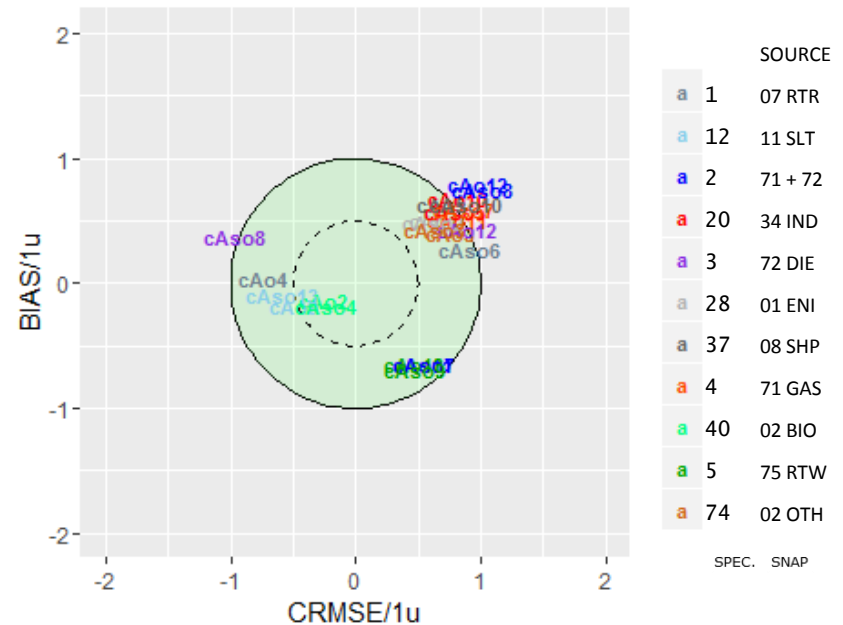


Lens

mandatory



optional



Sensitivity test cA (regular), cAs (effect of inv. layer), cAs2 (effect of domain spatial resolution)

Optional set, only cAo and cAso available. (cAs2o received but not included)

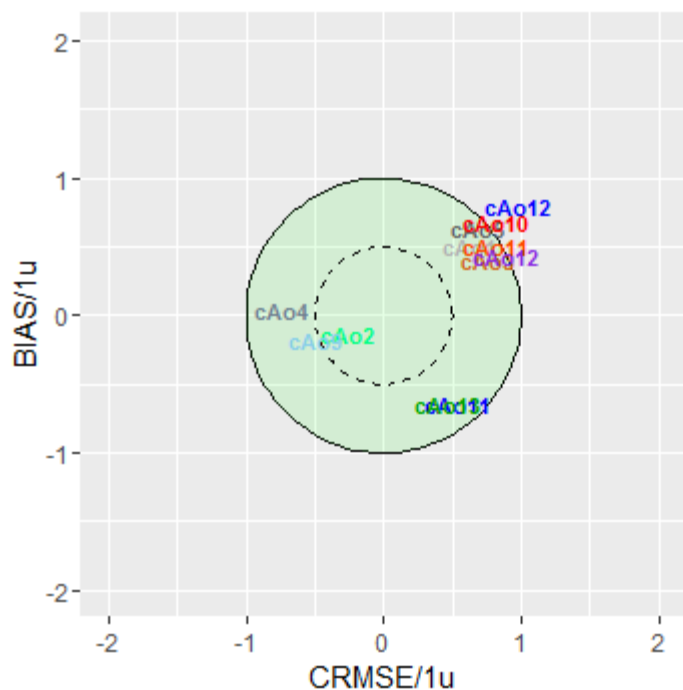
Agriculture and soil not shown

Sensitivity tests Target plot (sce time series)



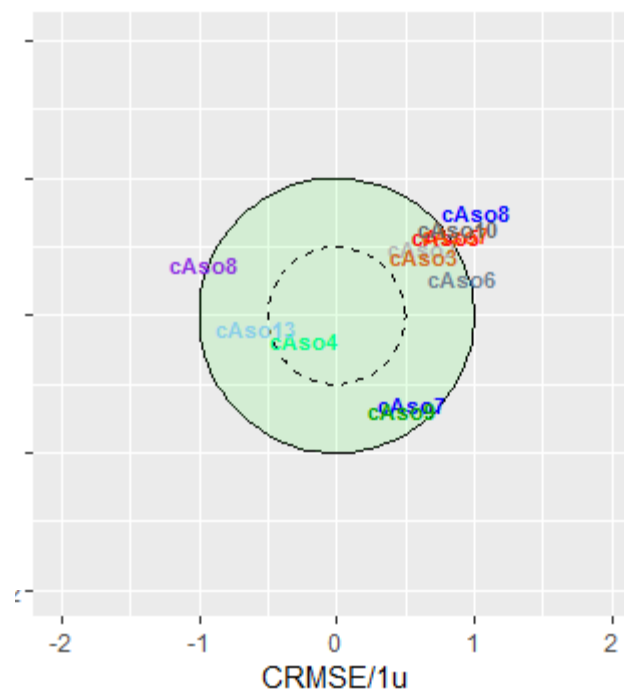
Lens

Optional cAo
(standard run)



SOURCE	SPEC.	SNAP
a 1	07	RTR
a 12	11	SLT
a 2	71 + 72	
a 20	34	IND
a 3	72	DIE
a 28	01	ENI
a 37	08	SHP
a 4	71	GAS
a 40	02	BIO
a 5	75	RTW
a 74	02	OTH

Optional cAso
(sensitivity run)



SOURCE	SPEC.	SNAP
a 1	07	RTR
a 12	11	SLT
a 2	71 + 72	
a 20	34	IND
a 3	72	DIE
a 28	01	ENI
a 37	08	SHP
a 4	71	GAS
a 40	02	BIO
a 5	75	RTW
a 74	02	OTH

Sensitivity test cA (regular), cAs (effect of inversion layer), cAs2 (effect of domain spatial resolution)

Optional set only available for cAo and cAso. (cAs2o will be included afterwards)

cAo exhaust and industry slightly overestimated, cAso also ship in the critical area.

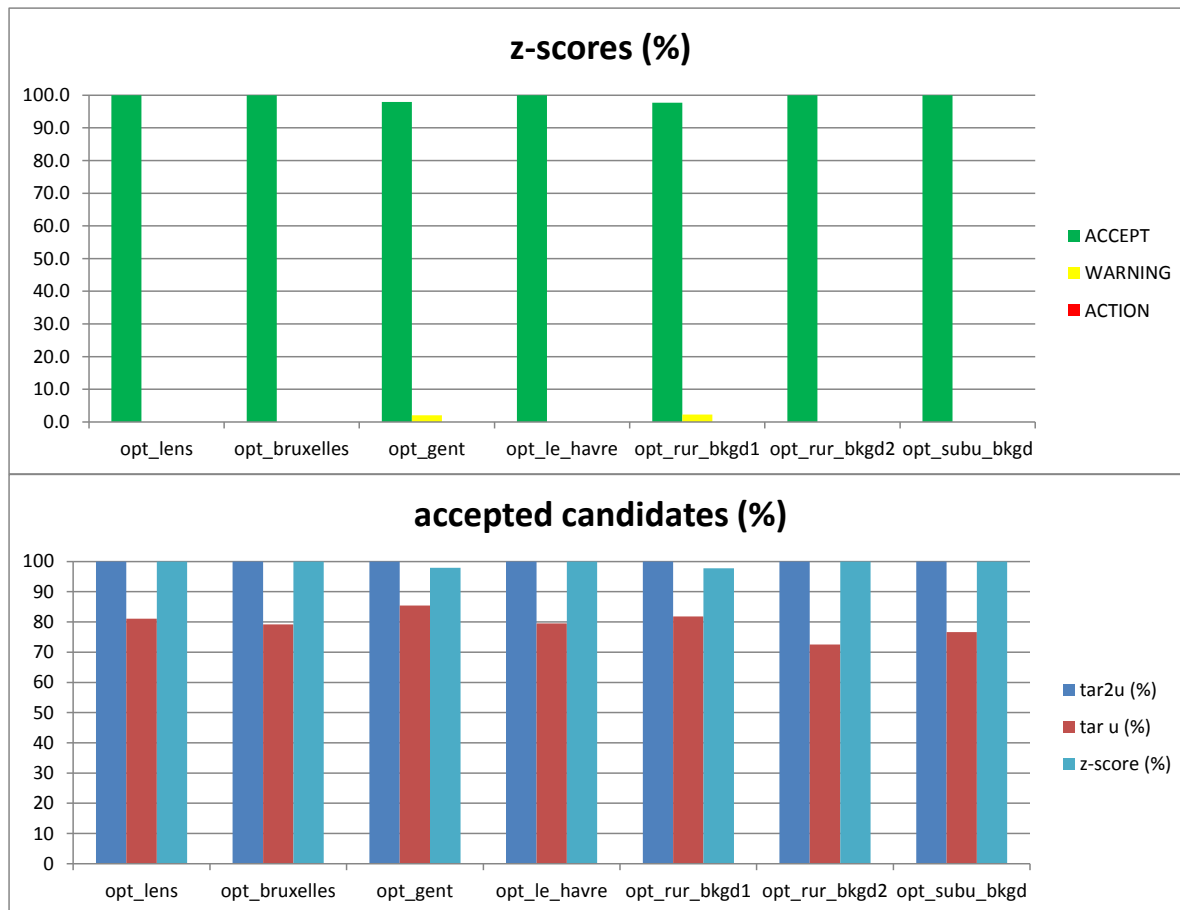
Agriculture and soil not shown

mandatory



Target test with 1u (time series) is more stringent than z scores (overall mean). CTM present high comparability with the CTM reference values for SA. CTM show similar performance in the different receptors.

optional



Results with optional set of sources show better performance than results with mandatory ones. In optional set of sources, rural sites slightly lower number of succesful target scores than other sites.

Thank you for your attention