Regional Modeling over Europe using HadGEM3-R

Met Office Hadley Centre

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Primary Aerosols and Budget

Figure 1 – UK Mask

BCFF				
Contribution	Domain	%	UK	%
CTRL	0.214	100.0	0.377	100.0
UK	0.008	3.6	0.254	67.5
Rest of domain	0.139	65.1	0.087	23.1
Boundary	0.067	31.6	0.036	9.4
SUM	0.215	100.3	0.377	100.1

OCFF				
Contribution	Domain	%	UK	%
CTRL	0.349	100.0	0.301	100.0
UK	0.006	1.7	0.196	65.0
Rest of domain	0.286	82.2	0.102	34.0
Boundary	0.057	16.4	0.003	1.1
SUM	0.350	100.3	0.301	100.0

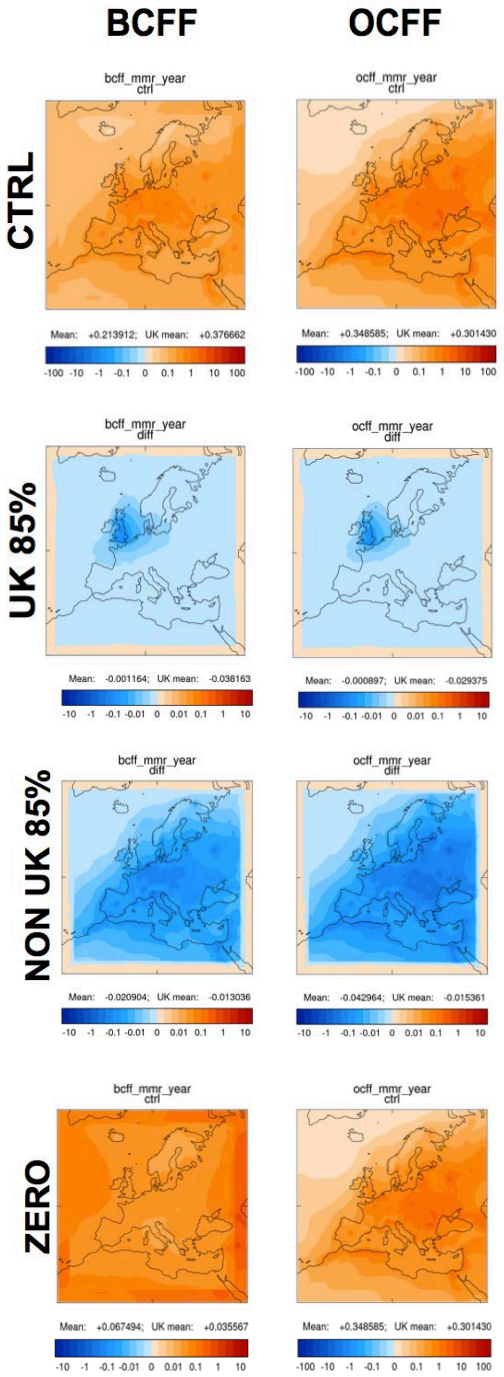


Figure 2 – Effect on surface concentration

Secondary aerosols

- Two additional experiments (Figure 3); SO_2 emissions reduced over UK to 85%; SO_2 emissions reduced over rest of domain to 85%s.

- The larger change in magnitude of SO_2 in the rest of domain experiment results in larger reduction in sulphate and greater increase in nitrate than the UK reduction.

- However, the proximity of the SO_2 changes in the UK experiment have a greater impact on sulphate in the UK itself.

- Table shows the 15% reductions scaled to 100%. This shows that a full reduction of SO_2 increases nitrate concentrations by ~10% for the domain and ~7% for the UK. This offsets some of the reduction in secondary aerosol achieved by SO_2 reductions.

SO2 reductions domain average

Reductions	Sulphate	%	Nitrate	%	TOTAL SIA	%
CTRL	0.819	100.0	0.292	100.0	1.111	100.0
UK SO2	-0.031	-3.7	0.002	0.8	-0.028	-2.5
ROD SO2	-0.447	-54.6	0.027	9.4	-0.420	-37.8
Boundary	-0.334	-40.8	0.000	0.0	-0.334	-30.1
SUM	-0.812	-99.1	0.030	10.2	-0.782	-70.4

SO2 reductions UK average

Reductions	Sulphate	%	Nitrate	%	TOTAL SIA	%
CTRL	0.712	100.0	0.635	100.0	1.347	100.0
UK SO2	-0.314	-44.1	0.019	3.0	-0.295	-21.9
ROD SO2	-0.229	-32.1	0.027	4.2	-0.202	-15.0
Boundary	-0.145	-20.4	0.000	0.0	-0.145	-10.8
SUM	-0.688	-96.6	0.046	7.2	-0.642	-47.7

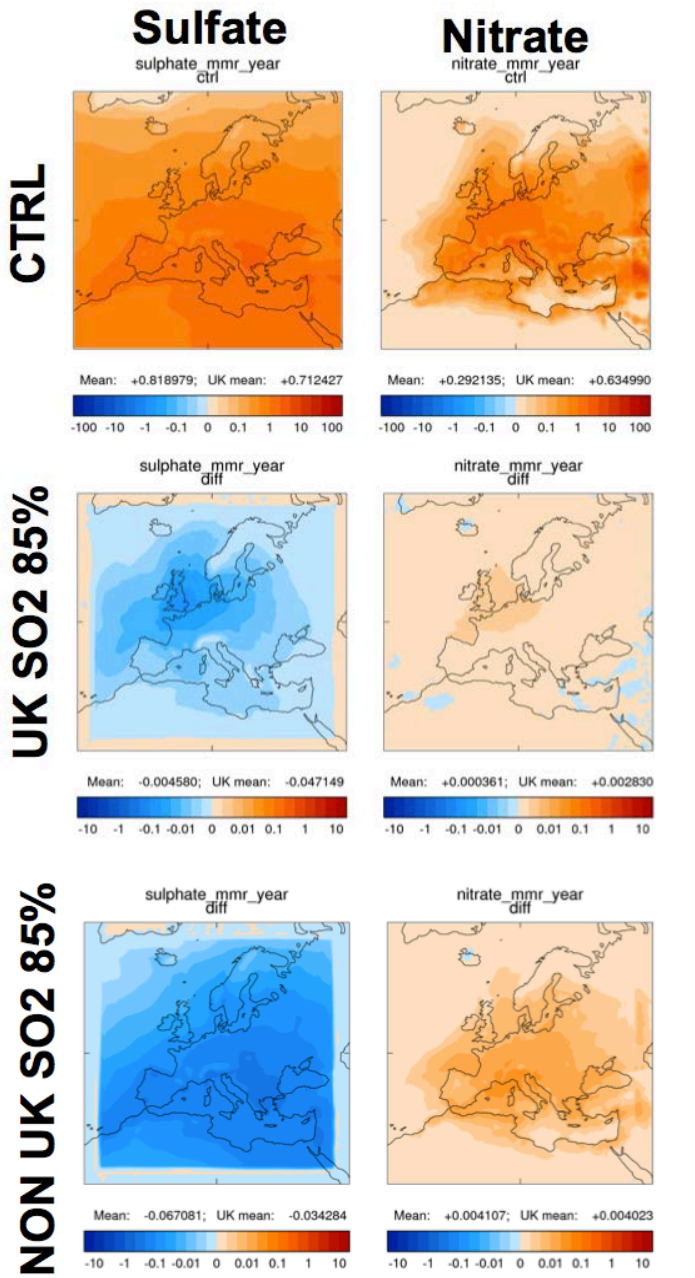
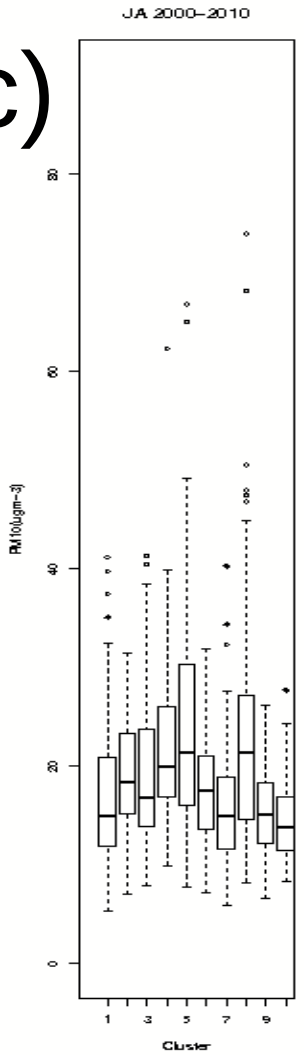
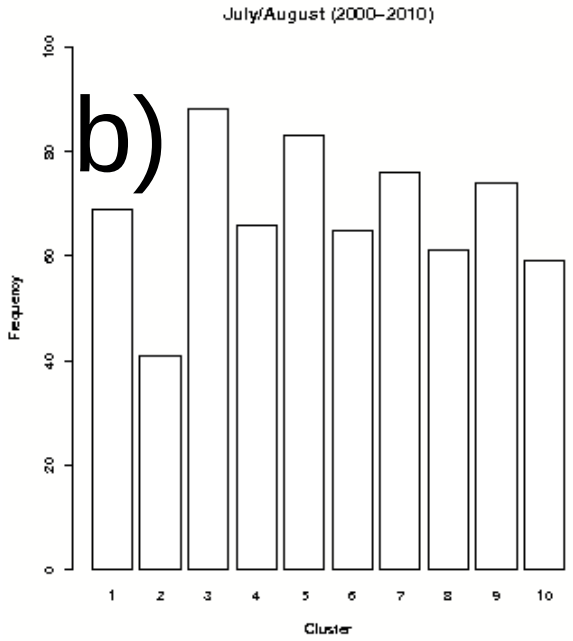


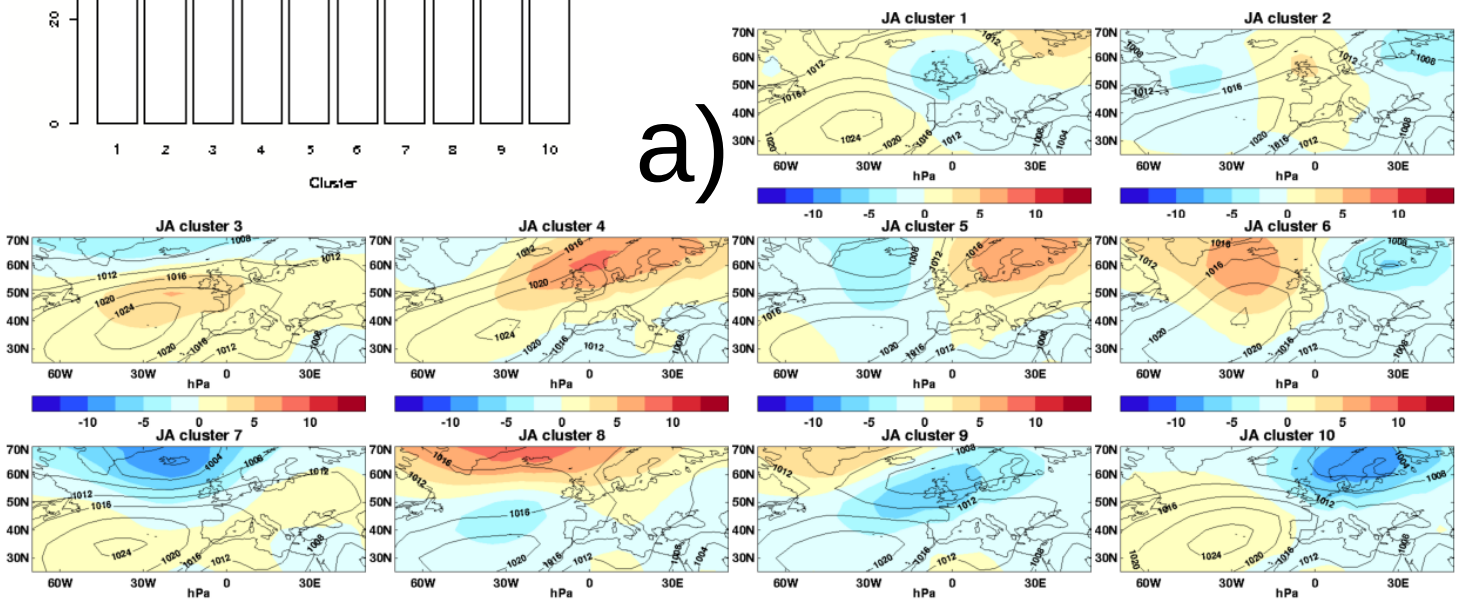
Figure 3 – Secondary aerosol interactions

Impact of large scale weather on aerosol surface concentration

- Here, a separate experiment aims to determine the effect of large scale meteorology on surface level pollution.
- Figure a) shows a 10 member cluster analysis from historical NCEP data. The frequency of each cluster for July/August is shown in b). This can be related to surface PM10 measurements c).
- It can be seen that there appears to be some signal certain clusters that give rise to higher PM10 concentrations







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