



**Assessment of sensitivity of model responses to emission changes  
(FAIRMODE CT9)**

**Paris episode  
CHIMERE–v2020r1**

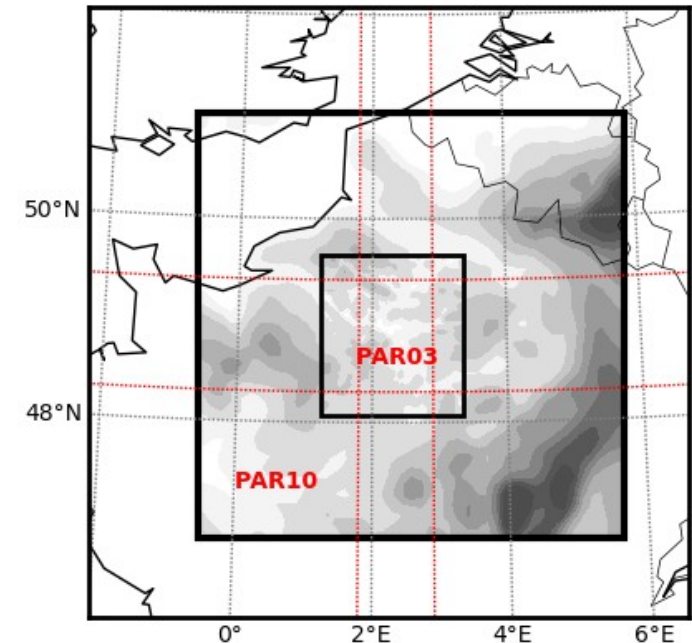
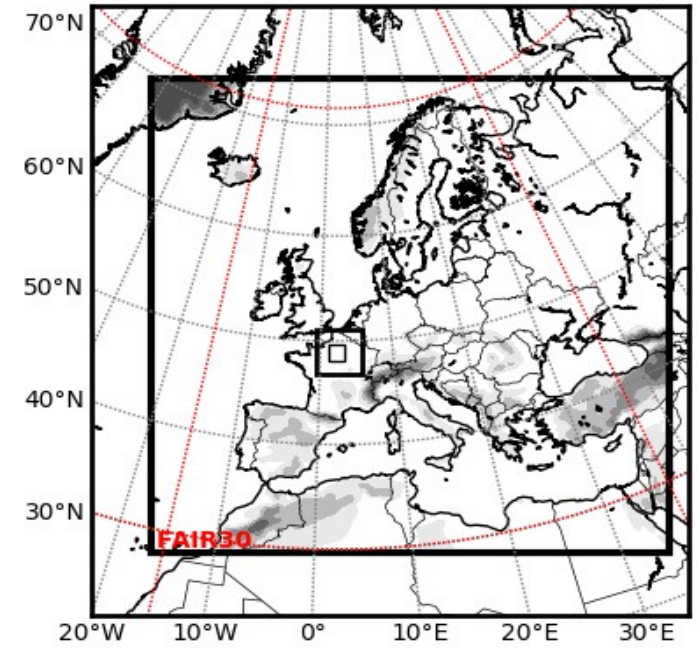
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Bertrand Bessagnet (JRC)



# Model configuration

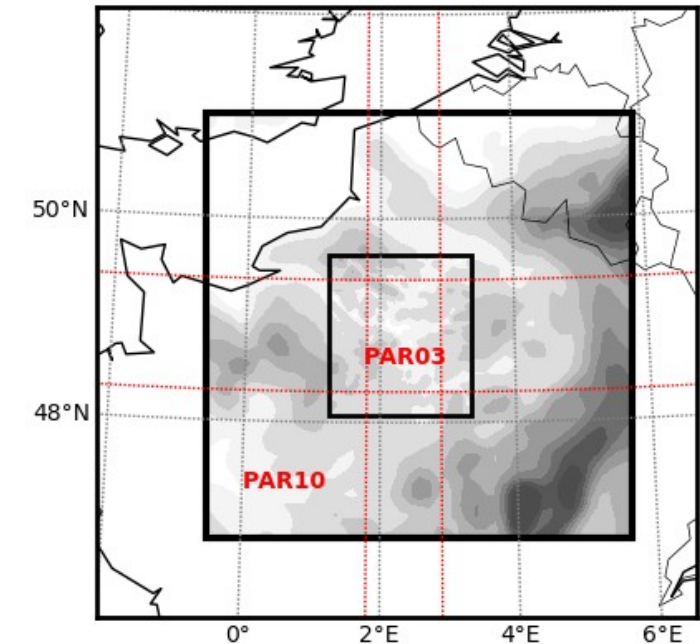
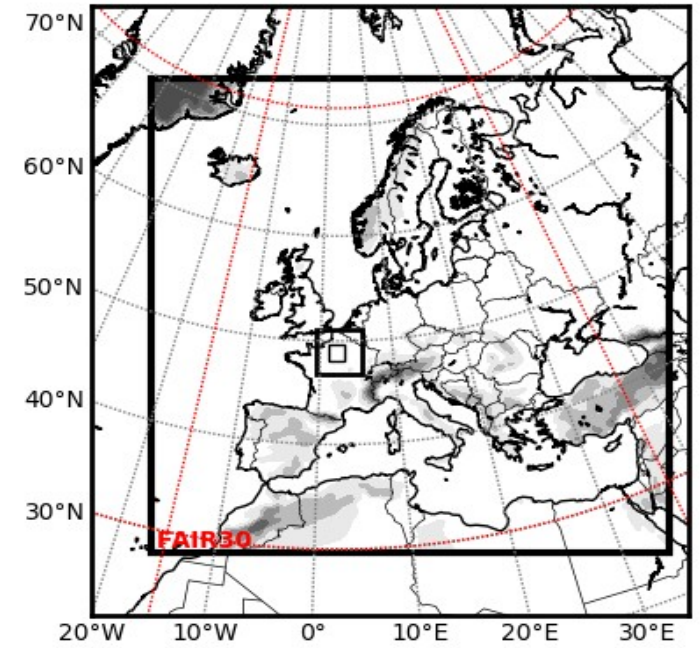
Runs : Paris episode 10/02/2015 to 17/02/2015  
(10 days of spinup period for all domains – BC continued to end of the month)

- Triple nesting : FAIR30(30kmx30km)  
PAR10(10kmx10km)  
PAR03(3kmx3km)
- Coupled to WRF – no direct/indirect aerosol effects
  - Specific scenarios for aerosol effects
- CAMS-reg anthropogenic emissions
- CAMS global reanalysis Boundary/initial conditions (3-hourly)
- 15 vertical layers: 999hPa to 300hPa



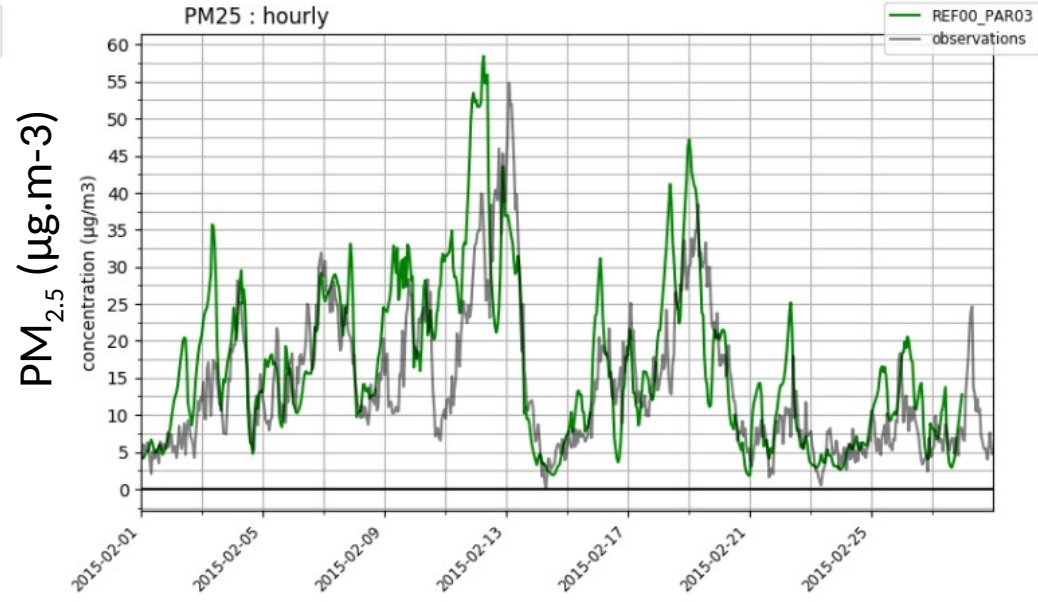
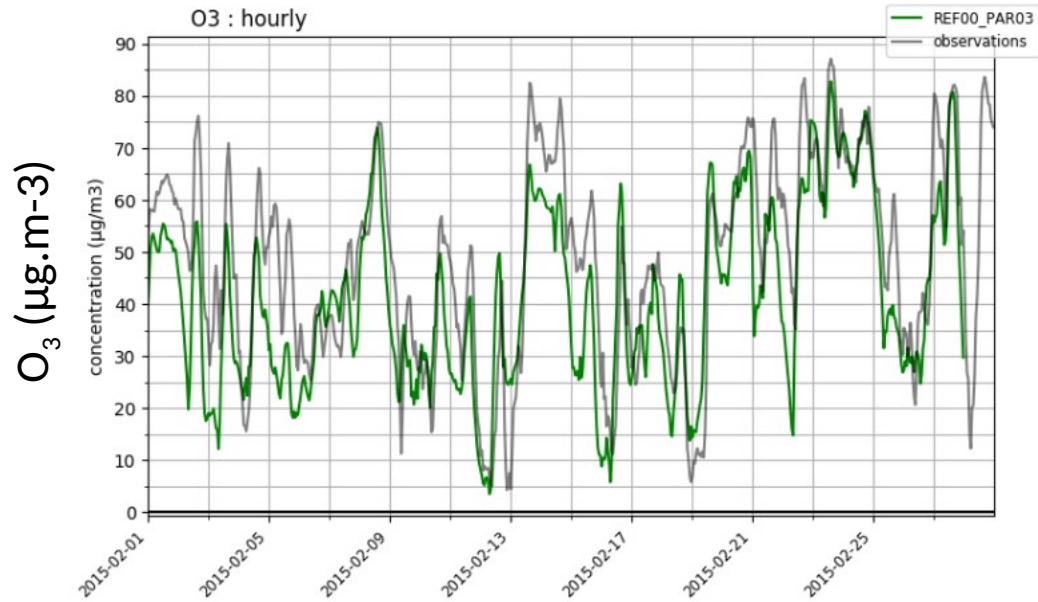
# Model configuration

Scenarios	FAIR30	PAR10	PAR03
SO <sub>x</sub>	-25%/-50%	-25%/-50%	-25%/-50%
PPM	-25%/-50%	-25%/-50%	-25%/-50%
NO <sub>x</sub>	-25%/-50%	-25%/-50%	-25%/-50%
NMVOOC	-25%/-50%	-25%/-50%	-25%/-50%
NH <sub>3</sub>	-25%/-50%	-25%/-50%	-25%/-50%
ALL	-25%/-50%	-25%/-50%	-25%/-50%
ALL - indirect	-50%	-50%	-50%
ALL - direct	-50%	-50%	-50%
ALL - direct/indirect	-50%	-50%	-50%



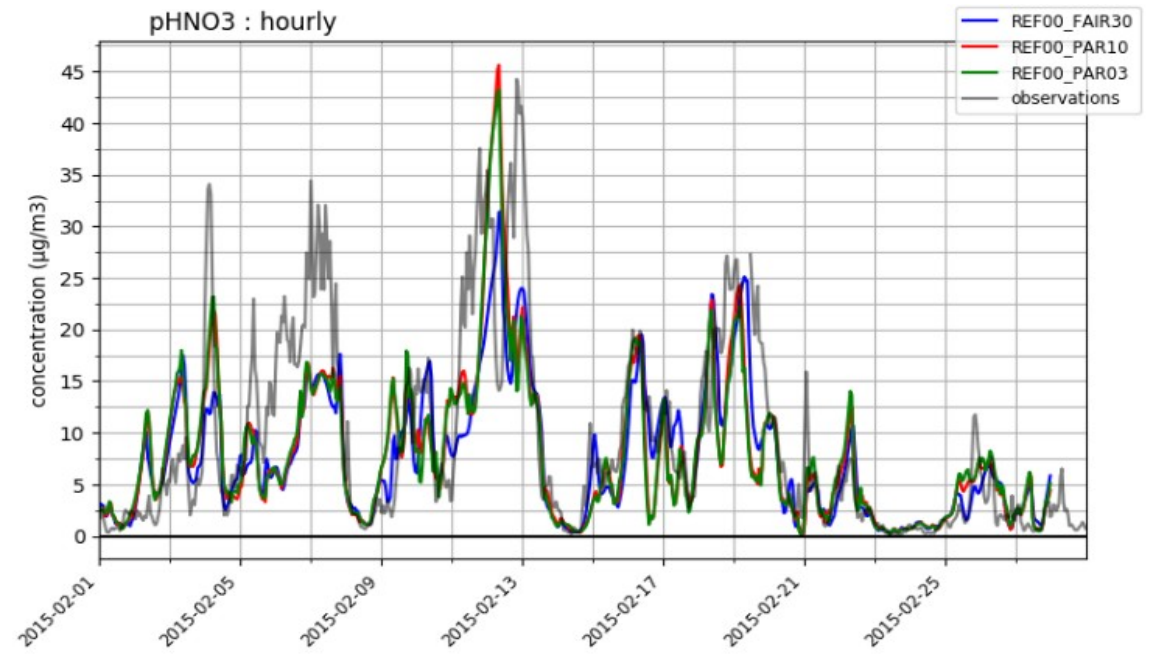
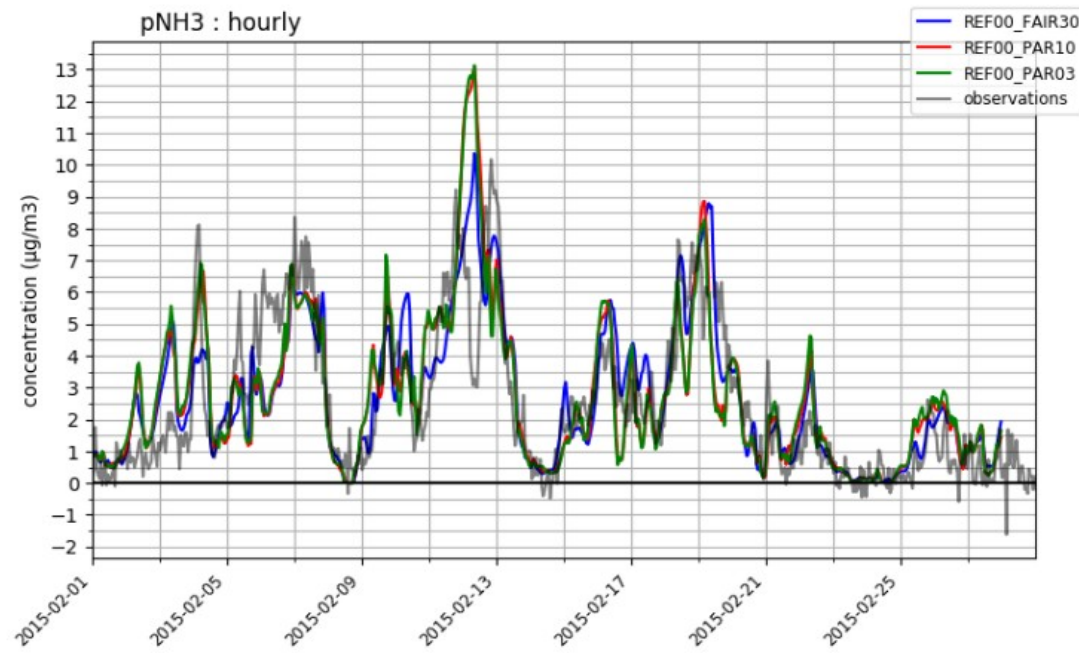
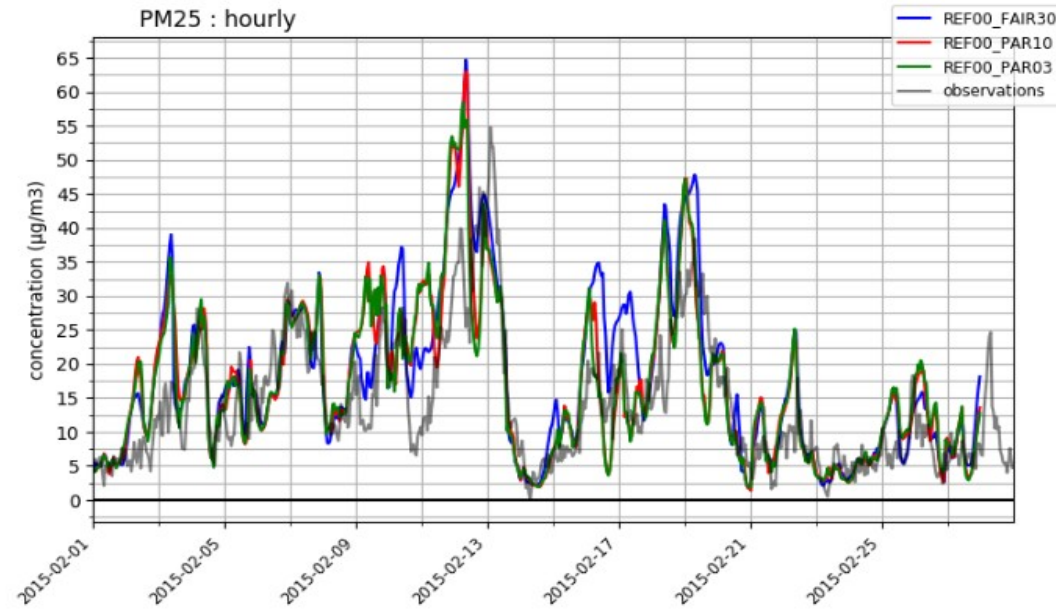
# Validation : PAR03

Validation was done for 02/2015 for O<sub>3</sub>, PM, NO<sub>2</sub>, meteorological parameters

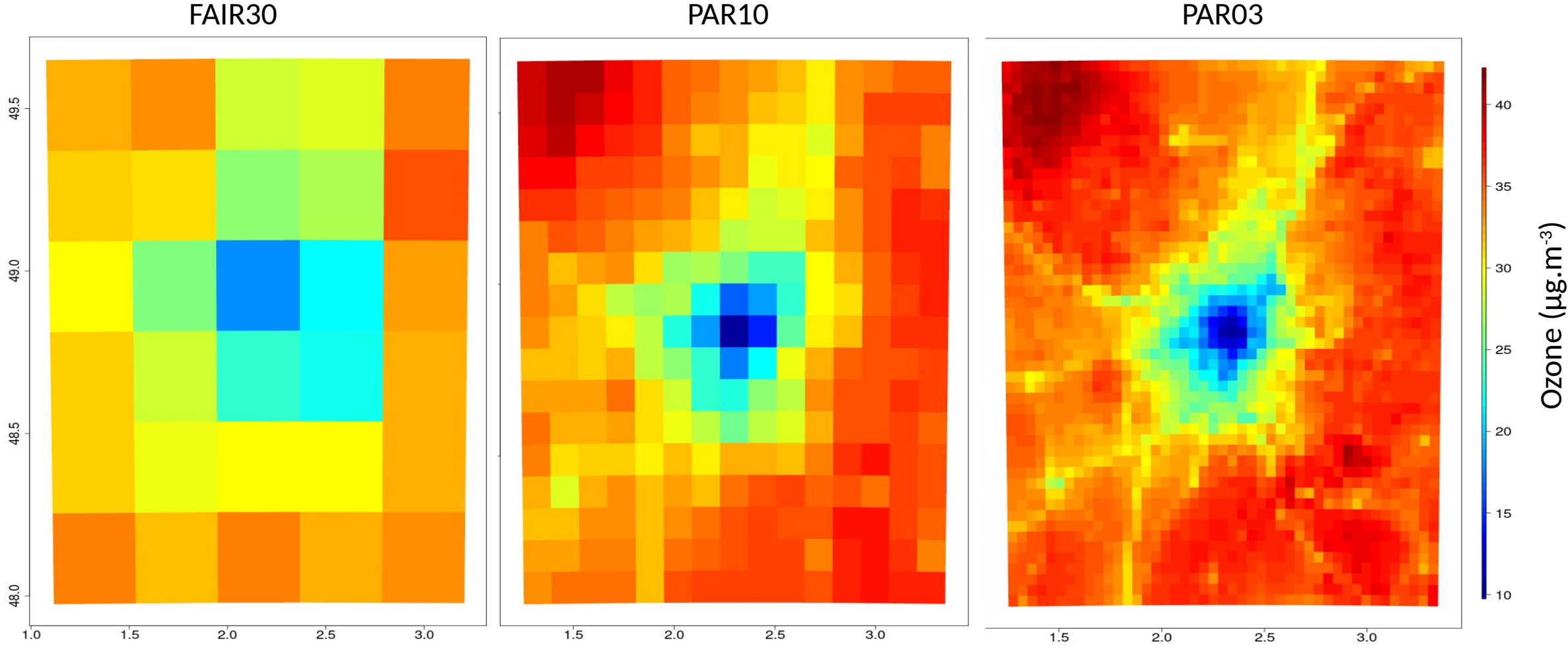


Species	Obs mean	RMSE	Bias	R
O3 (µg.m-3)	47.02	10.73	-6.71	0.85
NO2 (µg.m-3)	14.19	6.97	-4.07	0.69
PM10 (µg.m-3)	19.58	5.51	-1.40	0.85
PM2.5 (µg.m-3)	13.92	5.87	2.65	0.86

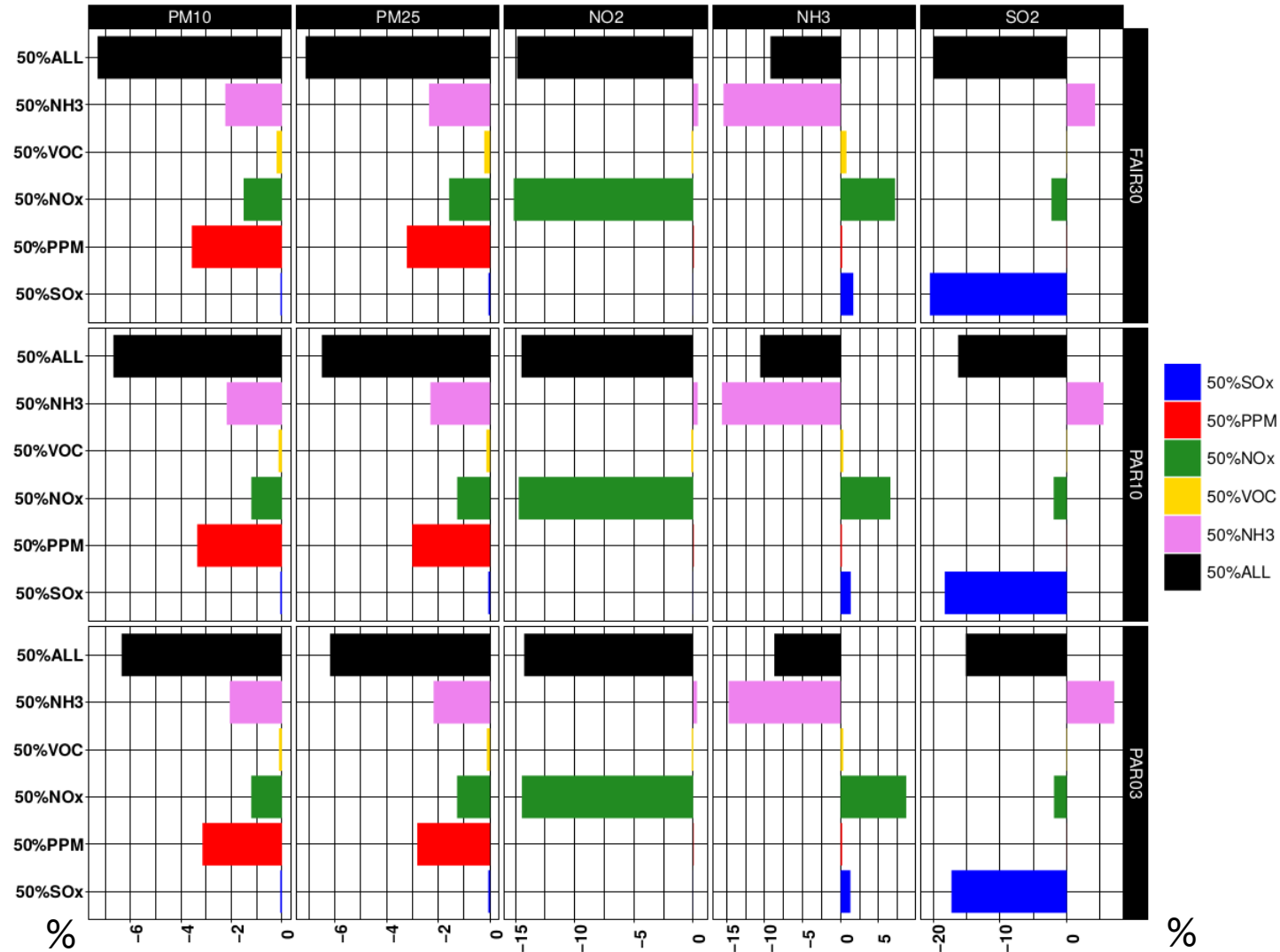
# Validation



# Effect of resolution on simulations

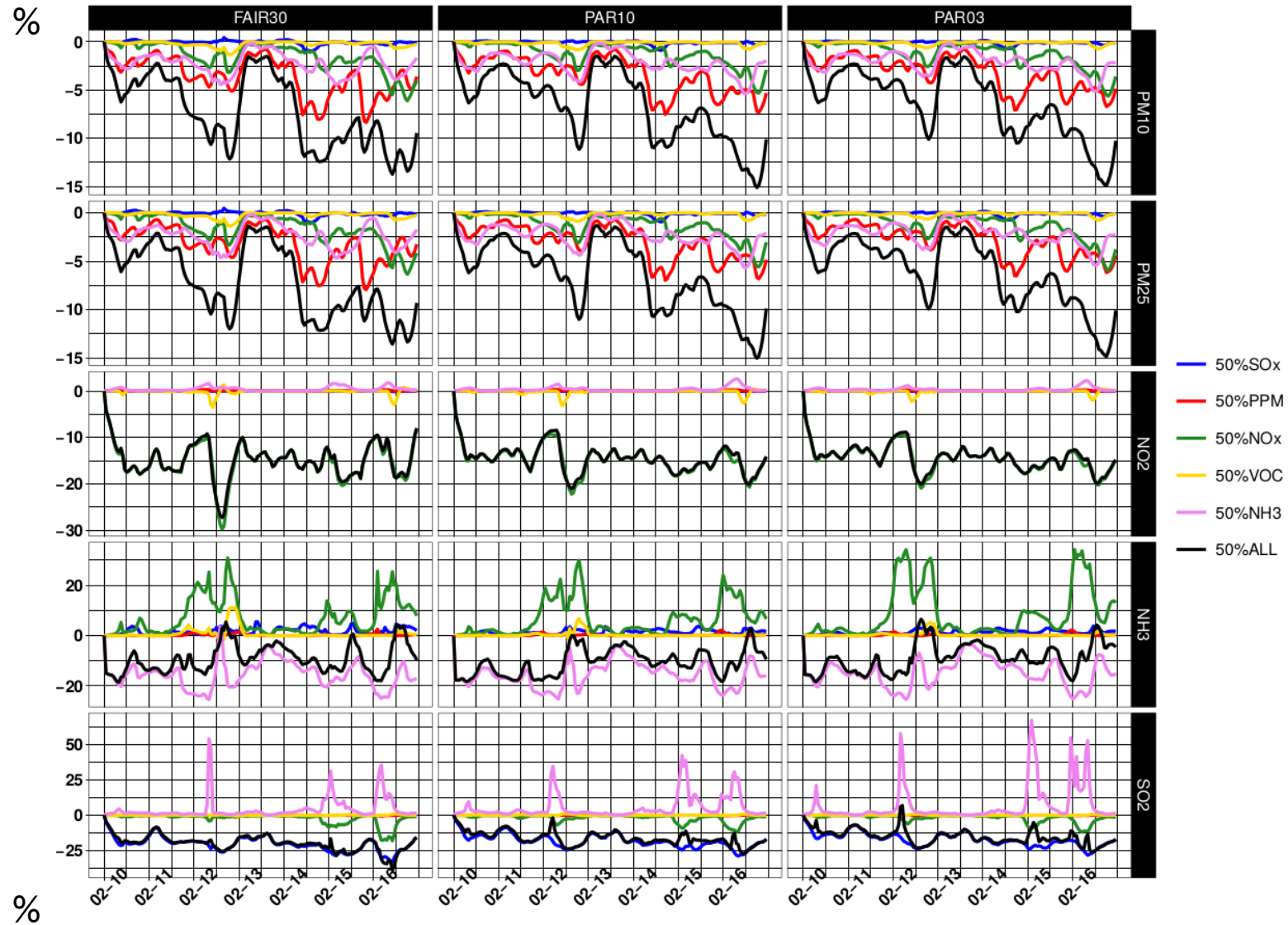


# Effect of resolution on 50% scenarios



Relative delta for selected species (columns) for all domains (rows) in percentage

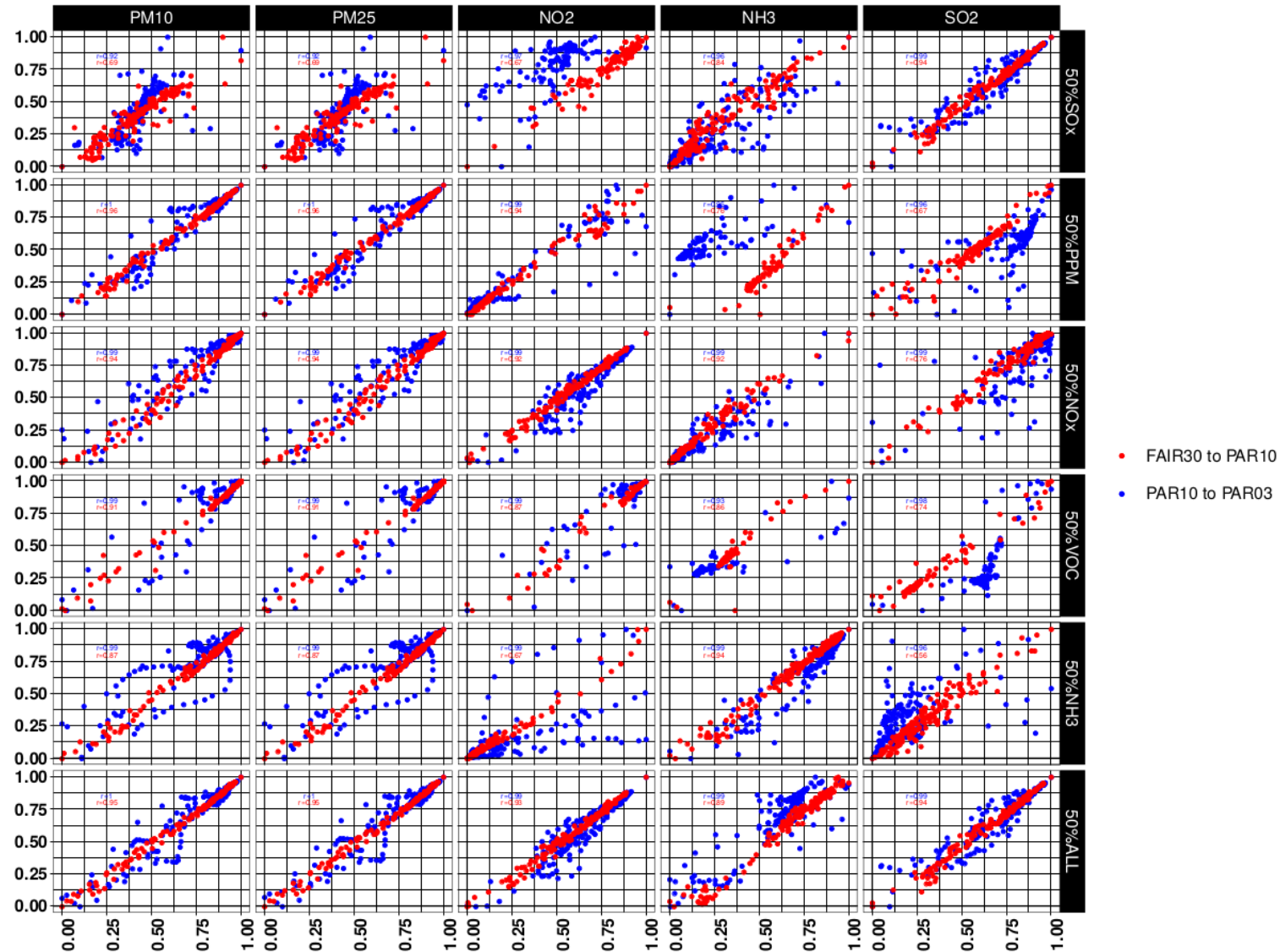
# Effect of resolution on 50% scenarios



Relative delta time series for selected species (rows)  
for all domains (columns) in percentage

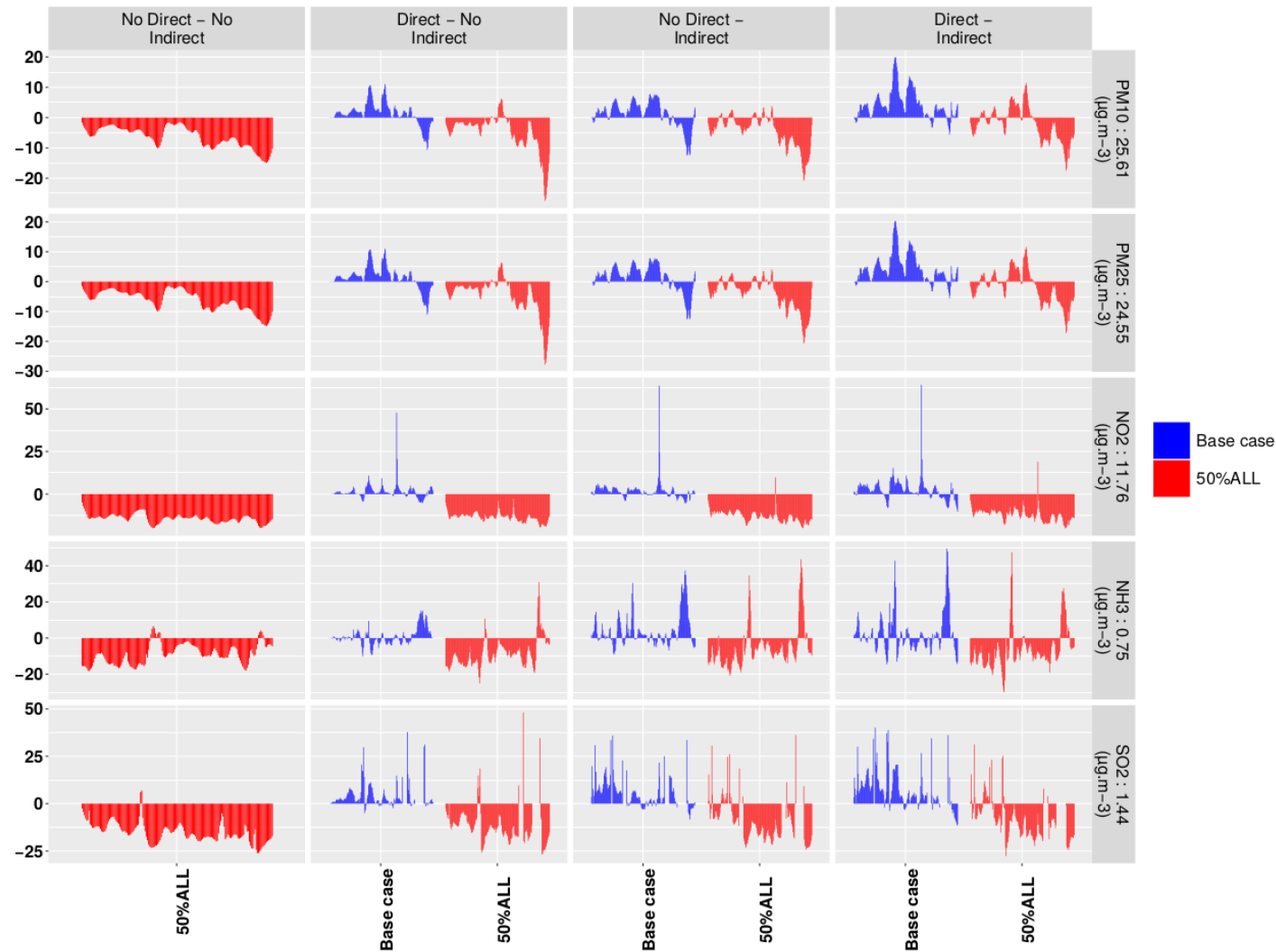


# Effect of resolution on 50% scenarios



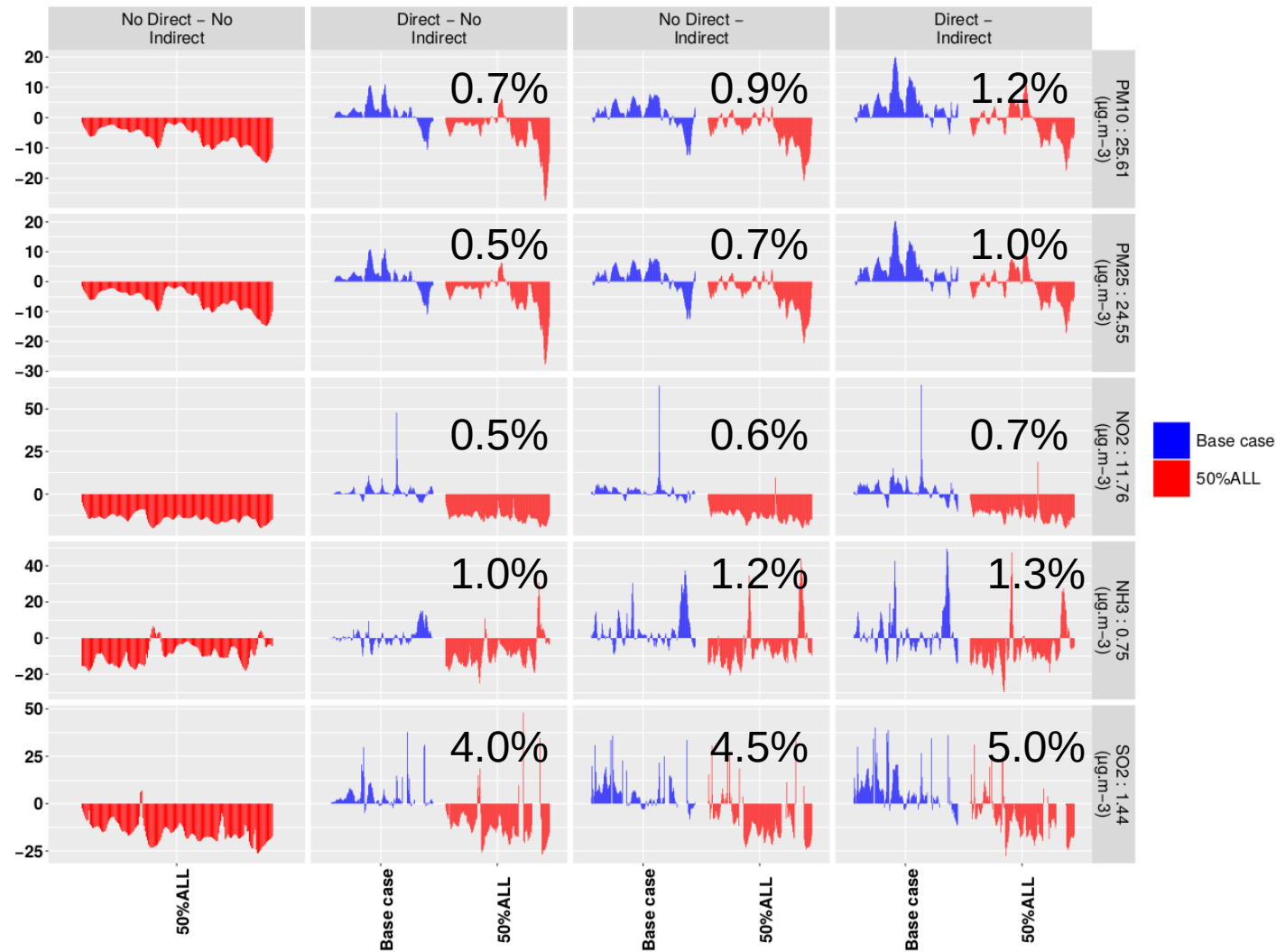
Normalized scatter plots for selected species (columns) and all scenarios (rows) between FAIR30/PAR10 (blue) and PAR10/PAR03 (red)

# Effect of direct/indirect meteorological effects



Relative delta of direct/indirect aerosol effects for base case scenarios and 50%ALL scenarios for PAR03 domain

# Effect of direct/indirect meteorological effects



Relative delta of direct/indirect aerosol effects for base case scenarios and 50%ALL scenarios for PAR03 domain

# Perspective

- A more detailed validation of the base case scenario
  - PM components ( $\text{NH}_4^+$ ,  $\text{SO}_4^{2-}$ , OA, ...)
  - Ozone vertical profile
- Using the nested runs to study the impact of the horizontal resolution on the simulations
  - Effects of local emission reduction scenarios on the larger domains