



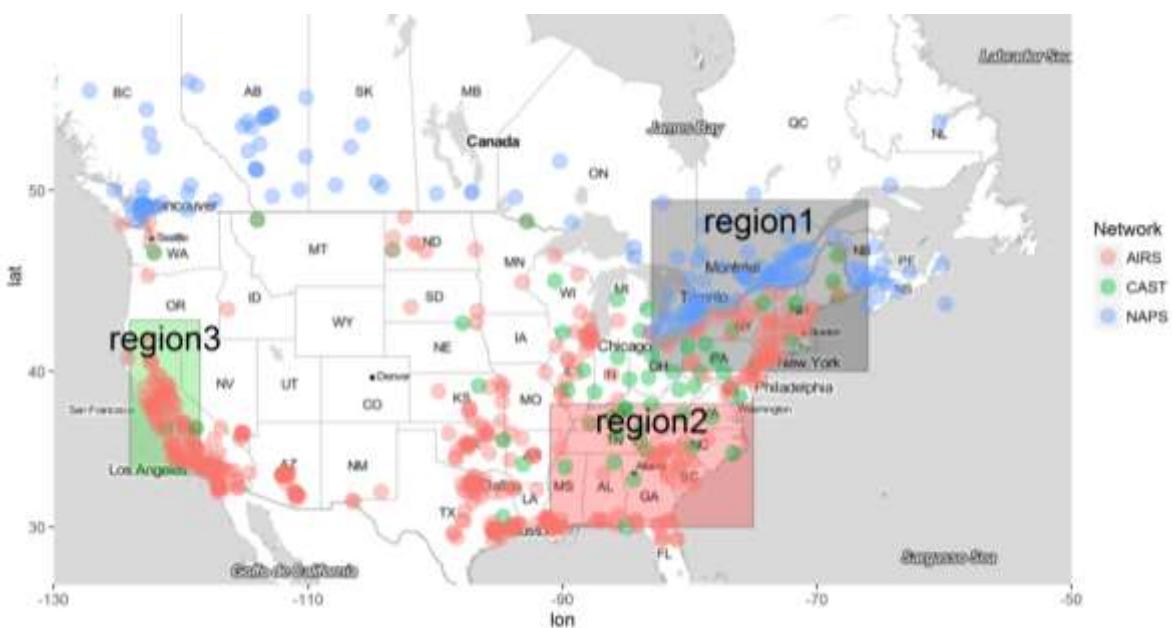
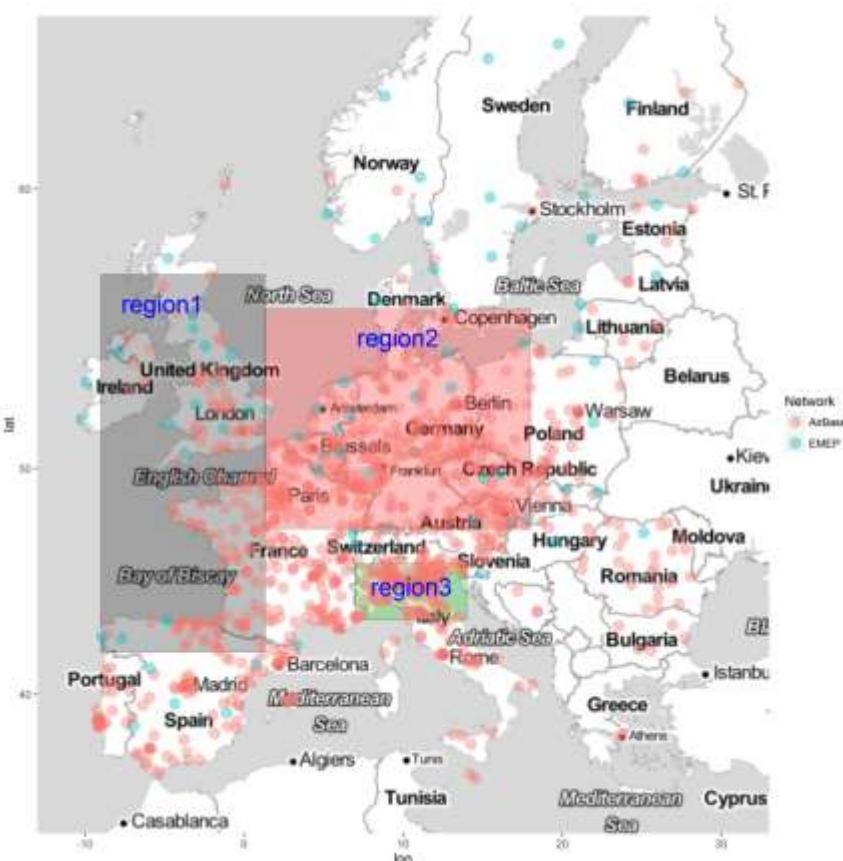
*Supplement of*

## **Error apportionment for atmospheric chemistry-transport models – a new approach to model evaluation**

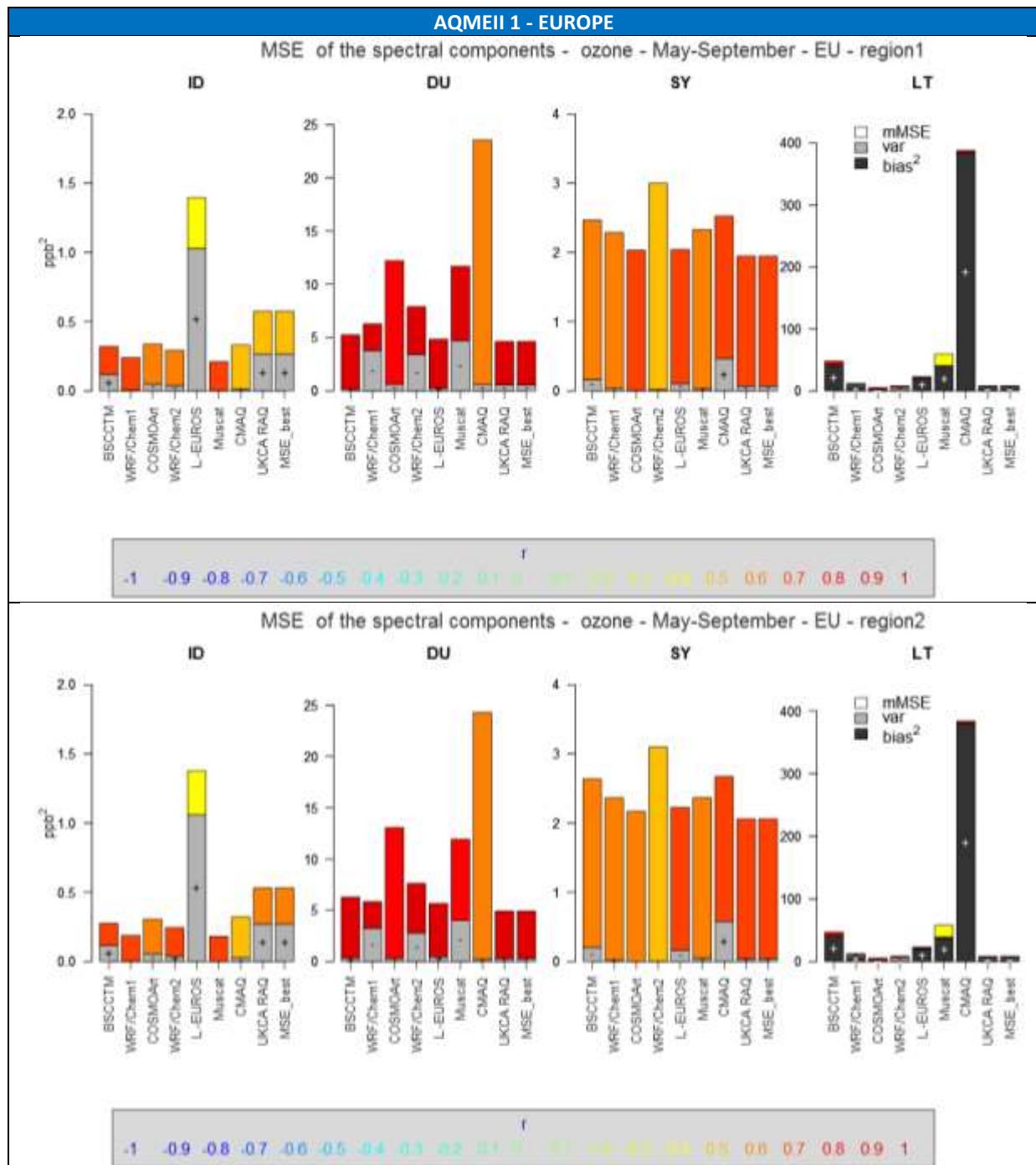
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**FIGURE S1.** Sub-regions of the two continental domains a) EU, and b) NA. Overlaid are the ozone monitoring stations for the year 2010 classified based on the network.



MSE of the spectral components - ozone - May-September - EU - region2

**ID**

Model	mMSE (ppb <sup>2</sup> )	var (ppb <sup>2</sup> )	bias <sup>2</sup> (ppb <sup>2</sup> )	Total (ppb <sup>2</sup> )
BSCCTM	0.3	0.1	0.2	0.6
WRF/Chem1	0.2	0.1	0.2	0.5
COSMOAir	0.3	0.1	0.2	0.6
WRF/Chem2	0.2	0.1	0.2	0.5
L-EUROS	0.1	1.0	0.3	1.4
Muscat	0.2	0.1	0.1	0.4
CMAQ	0.3	0.2	0.1	0.6
UKCA RAD	0.3	0.2	0.1	0.6
MSE_best	0.3	0.2	0.1	0.6

**DU**

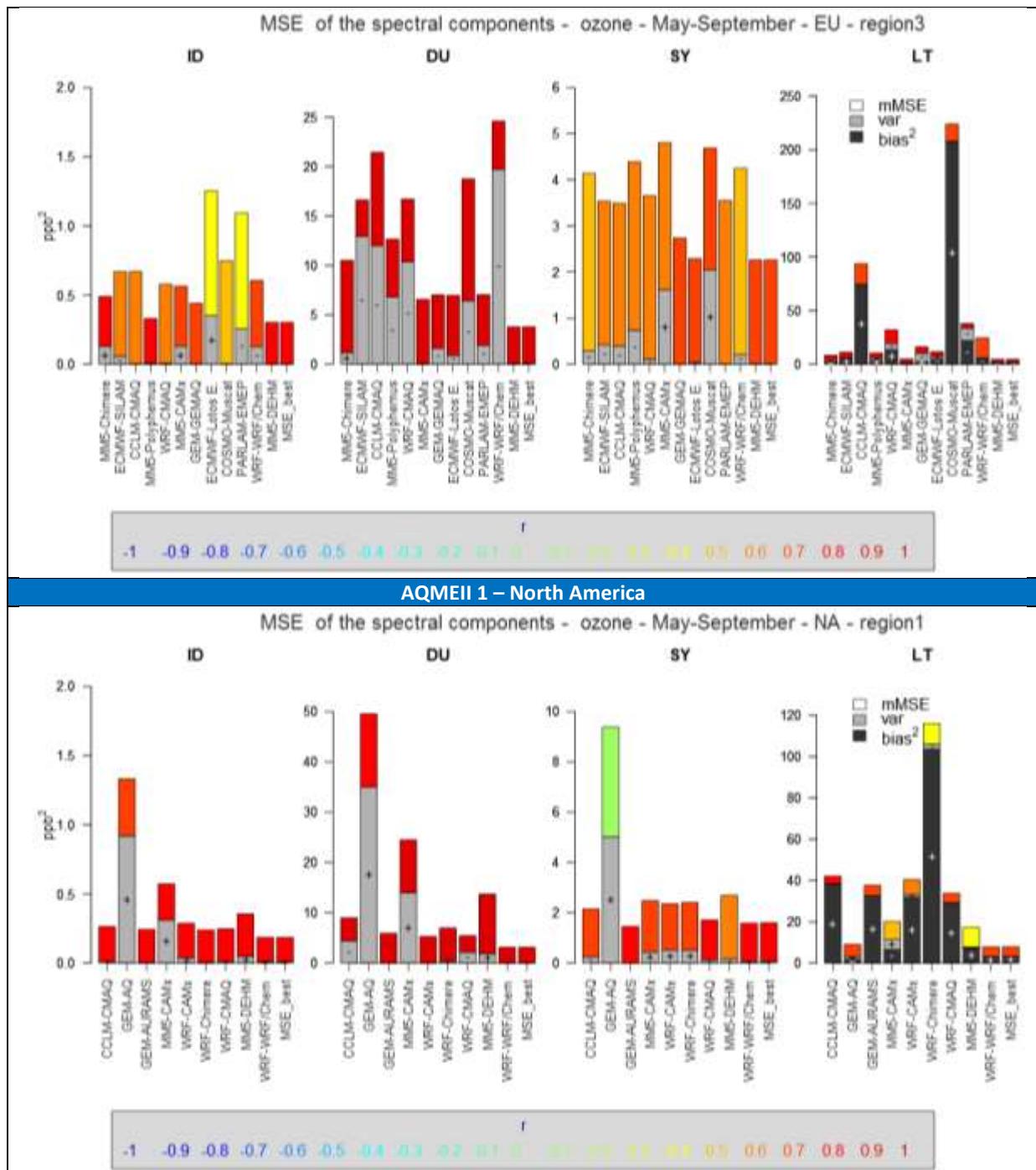
Model	mMSE (ppb <sup>2</sup> )	var (ppb <sup>2</sup> )	bias <sup>2</sup> (ppb <sup>2</sup> )	Total (ppb <sup>2</sup> )
BSCCTM	4.0	0.5	0.5	5.0
WRF/Chem1	5.0	0.5	0.5	6.0
COSMOAir	12.0	0.5	0.5	13.0
WRF/Chem2	7.0	0.5	0.5	8.0
L-EUROS	5.0	0.5	0.5	6.0
Muscat	5.0	0.5	0.5	6.0
CMAQ	24.0	0.5	0.5	25.0
UKCA RAD	5.0	0.5	0.5	6.0
MSE_best	5.0	0.5	0.5	6.0

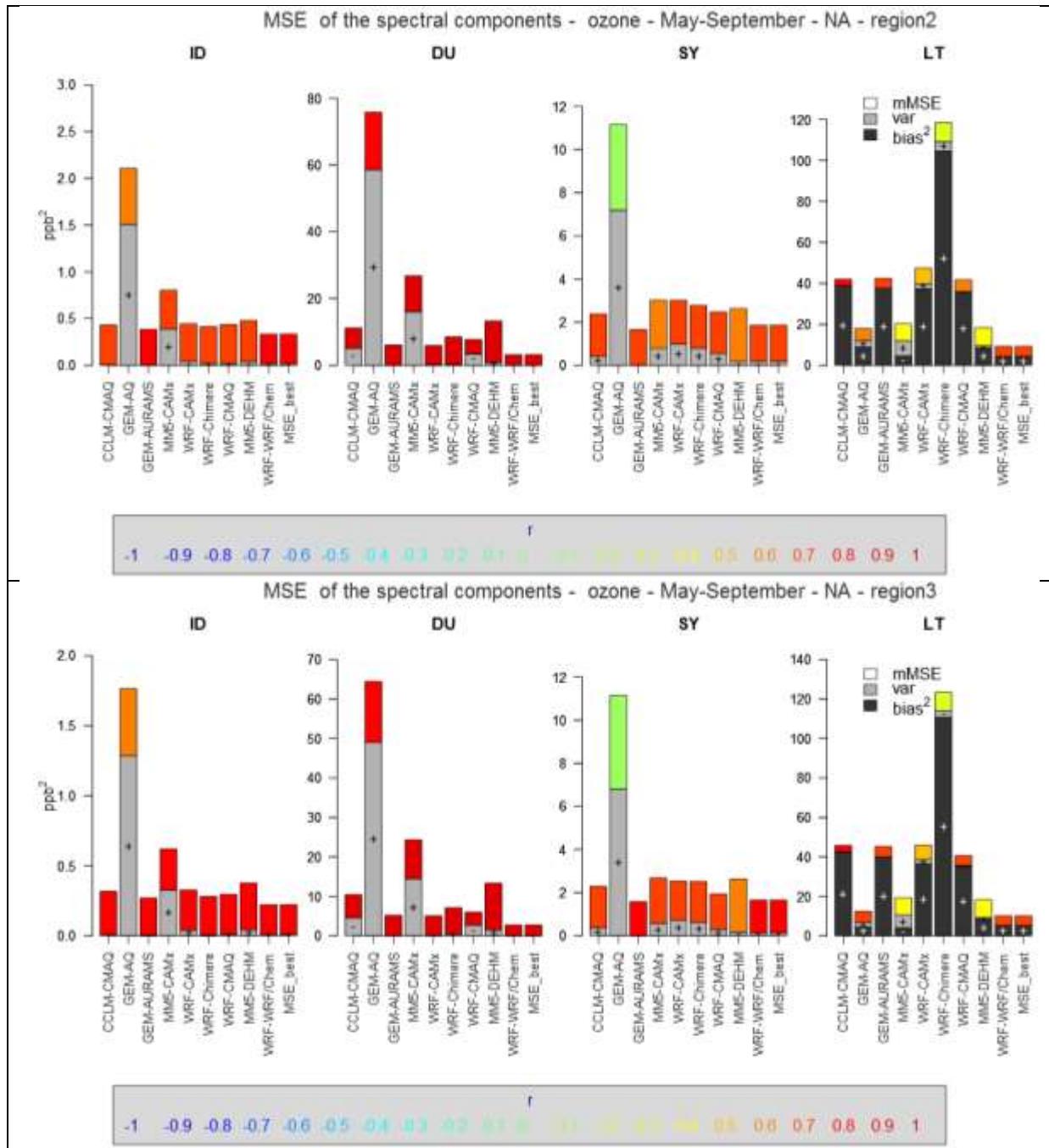
**SY**

Model	mMSE (ppb <sup>2</sup> )	var (ppb <sup>2</sup> )	bias <sup>2</sup> (ppb <sup>2</sup> )	Total (ppb <sup>2</sup> )
BSCCTM	2.5	0.5	0.5	3.5
WRF/Chem1	2.5	0.5	0.5	3.5
COSMOAir	2.2	0.5	0.5	3.2
WRF/Chem2	3.0	0.5	0.5	4.0
L-EUROS	2.2	0.5	0.5	3.2
Muscat	2.5	0.5	0.5	3.5
CMAQ	2.8	0.5	0.5	3.8
UKCA RAD	2.2	0.5	0.5	3.2
MSE_best	2.2	0.5	0.5	3.2

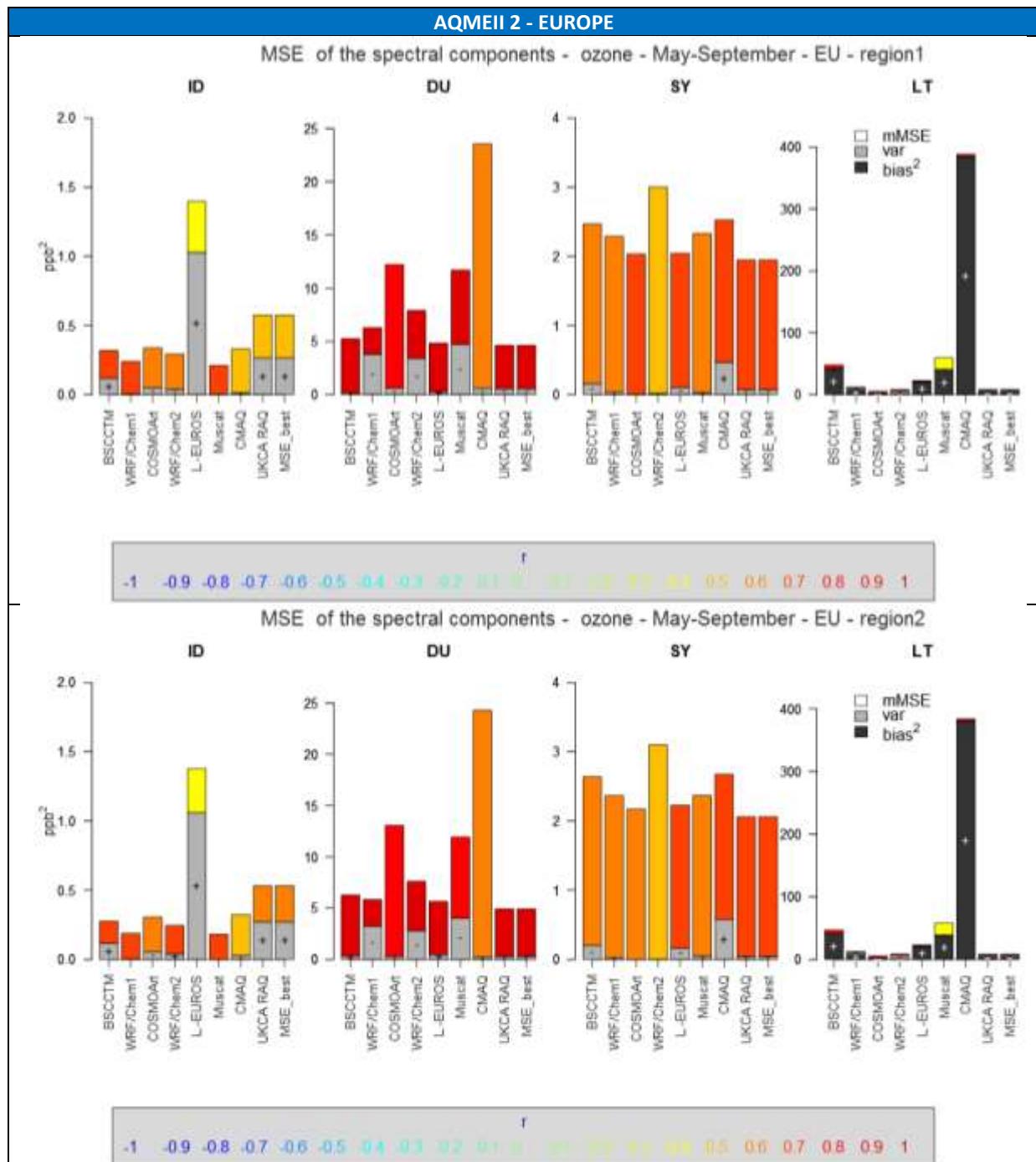
**LT**

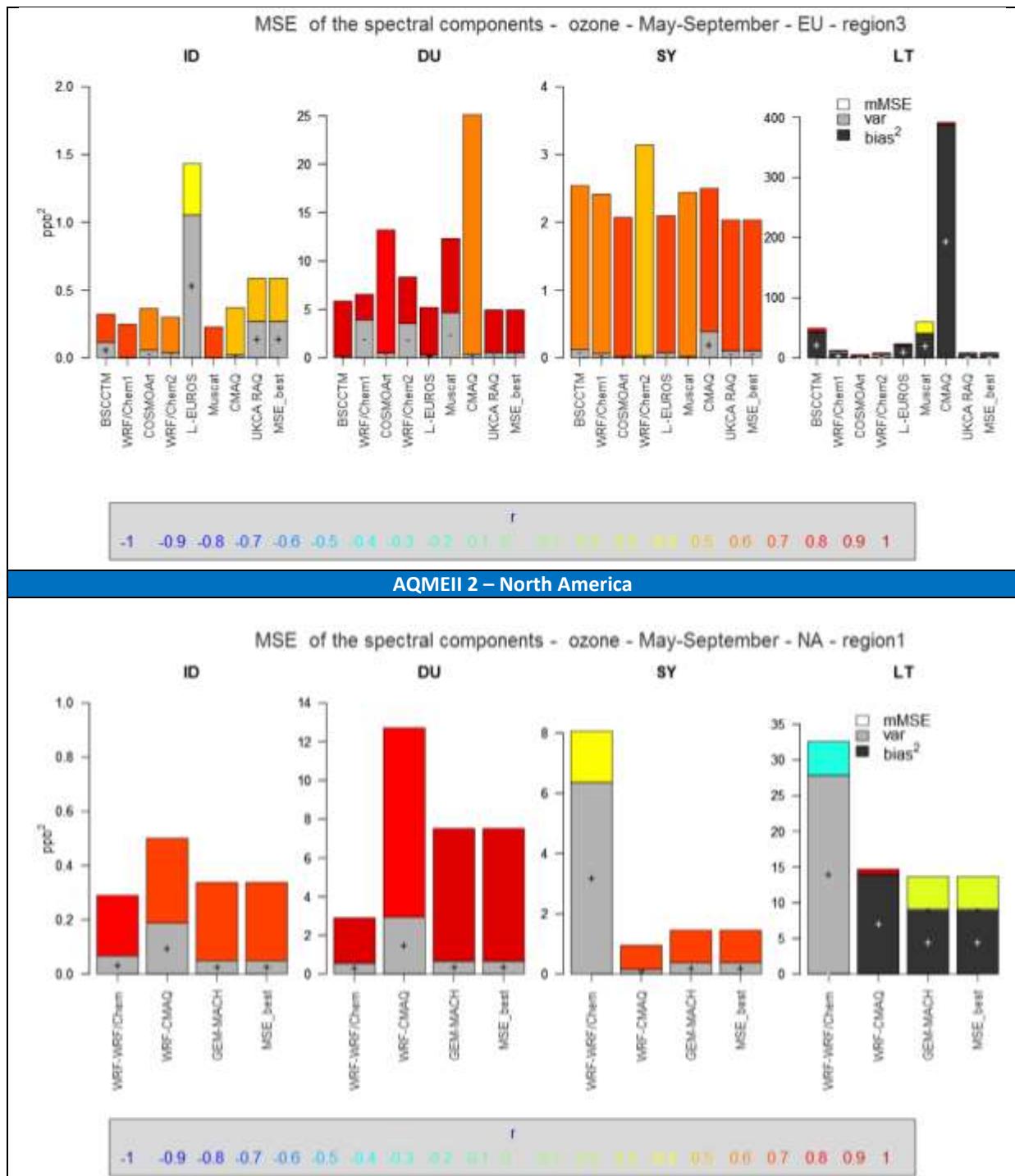
Model	mMSE (ppb <sup>2</sup> )	var (ppb <sup>2</sup> )	bias <sup>2</sup> (ppb <sup>2</sup> )	Total (ppb <sup>2</sup> )
BSCCTM	50	0.5	0.5	51
WRF/Chem1	10	0.5	0.5	11
COSMOAir	5	0.5	0.5	6
WRF/Chem2	5	0.5	0.5	6
L-EUROS	10	0.5	0.5	11
Muscat	10	0.5	0.5	11
CMAQ	380	0.5	0.5	381
UKCA RAD	10	0.5	0.5	11
MSE_best	10	0.5	0.5	11





**FIGURE S2.** MSE (ppb<sup>2</sup>) breakdown in bias, variance and mMSE of the spectral components ID, DU, SY, LT (based on Eq 9) for the models of AQMEII1 and the three sub-regions of **FIGURE S1**. The sign within the share of bias and variance indicates model overestimation (+) or underestimation (-) of mean concentration (bias) and variance. The colour of the mMSE share of the error is coded based on the values of  $r$ , the correlation coefficient, according to the colour scale at the bottom of each plot. Top three panels: EU; lower three panels: NA.





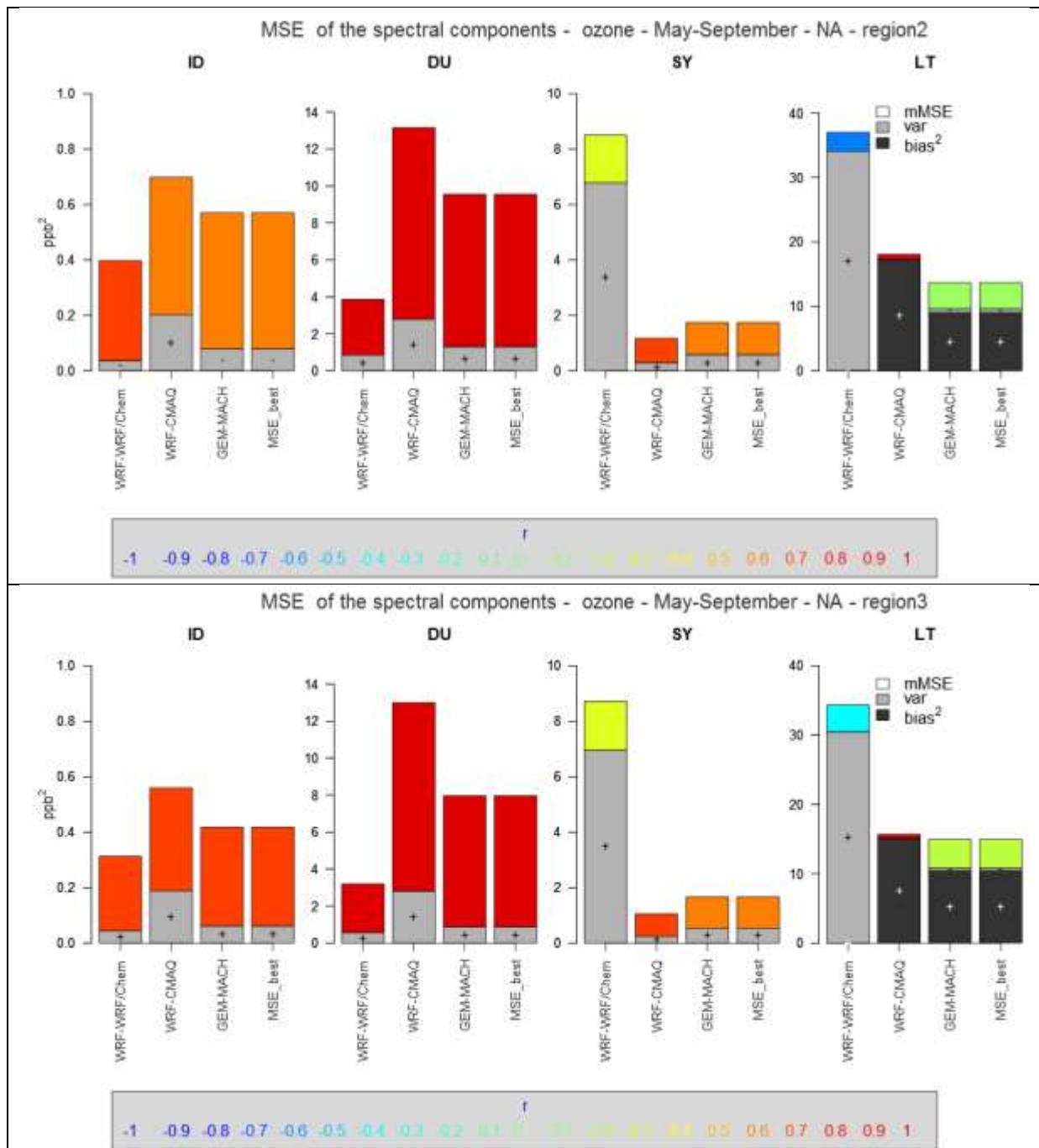


FIGURE S 3. As in

Figure S2 for the models of AQMEII2.