

EMEP model: SR Calculations, Sites, Sondes, and Nudging

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Source Receptor Calculations:

Concept: Name says it all. Calculations to find out where the pollutants get deposited or ends up, or on the other hand to find out the source of pollution at a particular country.

EMEP Method: Reduce the emissions of each component by 15% at each country. i.e., for each Years reporting
59 countries X 5 pollutants + Base run + BIC (5 runs)+
DMS + Volcano = 303 runs

SR: How to do with EMEP:

- femis.dat ->

```
Name 7  sox  nox  co  voc  nh3  pm25  pmco  
28    0  1.0  1.0  1.0  1.0  1.0   1.0
```

- For reducing 20% emissions of SOX from France

```
Name 7  sox  nox  co  voc  nh3  pm25  pmco  
8    0  1.0  .80  1.0  1.0  1.0   1.0
```

Reducing Emissions from a particular lonlat box

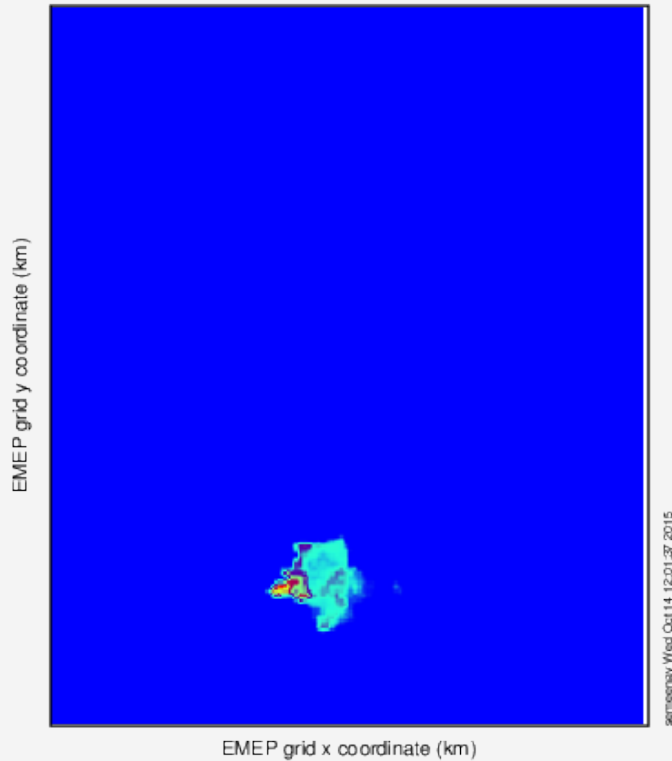
Name	7	sox	nox	co	voc	nh3	pm25	pmco
28	0	1.0	1.0	1.0	1.0	1.0	1.0	1.0
Lonlat	1.0 3.0 46.5 50.0	0.0	0.0	1.0	1.0	1.0	1.0	1.0
Lonlat	11.0 30.0 50.0 60.0	0.0	0.0	1.0	1.0	1.0	1.0	1.0

The lonlat lines have the format:

lonlat minlon maxlon minlat maxlat sector reduction1 reduction2

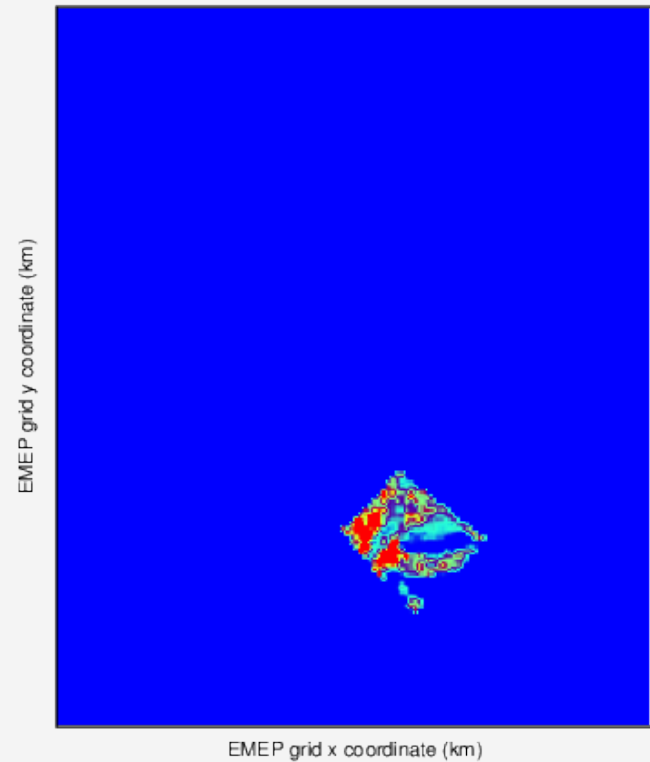
Should work for all gridded emissions (tested for ASCII, "Mixed" ASCII, "Mixed" fractions)

Emis_mgm2_nh3 (mg/m2)



Range of Emis_mgm2_nh3: 0 to 1.88795 mg/m2
Range of EMEP grid x coordinate: -350 to 6200 km
Range of EMEP grid y coordinate: -5450 to 2450 km
Current time at end of period: 41274 days since 1900-1-1 0:0:0
Frame 1 in File diff_FR.fullrun.nc

Emis_mgm2_nh3 (mg/m2)



Range of Emis_mgm2_nh3: 0 to 3 mg/m2
Range of EMEP grid x coordinate: -350 to 6200 km
Range of EMEP grid y coordinate: -5450 to 2450 km
Current time at end of period: 41274 days since 1900-1-1 0:0:0
Frame 1 in File diff_LLBox_fullrun.nc

SR Products:

SR Tables and Country Reports

	MK	MT	NL	NO	PL	PT	RO	RS	RUE	SE	SI	SK	TJ	TM	TR	UA	UZ	ATL	BAS	BLS	MED	NOS	AST	NOA	BIC	DMS	VOL	SUM	EXC	EU	
AL	4	0	0	0	2	0	1	8	1	0	0	0	-0	0	2	1	0	0	0	0	23	1	0	0	3	-0	0	99	72	48	AL
AM	0	0	0	0	0	0	0	0	2	0	0	0	0	0	13	0	0	0	0	0	1	0	3	0	3	-0	0	47	40	2	AM
AT	0	0	4	0	26	0	2	4	1	0	10	4	0	0	1	2	0	1	2	0	7	7	0	0	3	-0	-0	383	364	343	AT
AZ	0	0	0	0	1	0	0	0	19	0	0	0	0	1	9	3	1	0	0	0	1	0	8	0	4	-0	0	126	112	4	AZ
BA	1	0	1	0	12	0	3	15	1	0	1	4	-0	-0	1	2	-0	1	1	0	18	2	0	0	2	-0	-0	169	145	107	BA
BE	0	0	9	0	4	0	0	0	1	0	0	0	0	0	0	0	4	1	0	1	15	0	0	4	0	-0	-0	147	122	120	BE
BG	7	0	1	0	12	0	29	18	11	0	1	3	0	0	45	20	0	1	1	7	21	2	0	1	5	0	0	335	297	190	BG
BY	1	0	6	2	94	0	12	5	86	4	2	8	0	0	10	77	0	2	13	3	6	13	0	0	5	-0	-0	574	532	278	BY
CH	0	0	2	0	2	0	0	0	0	0	0	0	0	0	0	0	-0	1	0	0	4	3	0	0	3	0	-0	173	162	127	CH
CY	0	0	0	0	0	0	0	0	0	0	0	0	-0	0	5	0	0	0	0	0	4	0	0	0	1	-0	-0	14	9	3	CY
CZ	0	0	6	1	60	0	3	5	2	1	4	8	0	0	1	2	0	2	4	0	4	10	0	0	4	-0	0	392	369	351	CZ
DE	0	0	81	6	109	3	3	2	10	6	3	6	0	0	1	7	0	21	33	0	12	118	0	0	32	0	-0	1829	1613	1548	DE
DK	0	0	10	2	9	0	0	0	1	2	0	0	-0	0	0	1	0	4	10	0	1	26	0	0	3	0	-0	160	117	112	DK
EE	0	0	3	1	15	0	1	0	14	4	0	1	0	0	1	3	0	1	13	0	1	7	0	0	2	-0	0	123	100	75	EE
ES	0	0	7	1	2	68	-0	0	0	0	0	0	0	-0	0	-0	-0	62	2	0	94	17	0	1	51	-0	-0	959	732	730	ES
FI	0	0	9	12	40	0	1	1	56	30	0	2	0	0	1	4	0	7	47	0	2	33	0	-0	10	-0	-0	483	384	303	FI
FR	0	0	48	3	28	18	1	1	3	2	2	2	0	0	1	2	0	78	7	0	96	109	0	2	41	-0	0	2018	1686	1650	FR
GB	0	0	22	4	15	3	0	0	3	3	0	1	0	0	0	1	0	43	7	0	2	66	0	0	26	0	-0	665	519	508	GB
GE	0	0	0	0	1	0	0	0	10	0	0	0	0	1	31	4	0	0	0	2	1	0	2	0	5	-0	0	107	96	7	GE
GL	0	0	1	1	0	0	-0	0	1	0	0	0	0	0	0	0	0	2	1	0	0	2	0	-0	89	0	0	102	10	7	GL
GR	11	0	1	0	6	0	8	10	6	0	0	1	-0	0	44	10	0	1	1	3	81	2	0	2	10	0	0	387	287	200	GR
HR	0	0	1	0	16	0	3	12	1	0	6	5	-0	-0	1	2	-0	1	1	0	27	2	0	0	1	-0	-0	229	197	172	HR
HU	2	0	2	0	53	0	24	28	3	1	6	21	0	0	3	10	0	1	2	1	14	4	0	0	1	-0	0	383	360	301	HU
IE	0	0	3	0	1	1	0	0	0	0	0	0	0	0	0	0	0	13	1	0	1	9	0	0	8	-0	0	106	74	73	IE
IS	0	0	1	1	0	0	-0	0	0	0	0	0	0	-0	-0	0	0	5	1	0	0	4	-0	-0	8	-0	-0	44	26	19	IS
IT	1	1	4	1	15	3	2	7	1	0	21	4	-0	-0	4	2	-0	6	1	0	202	7	0	3	25	0	0	1455	1210	1171	IT
KG	0	0	0	0	0	0	0	0	5	0	0	0	32	4	3	0	182	0	0	0	0	12	0	0	17	-0	0	344	315	2	KG
KZT	1	0	4	5	30	1	8	3	818	3	1	3	30	60	65	104	234	6	8	6	14	11	73	1	94	-0	0	2587	2374	164	KZT
LT	0	0	3	1	43	0	2	1	15	3	1	2	0	0	1	10	0	1	11	0	1	9	0	0	2	-0	0	200	175	134	LT
LU	0	0	1	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	1	0	0	0	0	-0	15	14	13	LU
LV	0	0	3	1	30	0	2	1	19	4	0	1	0	0	1	7	0	1	14	0	1	9	0	0	2	-0	0	182	154	115	LV
MD	0	0	0	0	9	0	9	1	6	0	0	1	0	0	10	19	0	0	1	3	3	1	0	0	1	-0	0	84	76	34	MD
ME	0	0	0	0	1	0	0	4	0	0	0	0	0	-0	0	0	-0	0	0	0	9	0	0	0	1	-0	0	41	30	18	ME
MK	12	0	0	0	2	0	1	8	1	0	0	0	-0	0	3	1	0	0	0	0	6	0	0	0	2	-0	0	74	65	38	MK
MT	0	0	0	0	0	0	0	0	0	0	0	0	-0	0	0	0	0	0	0	0	1	0	0	0	0	0	0	2	1	1	MT
NL	0	0	19	1	5	0	0	0	1	0	0	0	0	0	0	0	0	4	2	0	1	24	0	0	5	0	-0	164	128	125	NL
NO	0	0	11	47	12	1	0	0	8	13	0	0	0	0	0	1	0	16	21	0	1	67	0	-0	17	-0	0	372	252	195	NO
PL	1	0	24	4	467	1	17	12	31	9	7	27	0	0	4	43	0	7	43	1	10	46	0	0	13	-0	0	1394	1273	1139	PL
PT	0	0	1	0	0	63	-0	0	0	0	0	0	-0	-0	0	-0	-0	33	0	0	3	2	0	0	17	-0	0	159	105	104	PT
RO	6	0	3	1	54	0	164	34	22	1	3	12	0	0	55	62	0	2	4	12	25	6	0	1	5	-0	0	702	648	447	RO
RS	9	0	1	0	19	0	19	66	3	0	1	6	0	0	5	6	0	1	1	1	15	2	0	0	3	-0	0	285	262	158	RS
RUE	5	0	45	49	324	2	61	22	5969	61	6	26	5	27	236	640	57	47	140	33	54	131	34	2	570	-0	0	10494	9483	1588	RUE
SE	0	0	24	28	37	1	0	0	27	59	0	1	0	0	0	5	0	12	73	0	2	90	0	0	15	-0	0	676	484	416	SE
SI	0	0	0	0	5	0	1	2	0	0	14	1	-0	-0	0	1	-0	0	0	0	7	1	0	0	1	-0	-0	103	94	89	SI
SK	1	0	2	0	50	0	9	9	1	0	3	19	0	0	1	5	0	1	2	0	5	3	0	0	1	-0	0	218	206	184	SK
TJ	0	0	0	0	0	0	0	0	3	0	0	0	68	7	2	0	57	0	0	0	0	16	0	15	-0	0	179	148	1	TJ	
TM	0	0	0	0	2	0	0	0	33	0	0	0	6	56	8	6	44	1	1	1	1	1	41	0	33	-0	0	280	202	12	TM
TR	2	0	2	1	12	1	15	6	40	1	1	2	0	0	796	38	0	2	2	26	115	4	19	7	56	-0	0	1295	1064	157	TR
UA	4	0	9	3	185	1	78	20	255	5	3	19	0	1	116	501	1	4	15	28	35	18	2	1	16	-0	0	1701	1583	600	UA
UZ	0	0	0	0	2	0	0	0	36	0	0	0	31	28	8	5	195	1	1	0	1	1	27	0	27	-0	0	434	376	13	UZ
ATL	0	0	132	139	80	56	-1	1	213	46	1	3	0	0	1	12	1	723	98	1	19	443	0	0	1893	0	0	6078	2899	2481	ATL
BAS	0	0	34	13	118	1	4	3	48	36	1	5	0	0	2	15	0	12	102	0	5	84	0	0	14	0	-0	1003	786	685	BAS
BLS	2	0	4	1	45	0	52	13	134	2	1	5	0	0	280	168	0	2	6	62	40	9	3	2	8	0	0	1035	904	265	BLS
MED	15	13	23	5	70	24	29	44	29	3	22	13	-0	0	415	40	0	47	11	19	1986	51	12	51	141	0	3	5546	3226	2607	MED
NOS	0	0	77	38	71	7	1	1	13	21	1	3	0	0	4	0	79	47	0	5	275	0	0	52	1	0	1788	1329	1261	NOS	
AST	1	0	2	1	11	0	3	2	168	1	0	1	27	45	156	35	77	2	2	4	56	4	397	5	444	-0	0	1743	829	78	AST
NOA	3	3	4	1	10	10	6	8	6	1	2	2	-0	0	52	7	0	13	2	2	398	10	1	41	215	-0	-0	1148	466	380	NOA
SUM	92	19	652	376	2220	270	575	376	8136	325	129	224	198	231	2393	1888	853	1272	756	219											

Country Reports



Convention on Long-range Transboundary Air Pollution

emep
emep
emep

Co-operative programme for monitoring
and evaluation of the long-range
transmission of air pollutants in Europe

DATA NOTE
MSC-W 1/2015

Transboundary air pollution by
main pollutants (S, N, O₃) and PM

Albania

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Sondes

Sondes:

integer, public, parameter :: &

,NSONDES_MAX = 99 & ! Max. no sondes allowed
,NLEVELS_SONDE = 20 & ! No. k-levels (9 => 0--2500 m)
,FREQ_SONDE = 1 & ! Interval (hrs) between outputs
,NADV_SONDE = 9 & ! No. advected species
,NSHL_SONDE = 3 & ! No. short-lived species
,NXTRA_SONDE = 4 ! No. Misc. met. params

Default in OpenSource

```
integer, public, parameter, dimension(NADV_SONDE) :: &  
  SONDE_ADV = (/ IXADV_O3, IXADV_NO2, IXADV_NO,  
IXADV_PAN, IXADV_NO3_c, IXADV_NO3_f, IXADV_SO4,  
IXADV_NH4_f, IXADV_NH3/)
```

```
integer, public, parameter, dimension(NSHL_SONDE) :: &  
  SONDE_SHL = (/ IXSHL_OH, IXSHL_OD, IXSHL_OP /)  
character(len=10), public, parameter, dimension(NXTRA_SONDE) ::
```

```
  SONDE_XTRA= (/ "NOy  ", "z_mid ", "p_mid ", "th  " /)
```

Sites

Sites:

```
integer, private :: isite          ! To assign arrays, if needed
integer, public, parameter :: &
  NSITES_MAX = 99 & ! Max. no surface sites allowed
  ,FREQ_SITE = 1 & ! Interval (hrs) between outputs
  ,NADV_SITE = NSPEC_ADV & ! No. advected species
  ,NSHL_SITE = NSPEC_SHL & ! No. short-lived species
  ,NXTRA_SITE_MISC = 2 & ! No. Misc. met. params
  ,NXTRA_SITE_D2D = 9+8 ! No. Misc. met. Params
```

```
integer, public, parameter, dimension(NADV_SITE) :: &
  SITE_ADV = (/ (isite, isite=1,NADV_SITE) /) ! Everything
```

```
integer, public, parameter, dimension(NSHL_SITE) :: &
  SITE_SHL = (/ (isite, isite=1,NSHL_SITE) /) ! All short-lived species
```

Nesting

Different MODES:

config_emep.nml →

MODE = 0 (do nothing)

1->write, 2->read, 3->read and write, 10->write at end of run, 11->read at start, 12->read at start and write at end

Using different Boundary conditions

```
USE_EXTERNAL_BIC      = T,                ! .false. to deactivate
EXTERNAL_BIC_NAME     = 'EXTBC',
EXTERNAL_BIC_VERSION = 'EXTBC',
TOP_BC                = T,
filename_eta          = '$filename_eta',#filename_eta
```

Nest_ml.f90 →

NHOURS SAVE=3

Nesting

```
&ExternalBICs_bc
```

```
! BC from ??? exp id:
```

```
description='ECHAM','ECHAM5',4, name,version,size
```

```
map_bc=! emep,external,frac,wanted,found,IXADV,
```

```
'O3' , 'O3' ,1.0,T,F,-1,
```

```
'NO' , 'NO' ,1.0,T,F,-1,
```

```
'NO2' , 'NO2' ,1.0,T,F,-1,
```

```
'CH4' , 'CH4' ,1.0,T,F,-1,
```

```
&end
```

Nest_ml.f90 →

NHOURS SAVE=3

Nesting

....or you can create a BC data from EMEP Global and use this one for the regional runs

! 0=do nothing; 1=write; 2=read; 3=read and write;
! 10=write at end of run; 11=read at start; 12=read at start and write at end (BIC)

!-----

MODE = 10,
NHOURSAVE = 3, ! hours between saves. Fraction of 24
NHOURREAD = 1, ! hours between reads. Fraction of 24

!----- File name templates for Nest I/O

template_read_3D = 'EMEP_IN.nc', ! a different path can be set here
template_read_BC = 'EMEP_IN.nc', ! for each of the IO IC/BC files,
template_write = 'EMEP_OUT.nc', ! if needed.

Nesting

Read in EMEP BC

! 0=do nothing; 1=write; 2=read; 3=read and write;
! 10=write at end of run; 11=read at start; 12=read at start
and write at end (BIC)

!-----

```
MODE                = 2,  
NHOURSAVE           = 3, ! hours between saves. Fraction of 24  
NHOURREAD           = 1, ! hours between reads. Fraction of 24  
!----- File name templates for Nest I/O  
template_read_3D    = 'EMEP_IN.nc',    ! a different path can be set here  
template_read_BC    = 'EMEP_OUT.nc',    ! for each of the IO IC/BC files,  
!template_write     = 'EMEP_OUT.nc',    ! if needed.
```

Notes:

After each run, Output will be written out to the \$HOME Directory.

If you do not want your files to be overwritten, edit 'runlabel1' in modrun.sh file

You can compare a 'Base run' with the data on EMEP Opensource Web site.

There are two sets of model output.

- Without Forest Fire Data
- With FINN Forest Fire Data