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Supplement of

Impact of climate change on the production and transport of sea salt aerosol on European seas

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$$\frac{dF}{dD_p} = 1.373 * U_{10m}^{3.41} * \frac{1 + 0.057 D_p^{1.05}}{D_p^3} * 10^{1.19 \exp\left(-\left(\frac{0.38 - \lg D_p}{0.65}\right)^2\right)} \quad \text{(S1)}$$

where dF/dD_p is the rate of sea salt droplet generation per unit area of the whitecap and per increment of droplet dry radius (dD_p) U_{10} is the wind speed at 10 m

$$\frac{dF}{dD_p} = 3.84 * 10^{-6} * A_k T_w + B_k * U_{10m}^{3.41} \quad \text{(S2)}$$

where dF/dD_p is the rate of sea salt droplet generation per unit area of sea surface and per increment of log of the droplet dry radius (dD_p) , T_w is the temperature of seasurface water, and A_k and B_k are the parameters describing the dependence of sea salt flux on the aerosol size (described in Eq. S3), and U_{10} is the wind speed at 10 m.

$$A_k = C_4 d_d^4 + C_3 d_d^3 + C_2 d_d^2 + C_1 d_d + C_0$$
$$B_k = D_4 d_d^4 + D_3 d_d^3 + D_2 d_d^2 + D_1 d_d + D_0 \quad \text{(S3)}$$

Where C_i and D_i are empirical coefficients tabulated according to Mårtensson et al. (2003), shown in the table below.

Table S1: Coefficients for the Parameterization of A_k (C_4–C_0) and B_k (D_4–D_0) in Equation (S3) for the Three Size Intervals (k)

Size Interval, 10^{-6} m	**C_4**	**C_3**	**C_2**	**C_1**	**C_0**
0.020–0.145	-2.576×10^{35}	5.932×10^{28}	2.867×10^{21}	-3.003×10^{13}	2.881×10^{6}
0.145–0.419	-2.452×10^{33}	2.404×10^{27}	-8.148×10^{20}	1.183×10^{14}	-6.743×10^{6}
0.419–2.8	1.085×10^{29}	-9.841×10^{23}	3.132×10^{18}	-4.165×10^{12}	2.181×10^{6}
Size Interval, 10^{-6} m	D_4	D_3	D_2	D_1	D_0
0.020–0.145	7.188×10^{37}	-1.616×10^{31}	6.791×10^{23}	1.829×10^{16}	7.609×10^{8}
0.145–0.419	7.368×10^{35}	-7.310×10^{29}	2.528×10^{23}	-3.787×10^{16}	2.279×10^{9}
0.419–2.8	-2.859×10^{31}	2.601×10^{26}	-8.297×10^{20}	1.105×10^{15}	-5.800×10^{8}

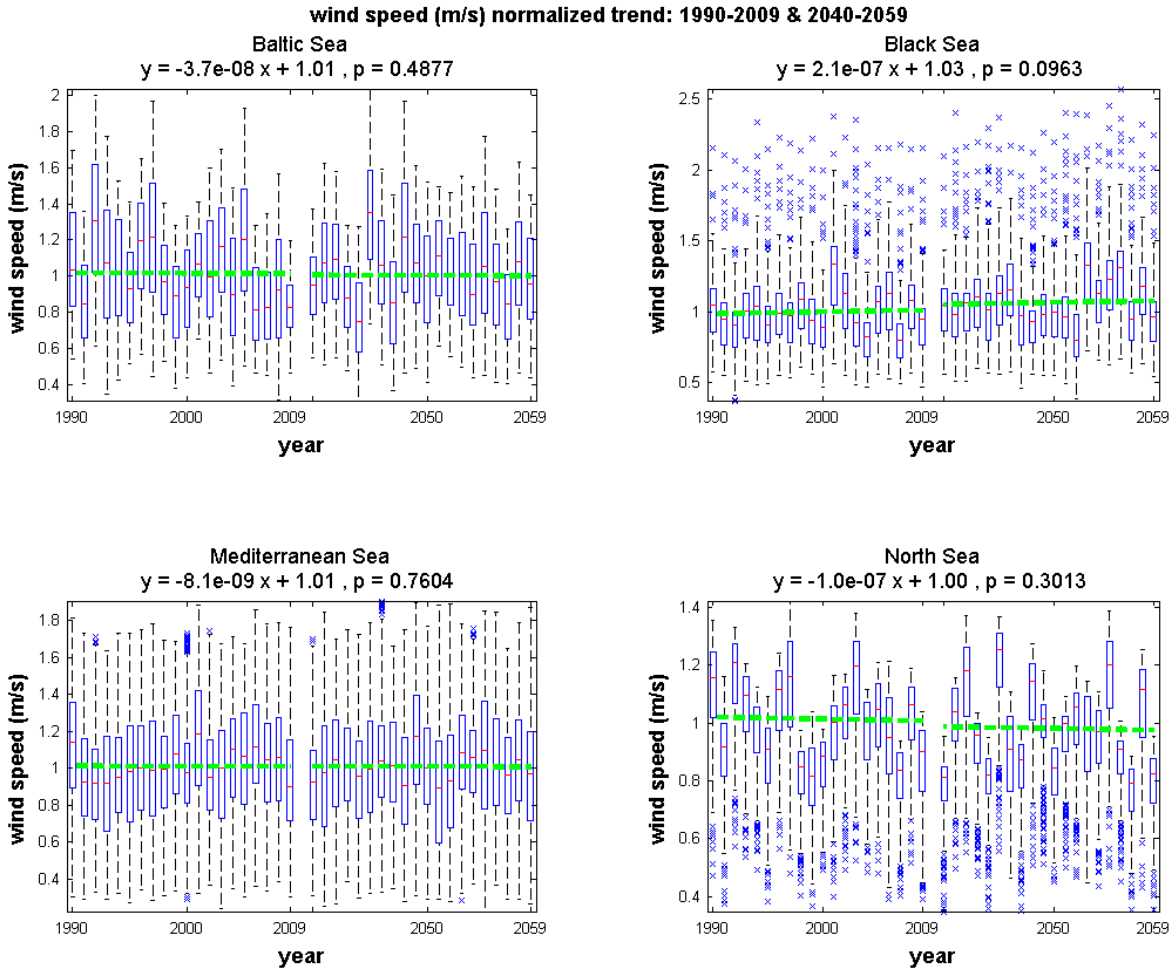


Figure S1 Annual mean win speed (m s^{-1}) normalized trend (y) over the past and future periods (x [year]), over the Baltic, Black, North and Mediterranean Seas. Only sea cells considered.

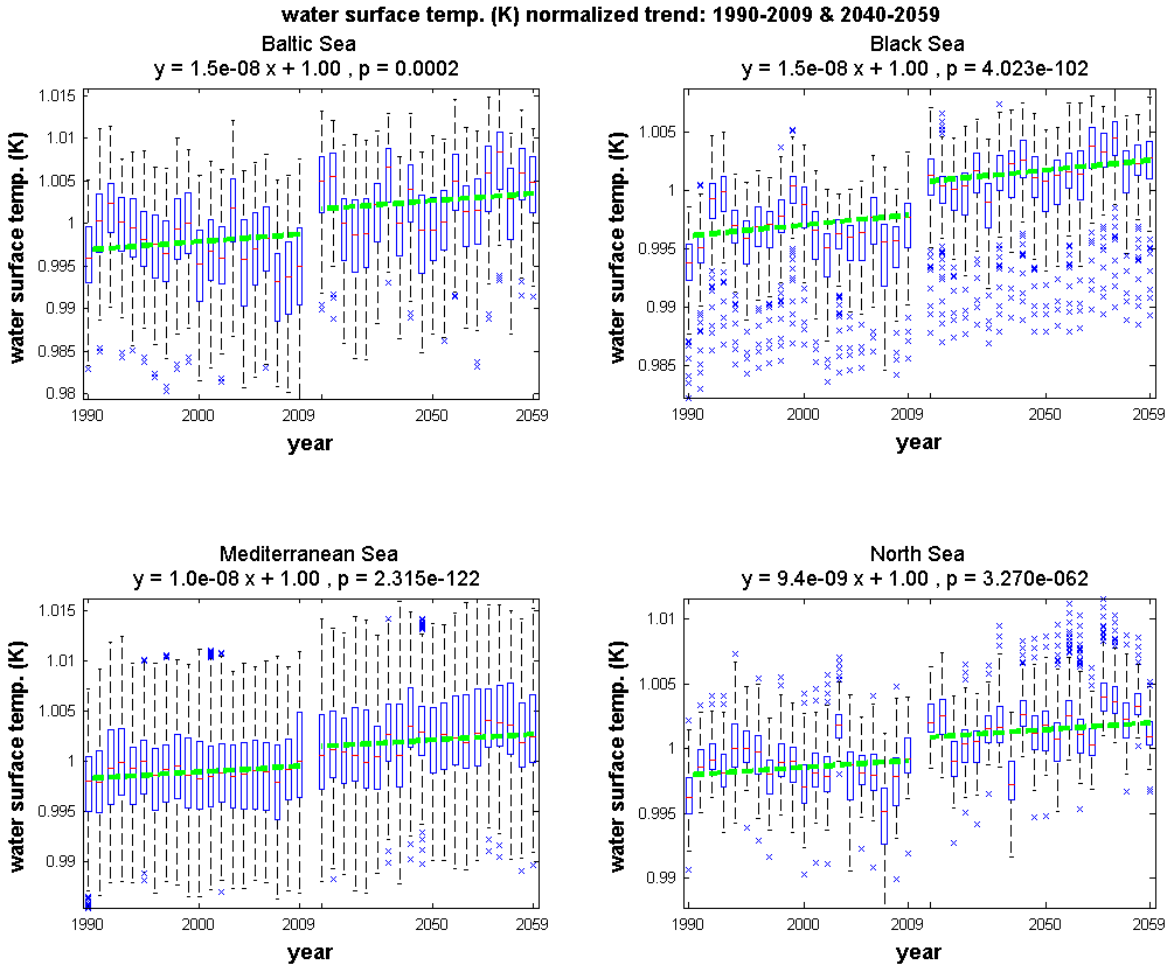


Figure S2 Annual mean water surface temperature (K) normalized trend (y) over the past and future periods (x [year]), over the Baltic, Black, North and Mediterranean Seas. Only sea cells considered.

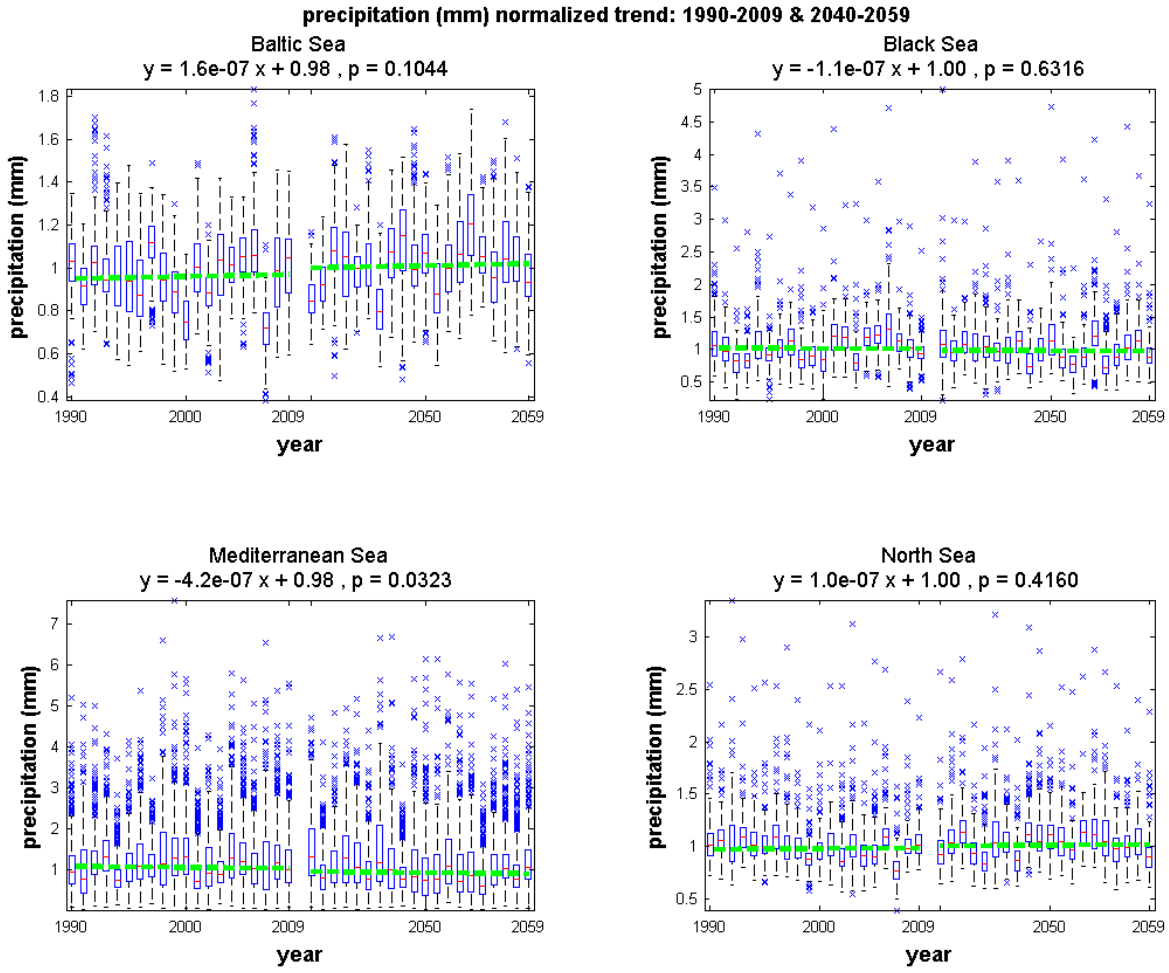


Figure S3 Annual precipitation (mm) normalized trend (y) over the past and future periods (x [year]), over the Baltic, Black, North and Mediterranean Seas. Only sea cells considered.

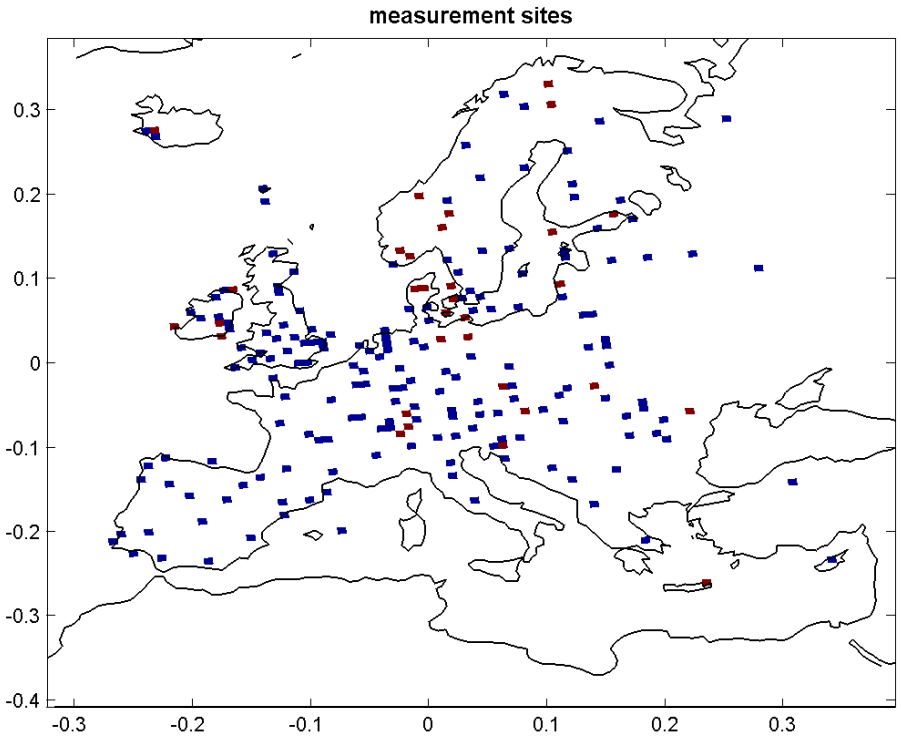


Figure S4 Location of the EMEP measurement sites measuring concentration and wet deposition of Na^+. The ones measuring both quantities are marked in red.

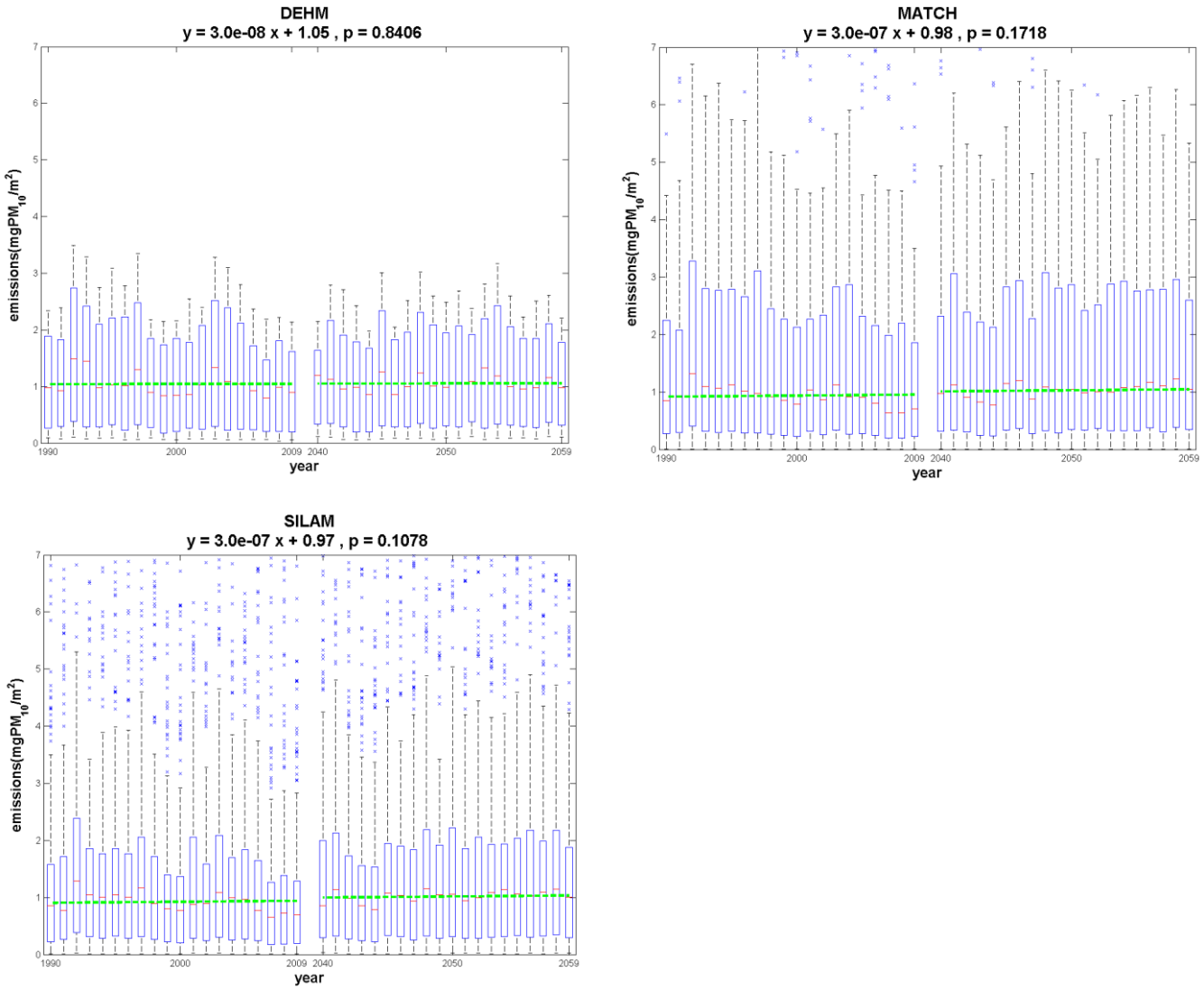
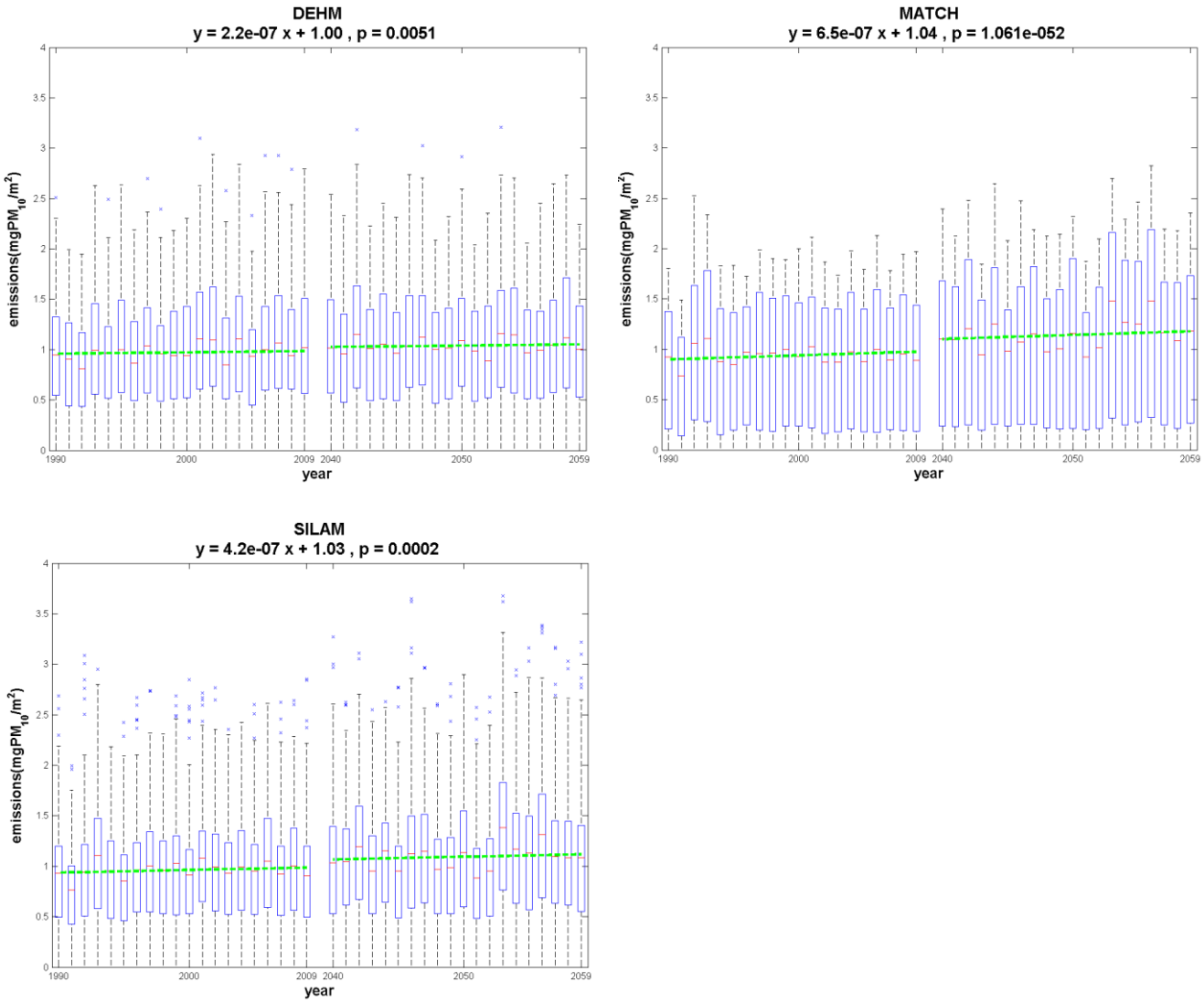


Figure S5 Baltic Sea SSA annual emission ($mgPM_{10}\ m^{-2}$) normalized trend (y) over the past and future periods (x [year]).



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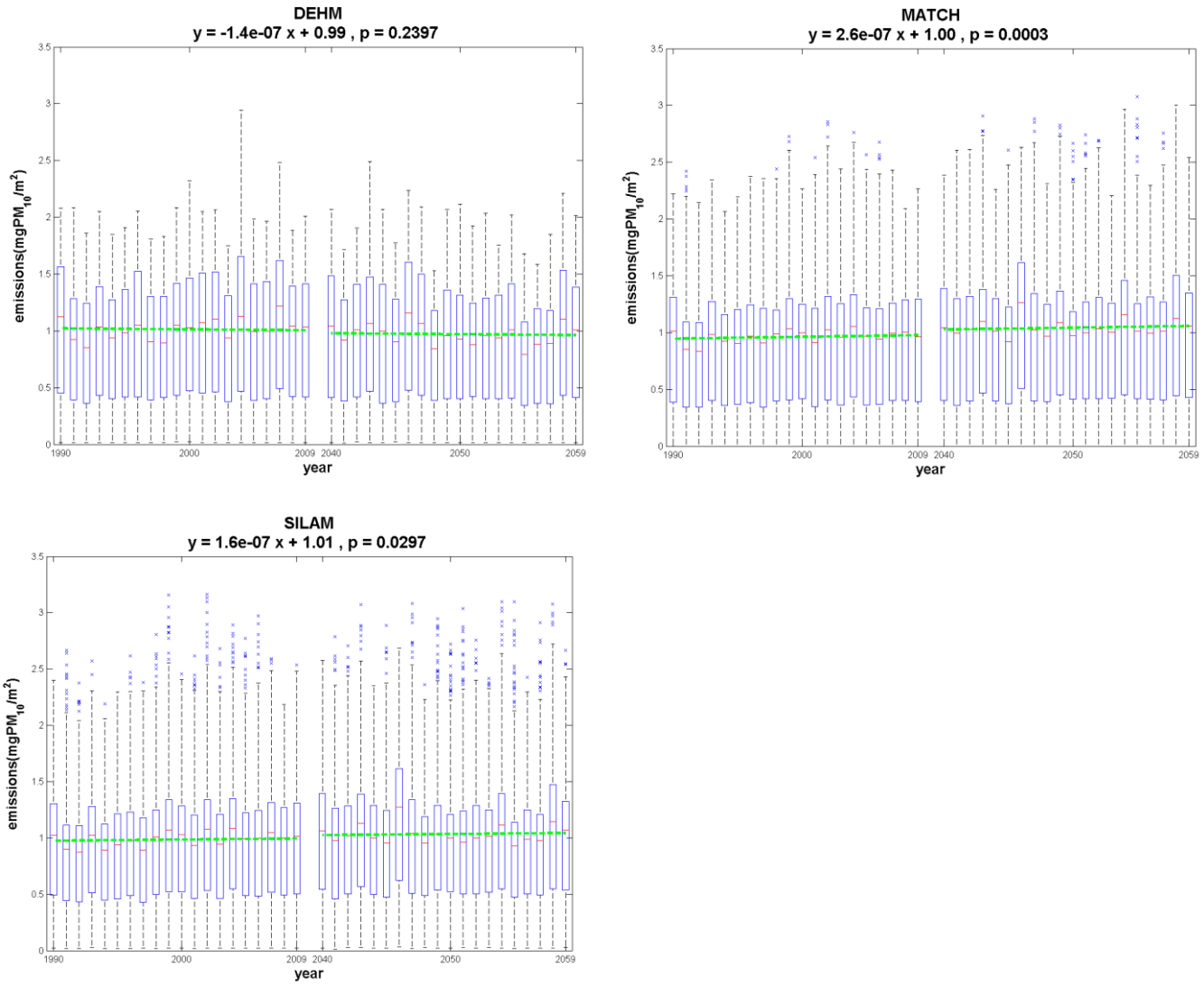
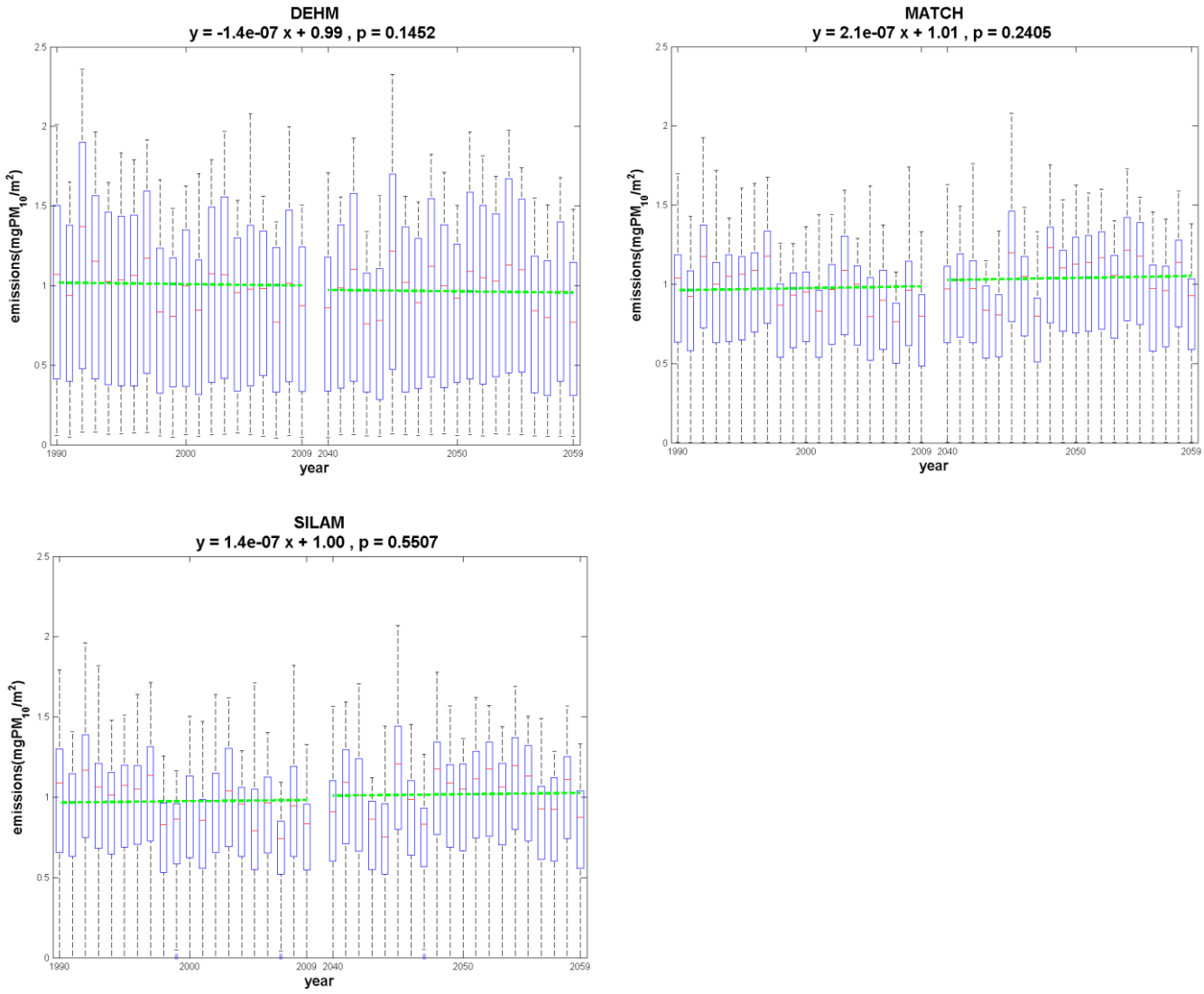
2 **Figure S6** Black Sea SSA annual emission ($mgPM_{10}$ m^{-2}) normalized trend (y) over the past
3 and future periods (x [year]).



1

2 **Figure S7** Mediterranean Sea SSA annual emission ($mgPM_{10}$ m^{-2}) normalized trend (y) over
3 the past and future periods (x [year]).



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2 **Figure S8** North Sea SSA annual emission ($mgPM_{10}$ m^{-2}) normalized trend (y) over the past
3 and future periods (x [year]).

4

5

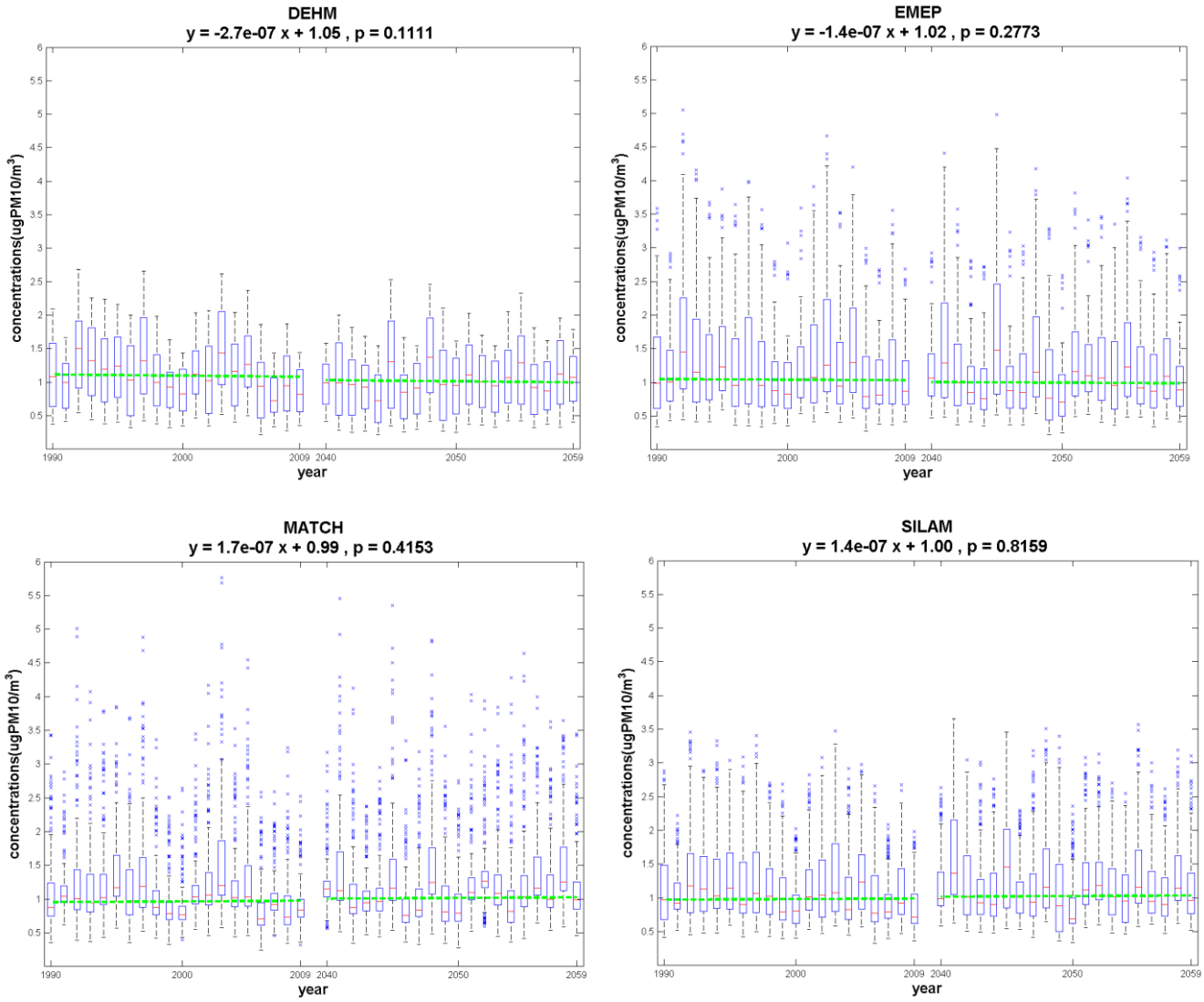
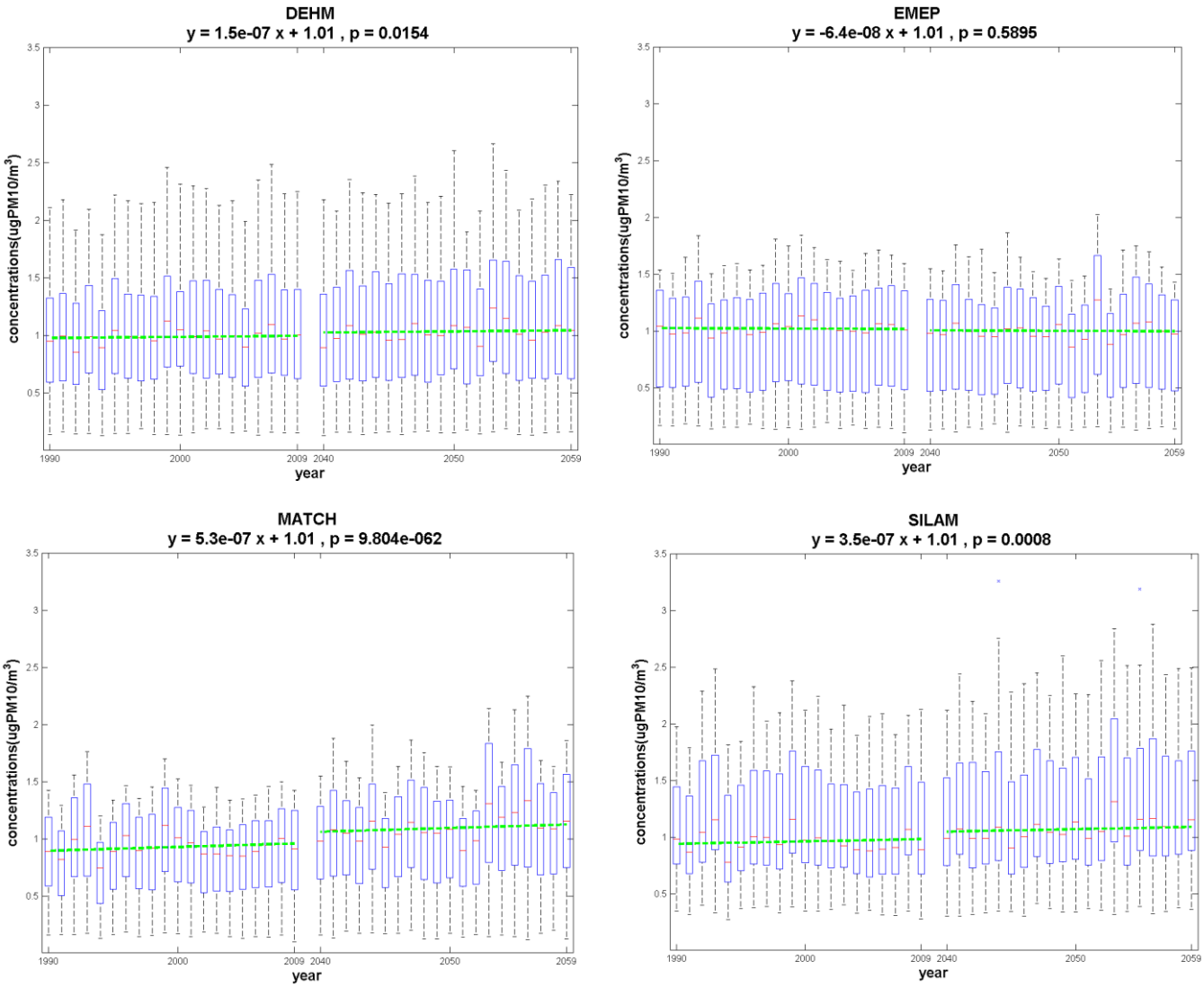
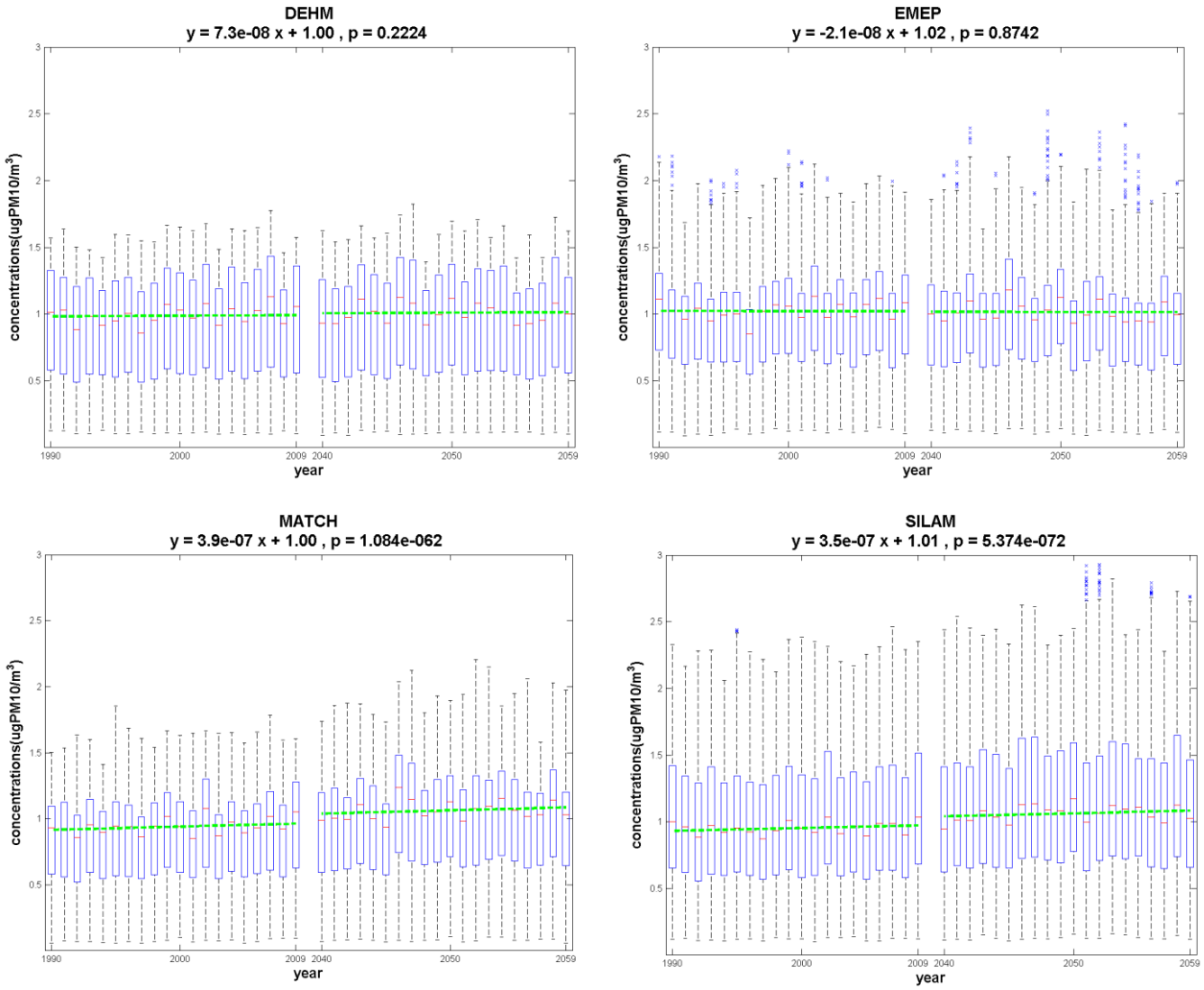


Figure S9 Baltic Sea SSA mean concentration ($\mu gPM_{10}\ m^{-3}$) normalized trend (y) over the past and future periods (x [year]).



1

2 **Figure S10** Black Sea SSA mean concentration ($\mu gPM_{10}\ m^{-3}$) normalized trend (y) over the
3 past and future periods (x [year]).



1

2 **Figure S11** Mediterranean Sea SSA mean concentration ($\mu gPM_{10}/m^3$) normalized trend (y)
3 over the past and future periods (x [year]).

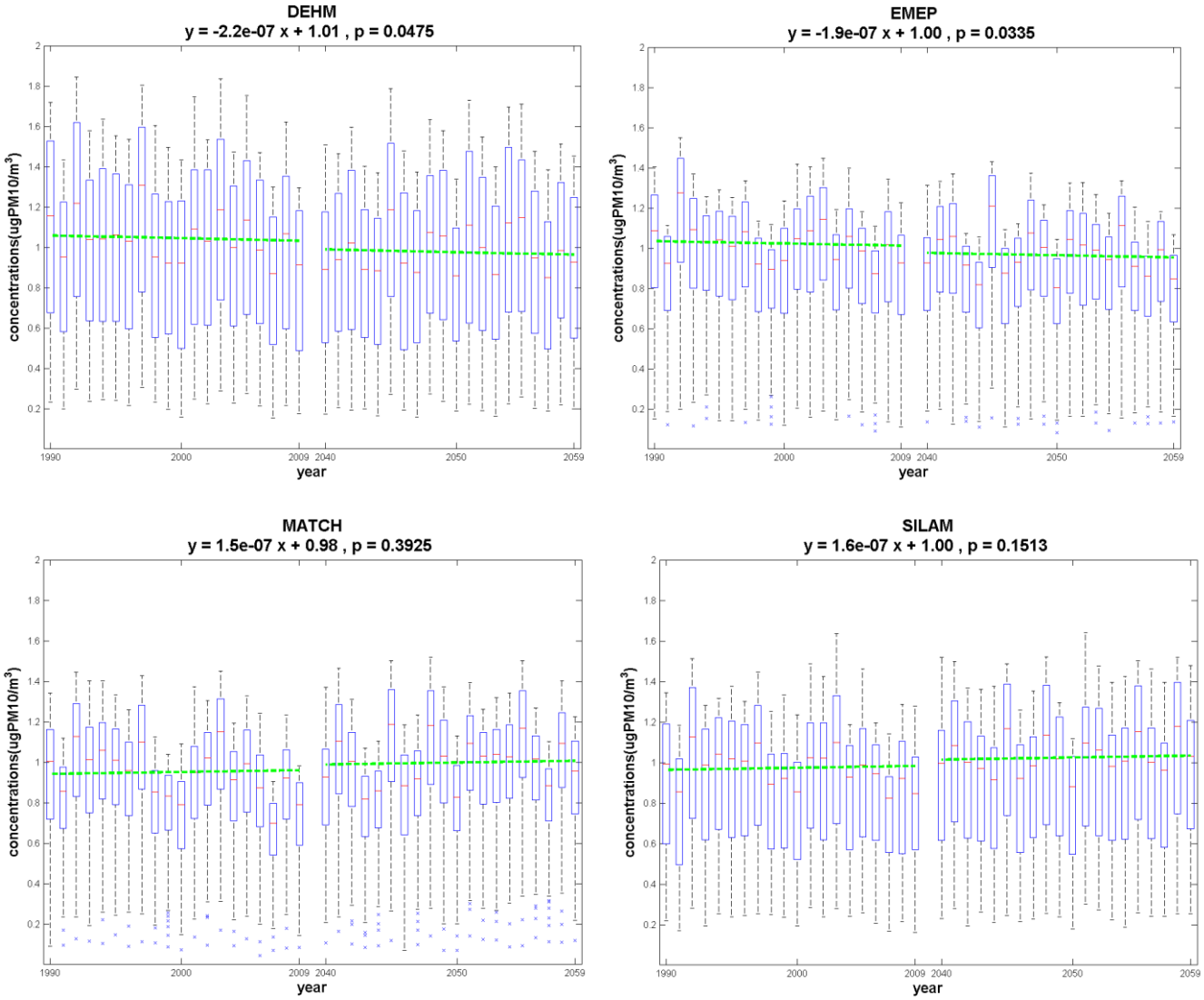


Figure S12 North Sea SSA mean concentration ($\mu gPM_{10}\ m^{-3}$) normalized trend (y) over the past and future periods (x [year]).

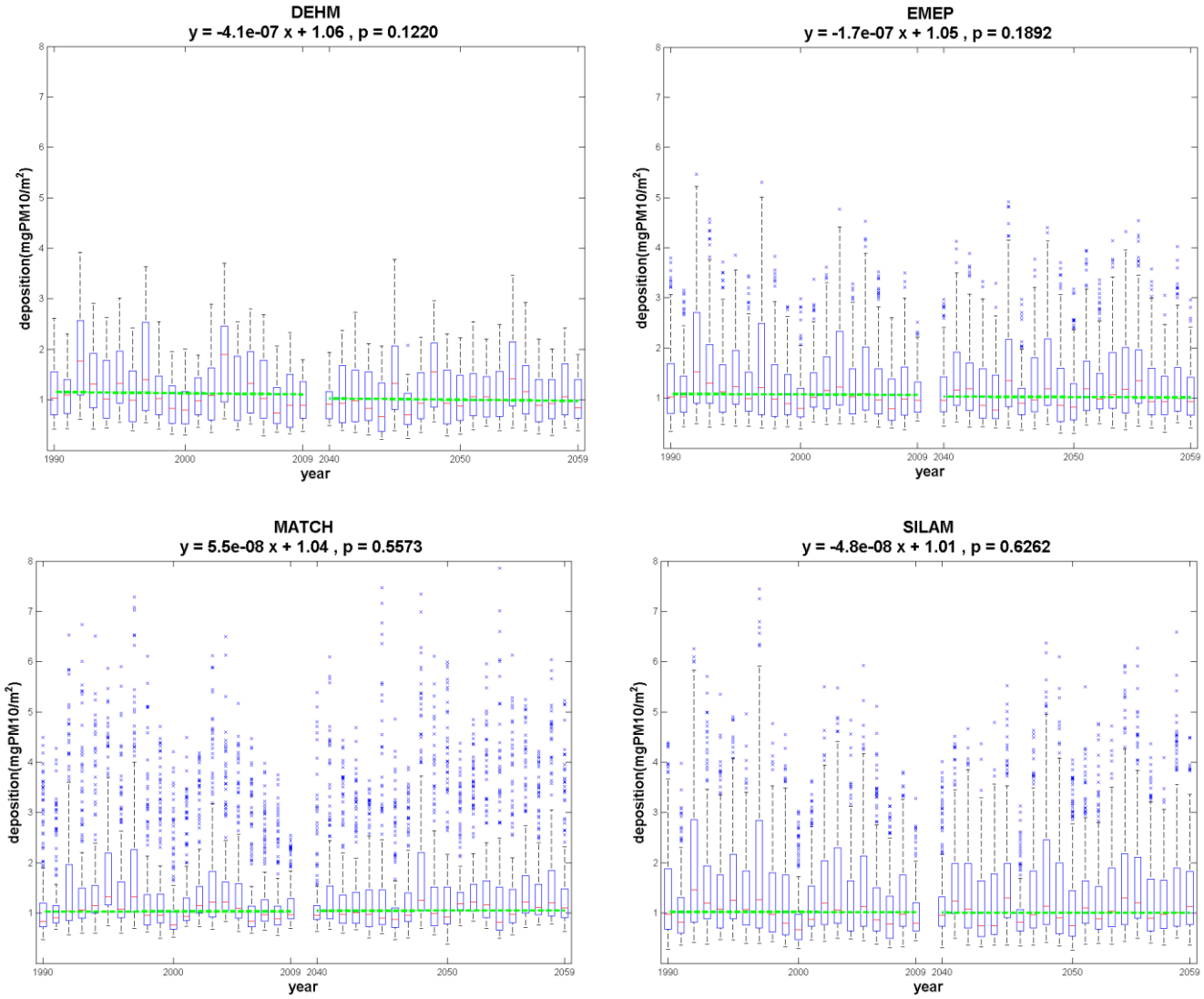
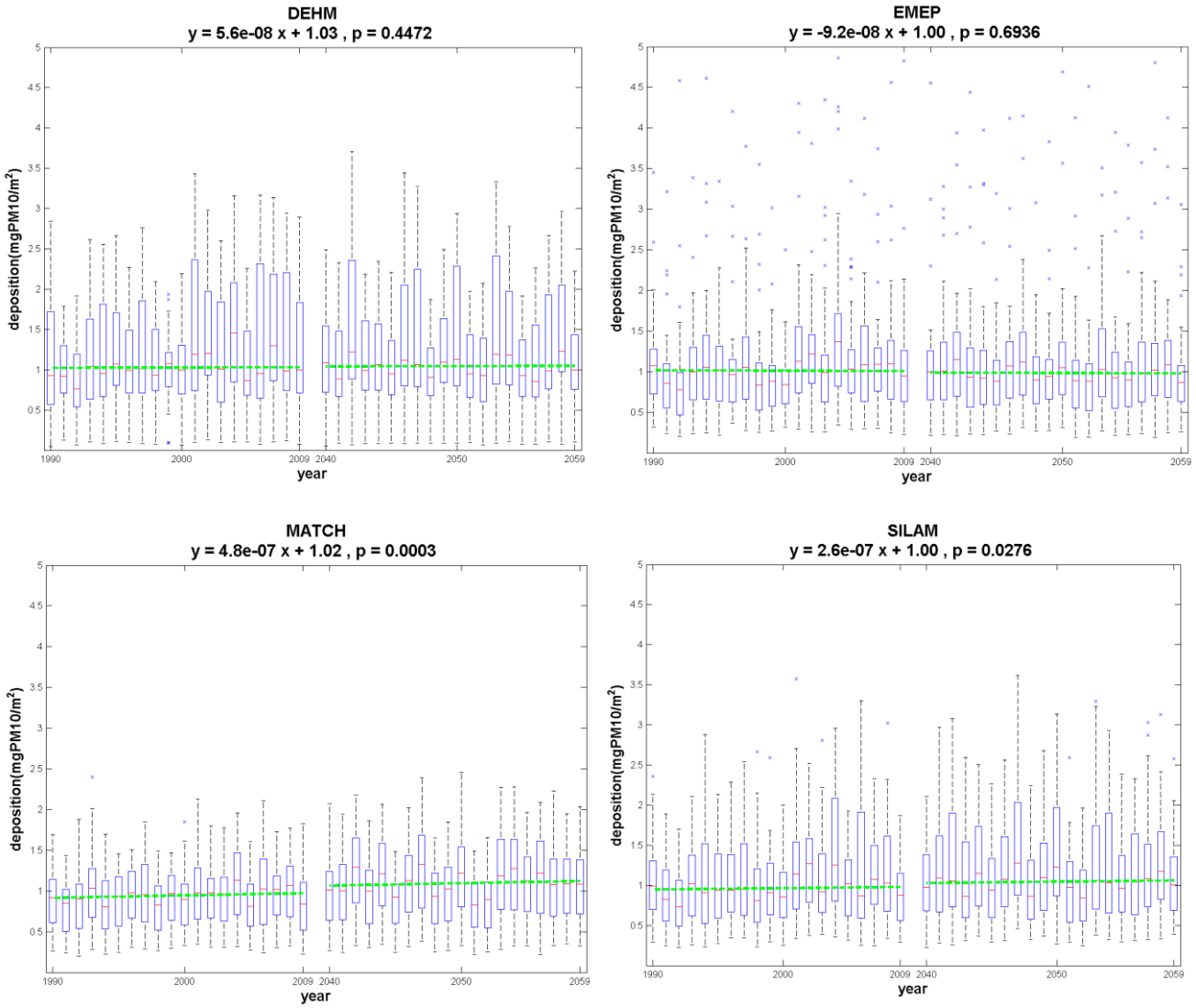


Figure S13 Baltic Sea SSA annual deposition ($mgPM_{10}$ m^{-2}) normalized trend (y) over the past and future periods (x [year]).



1

2 **Figure S14** Black Sea SSA annual deposition ($mgPM_{10}$ m^{-2}) normalized trend (y) over the
3 past and future periods (x [year]).

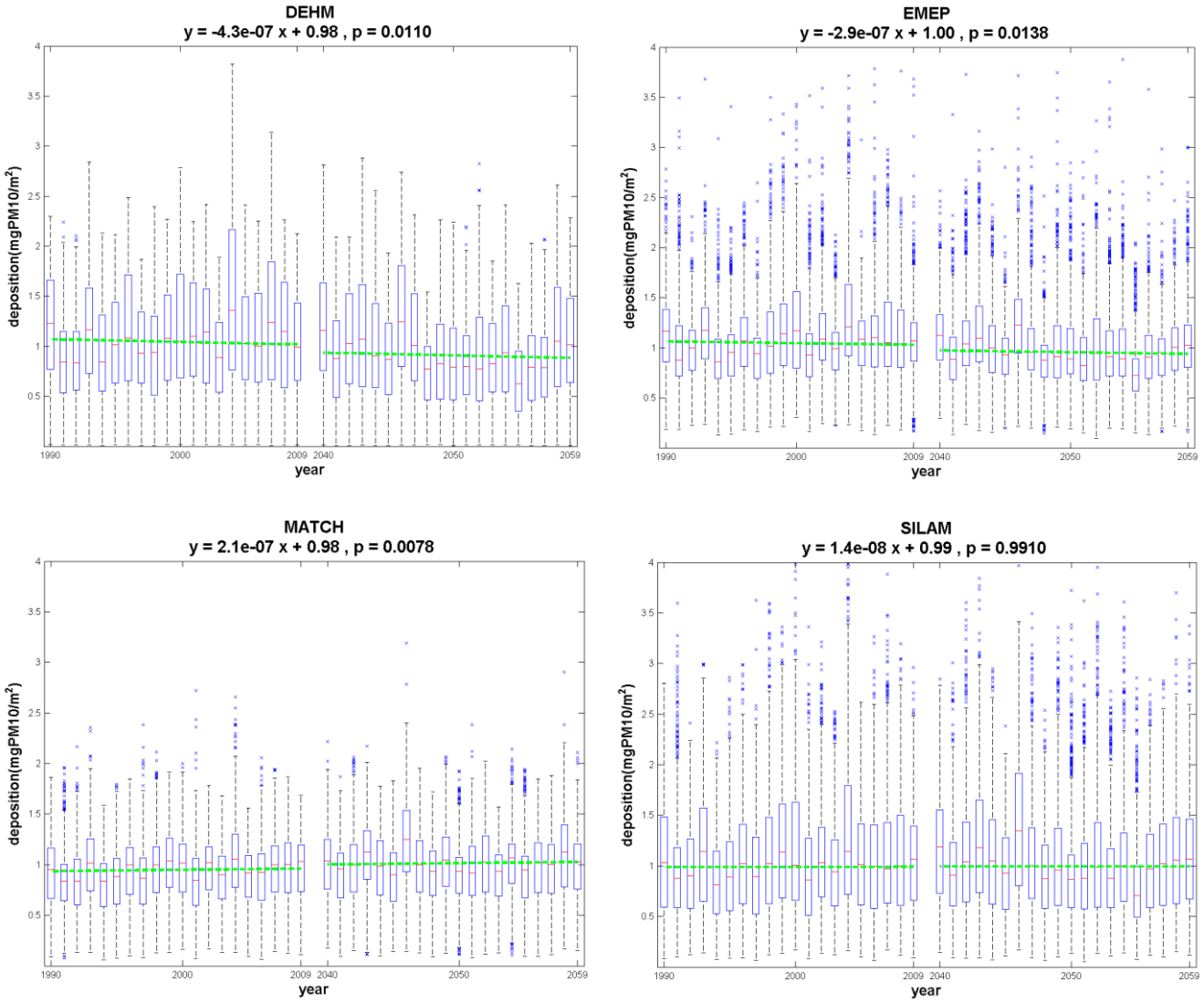


Figure S15 Mediterranean Sea SSA annual deposition ($mgPM_{10}$ m^{-2}) normalized trend (y) over the past and future periods (x [year]).

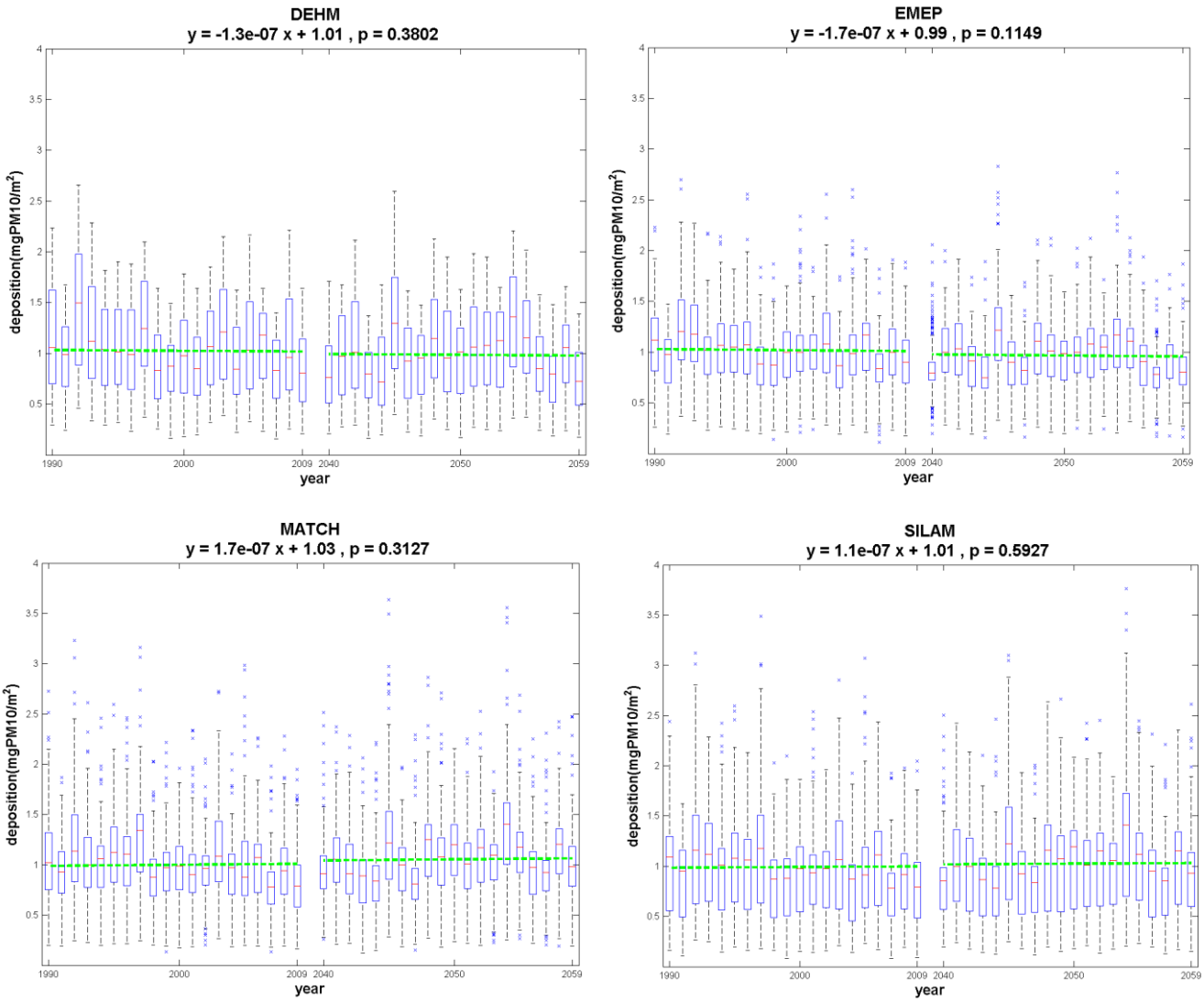


Figure S16 North Sea SSA annual deposition ($mgPM_{10}$ m^{-2}) normalized trend (y) over the past and future periods (x [year]).