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Supplement of

A multimodel evaluation of the potential impact of shipping on particle species in the Mediterranean Sea

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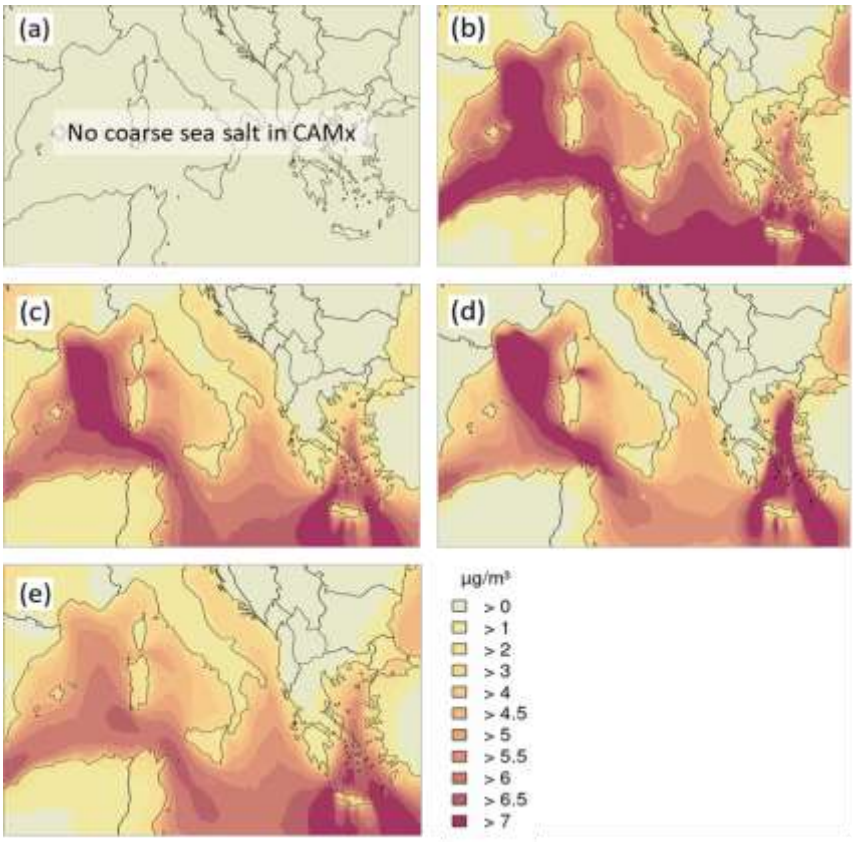

Figure S1: Annual mean sea salt (NaCl) total concentration. (a) = CAMx, (b) = CHIMERE, (c) = CMAQ, (d) = EMEP, (e) = LOTOS-EUROS.

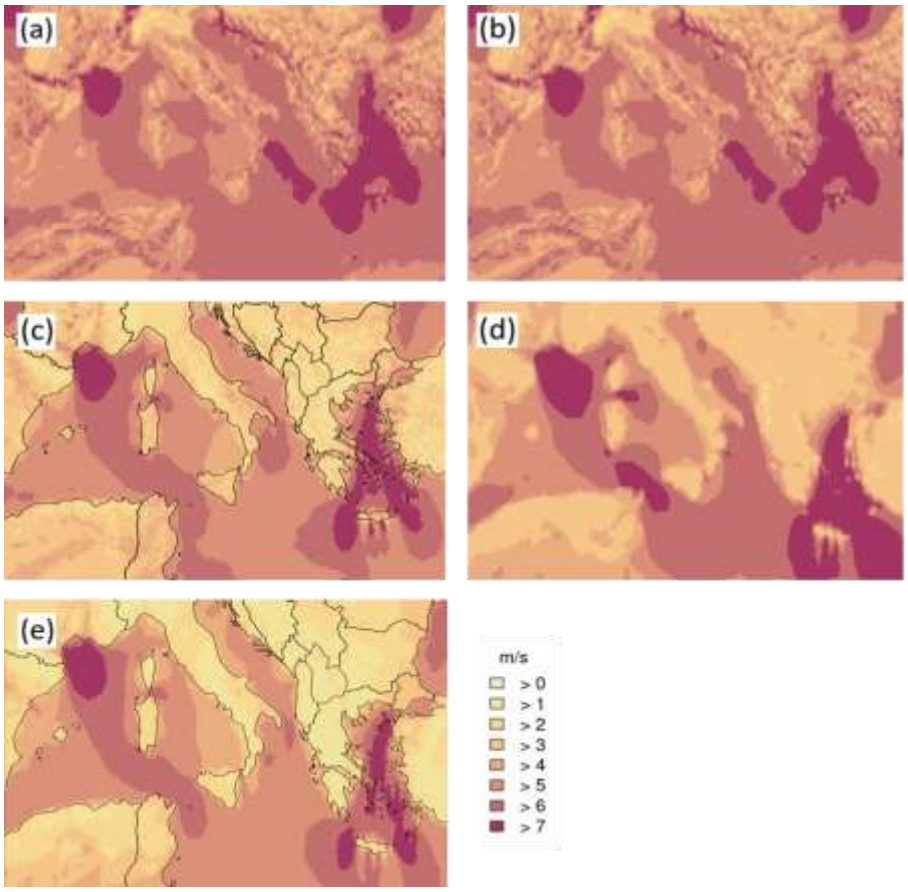

Figure S2: Annual mean wind speed (m/s). (a) = CAMx, (b) = CHIMERE, (c) = CMAQ, (d) = EMEP, (e) = LOTOS-EUROS.

Figure S3: Overview of points the wind speed and sea salt correlation was tested was compared, latitude and longitude values are in table S1. Map source: ArcGIS Pro 2.7.1 © 2020 Esri Inc.

Table S1: Latitudes, longitudes, and correlation at these points based on hourly values in CMAQ, EMEP and LOTOS-EUROS and daily values in CHIMERE.

			Correlation (r) wind speed and sea salt			
ID	**latitude**	**longitude**	**CHIMERE**	**CMAQ**	**EMEP**	**LOTOS-EUROS**
1	42.778684	4.00158	0.59	0.72	0.48	0.62
2	38.663892	4.00158	0.72	0.72	0.53	0.62
3	39.549332	6.587002	0.75	0.79	0.59	0.67
4	35.720838	12.907362	0.7	0.78	0.58	0.7
5	37.014137	17.641123	0.67	0.77	0.60	0.66
6	42.832907	15.678871	0.62	0.75	0.55	0.64
7	36.179274	25.391863	0.34	0.71	0.48	0.57
8	39.267262	25.102001	0.31	0.78	0.60	0.71

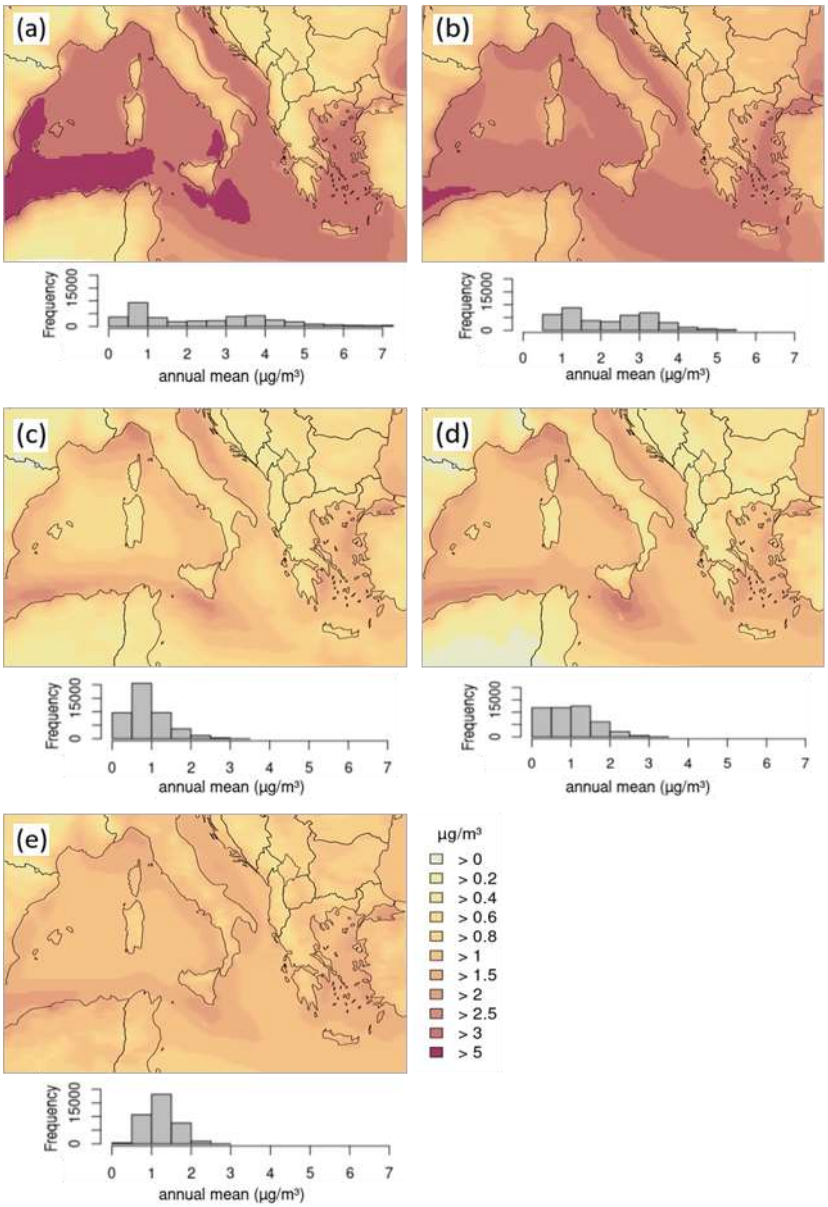

Figure S4: Annual mean HNO_3 total concentration. (a) = CAMx, (b) = CHIMERE, (c) = CMAQ, (d) = EMEP, (e) = LOTOS-EUROS. Below the domain figure is the respective frequency distribution displayed for the annual mean HNO_3 concentration, referred to the whole model domain.

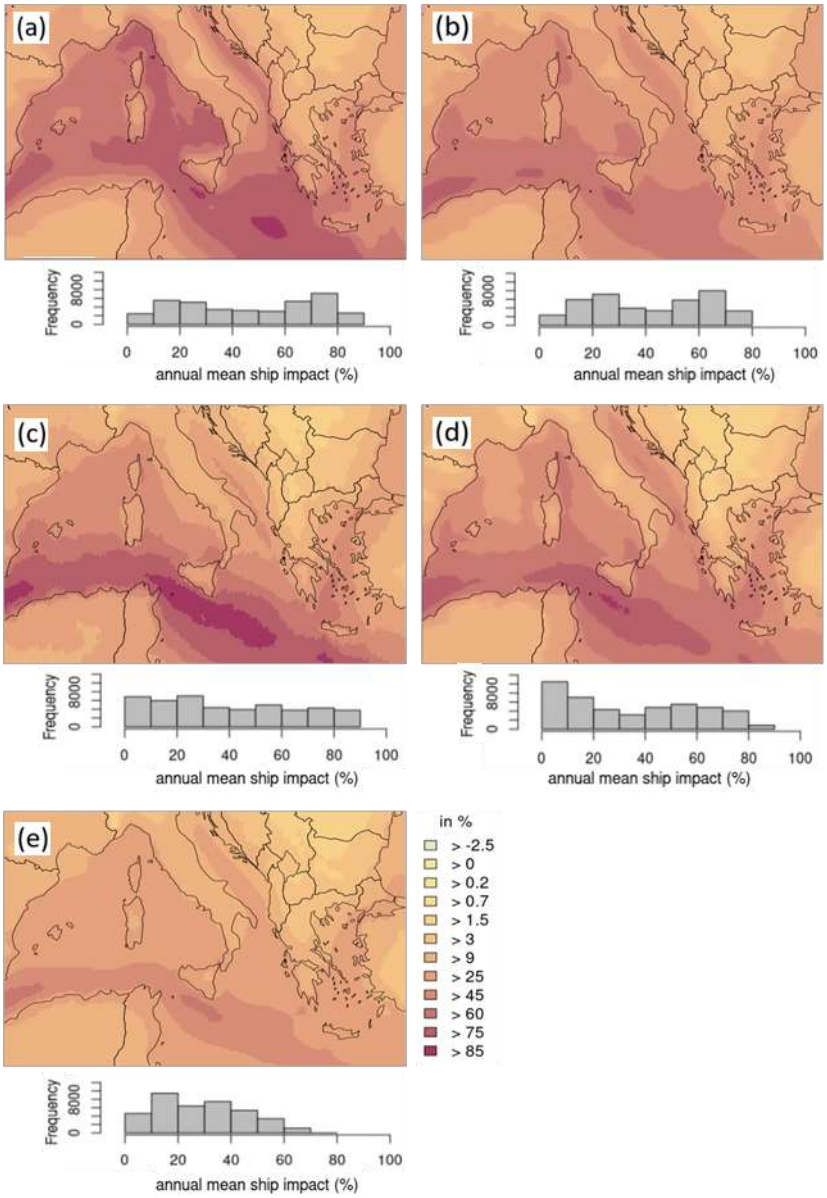

Figure S5: Annual mean HNO_3 relative potential ship impact. (a) = CAMx, (b) = CHIMERE, (c) = CMAQ, (d) = EMEP, (e) = LOTOS-EUROS. Below the domain figure is the respective frequency distribution displayed for the annual mean HNO_3 potential ship impact, referred to the whole model domain.

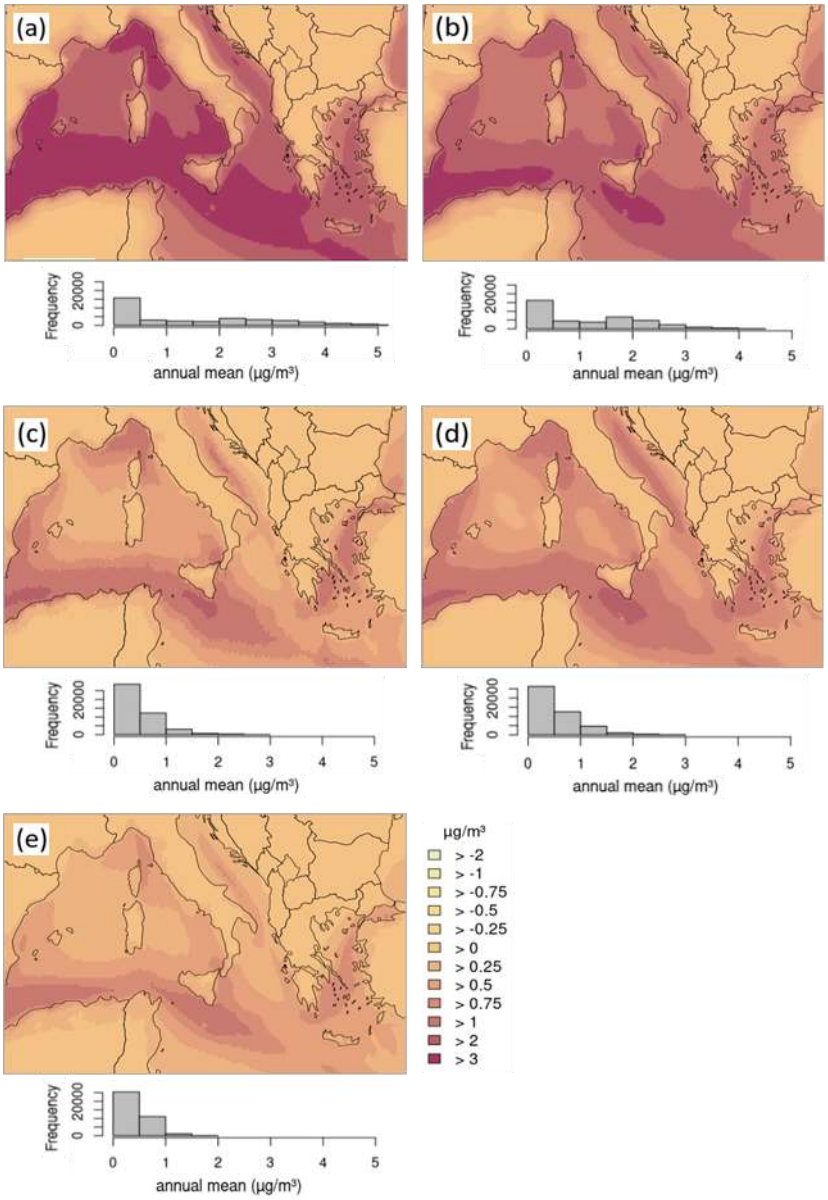

Figure S6: Annual mean HNO_3 absolute potential ship impact. (a) = CAMx, (b) = CHIMERE, (c) = CMAQ, (d) = EMEP, (e) = LOTOS-EUROS. Below the domain figure is the respective frequency distribution displayed for the annual mean HNO_3 potential ship impact, referred to the whole model domain.

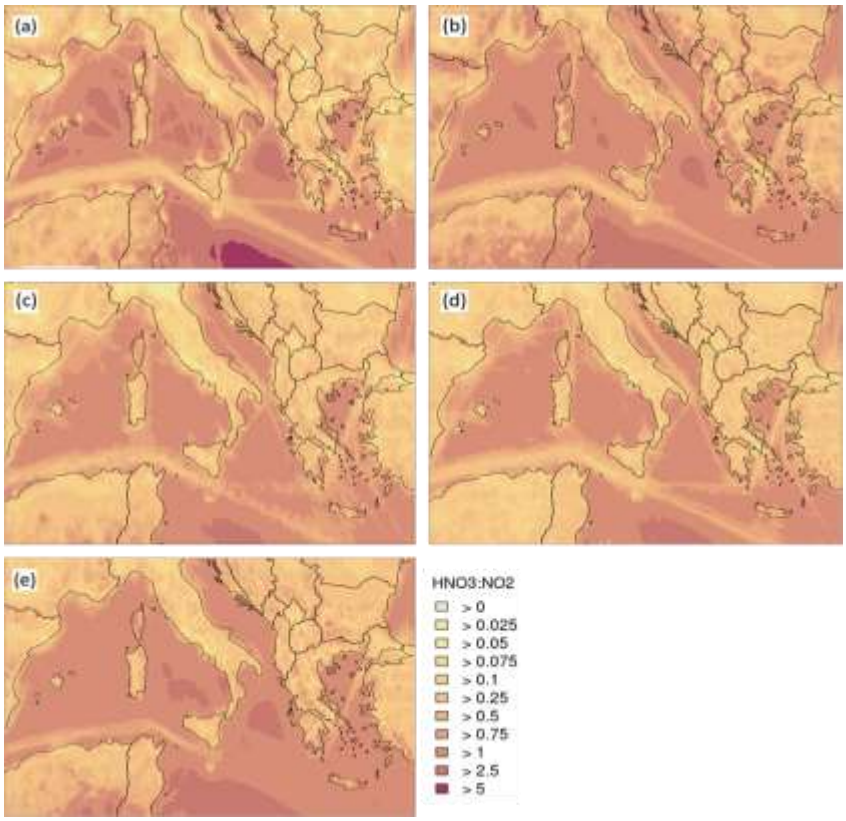

Figure S7: Annual mean ratio of HNO_3:NO_2 for emisbase run with all emission sources, based on averaged daily values. (a) = CAMx, (b) = CHIMERE, (c) = CMAQ, (d) = EMEP, (e) = LOTOS-EUROS.

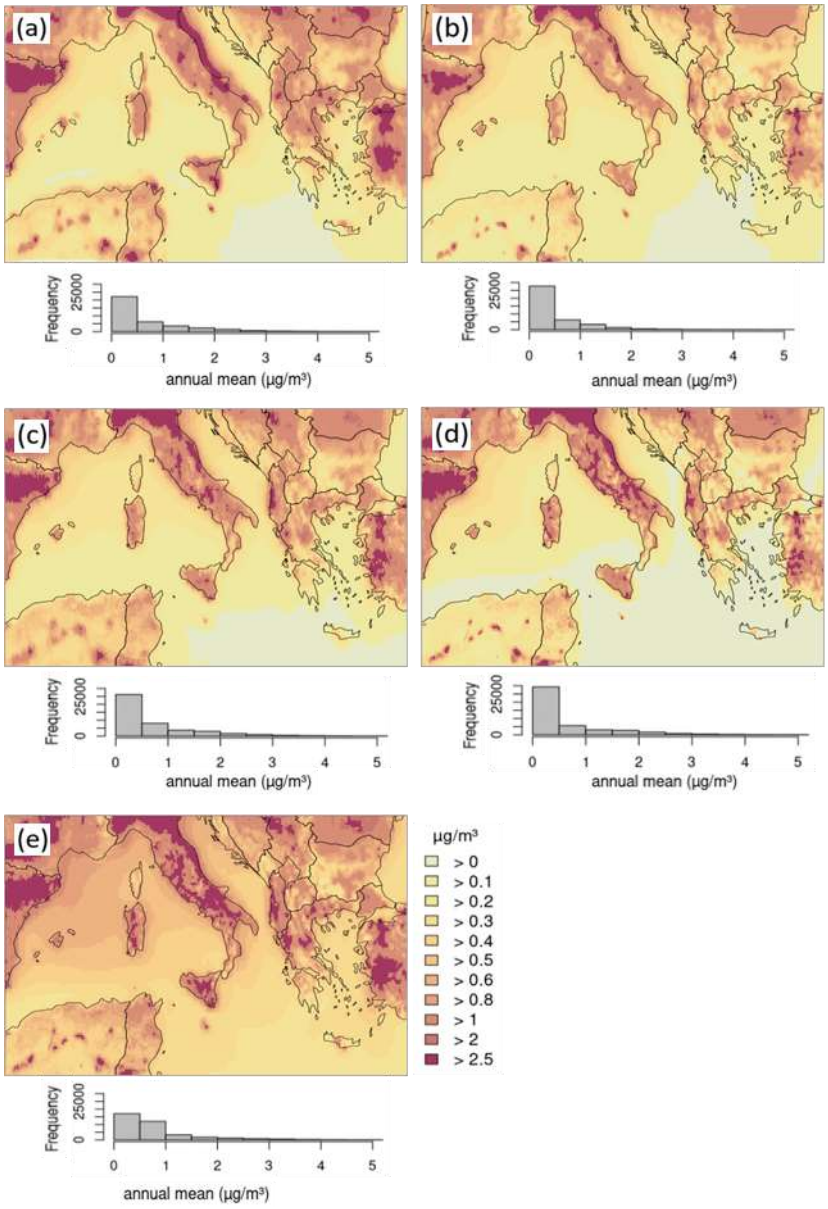

Figure S8: Annual mean NH_3 total concentration. (a) = CAMx, (b) = CHIMERE, (c) = CMAQ, (d) = EMEP, (e) = LOTOS-EUROS. Below the domain figure is the respective frequency distribution displayed for the annual mean NH_3 concentration, referred to the whole model domain.

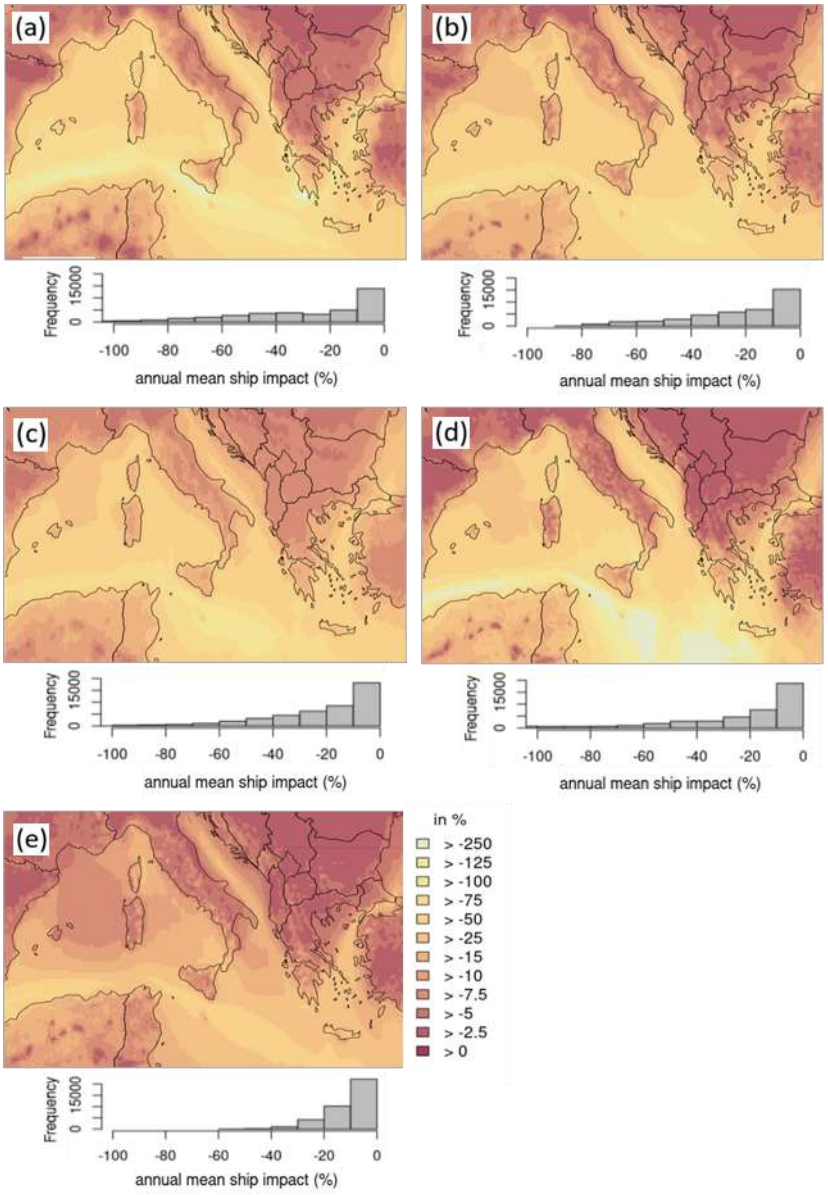

Figure S9: Annual mean NH_3 relative potential ship impact. (a) = CAMx, (b) = CHIMERE, (c) = CMAQ, (d) = EMEP, (e) = LOTOS-EUROS. Below the domain figure is the respective frequency distribution displayed for the annual mean NH_3 potential ship impact, referred to the whole model domain.

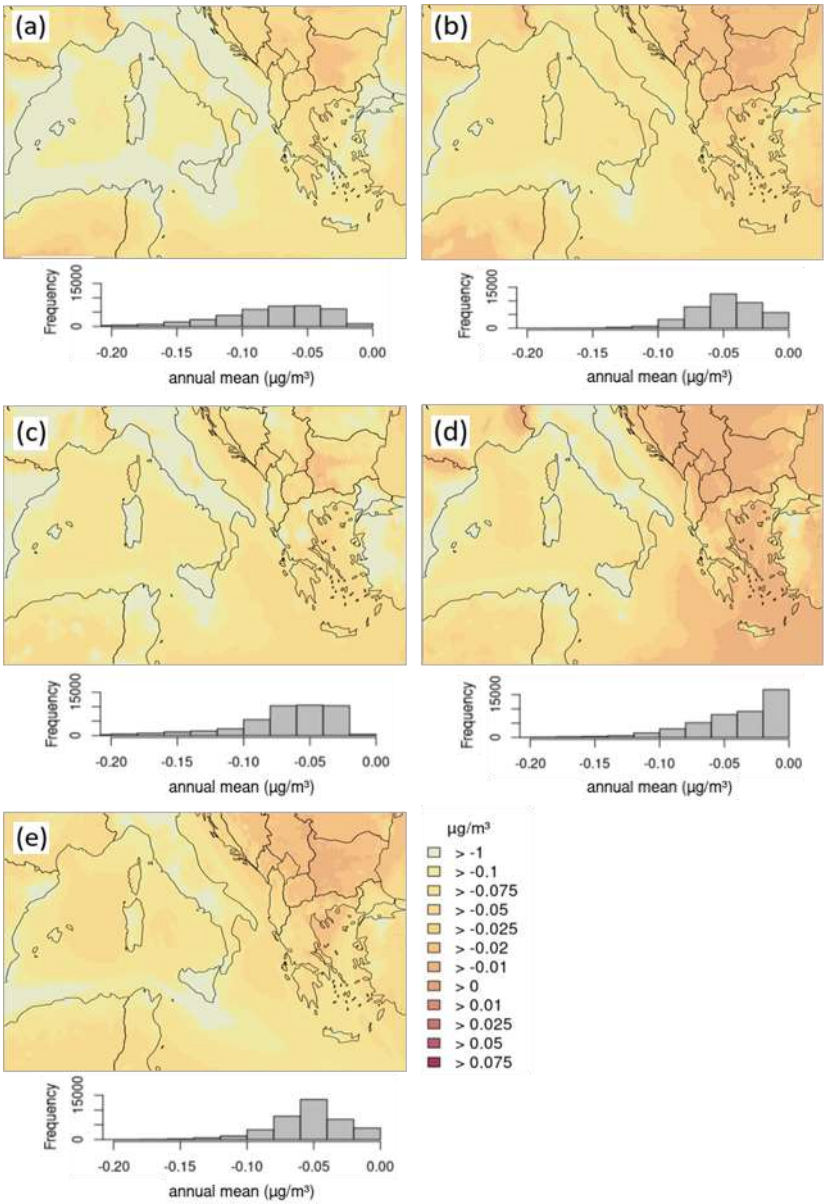

Figure S10: Annual mean NH_3 absolute potential ship impact. (a) = CAMx, (b) = CHIMERE, (c) = CMAQ, (d) = EMEP, (e) = LOTOS-EUROS. Below the domain figure is the respective frequency distribution displayed for the annual mean NH_3 potential ship impact, referred to the whole model domain.

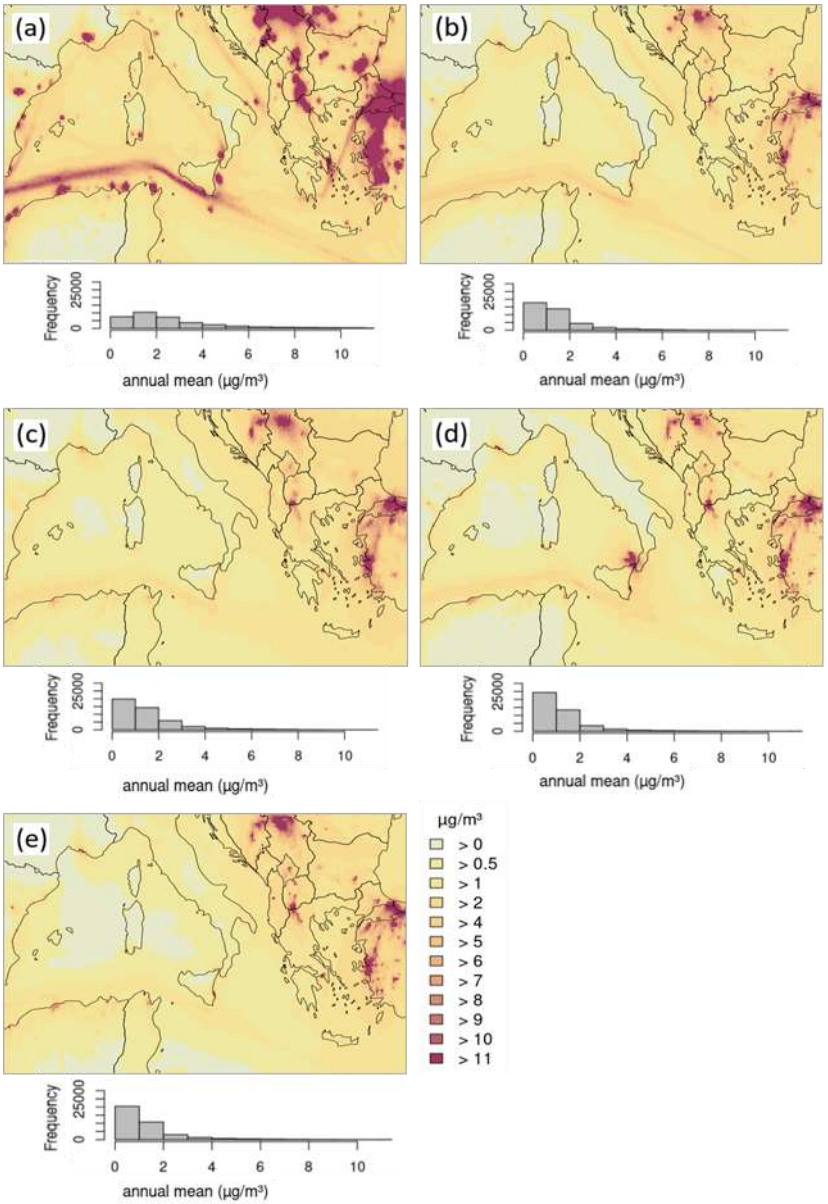

Figure S11: Annual mean SO_2 total concentration. (a) = CAMx, (b) = CHIMERE, (c) = CMAQ, (d) = EMEP, (e) = LOTOS-EUROS. Below the domain figure is the respective frequency distribution displayed for the annual mean SO_2 concentration, referred to the whole model domain.

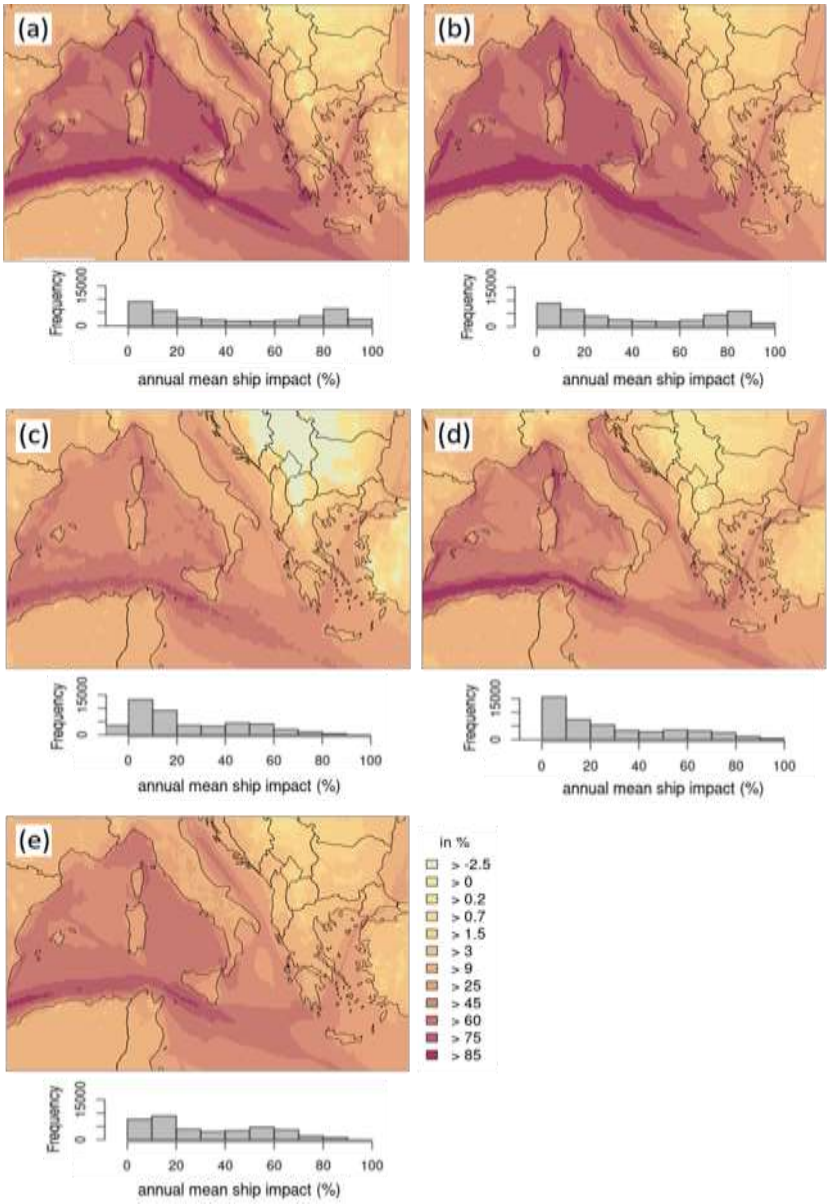

Figure S12: Annual mean SO_2 relative potential ship impact. (a) = CAMx, (b) = CHIMERE, (c) = CMAQ, (d) = EMEP, (e) = LOTOS-EUROS. Below the domain figure is the respective frequency distribution displayed for the annual mean SO_2 potential ship impact, referred to the whole model domain.

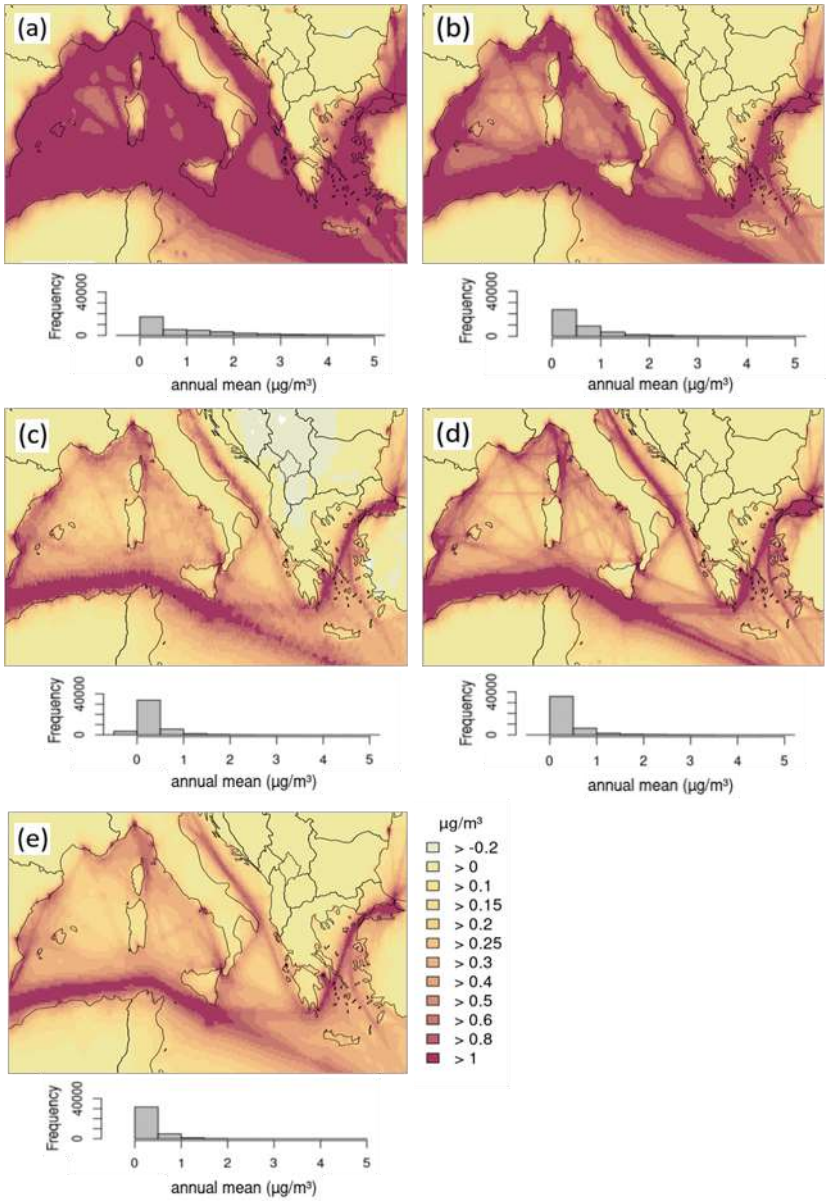

Figure S13: Annual mean SO_2 absolute potential ship impact. (a) = CAMx, (b) = CHIMERE, (c) = CMAQ, (d) = EMEP, (e) = LOTOS-EUROS. Below the domain figure is the respective frequency distribution displayed for the annual mean SO_2 potential ship impact, referred to the whole model domain.

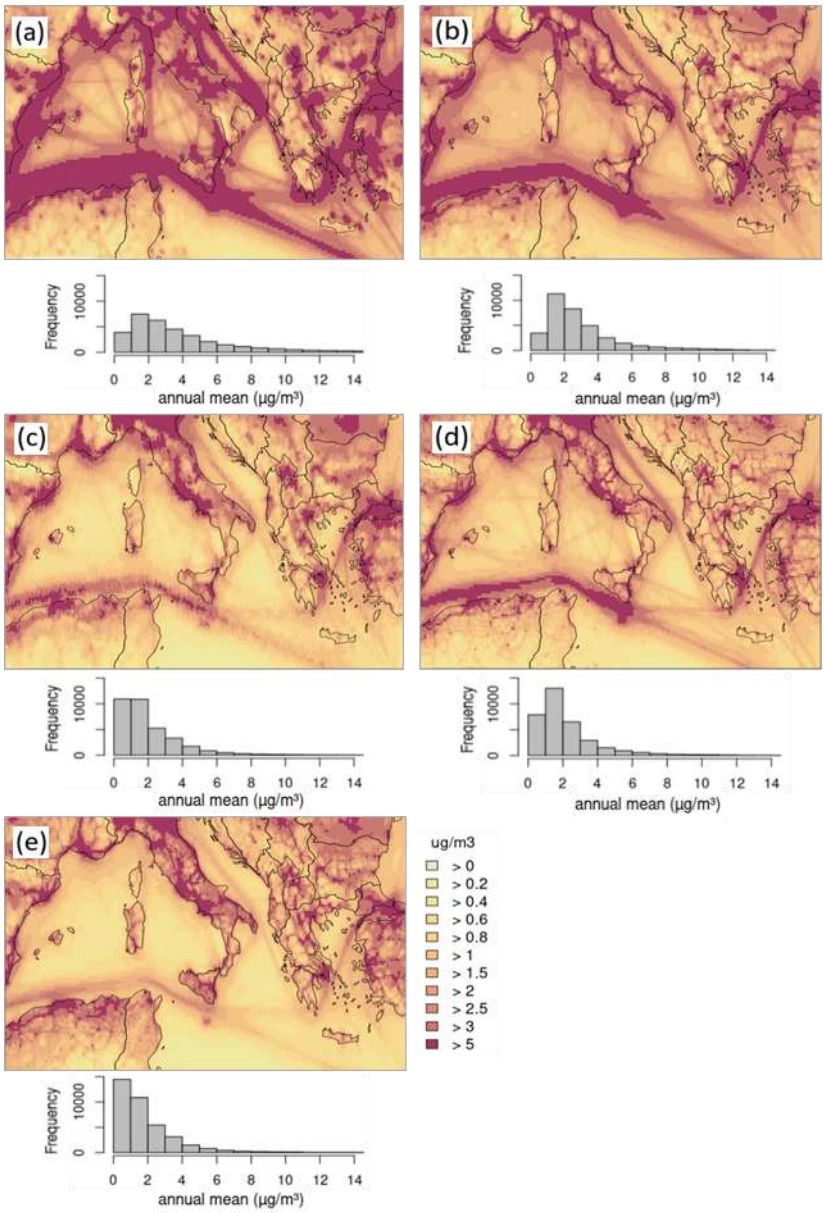

Figure S14: **Annual mean NO_2 total concentration. (a) = CAMx, (b) = CHIMERE, (c) = CMAQ, (d) = EMEP, (e) = LOTOS-EUROS. Below the domain figure is the respective frequency distribution displayed for the annual mean SO_2 concentration, referred to the whole model domain.**

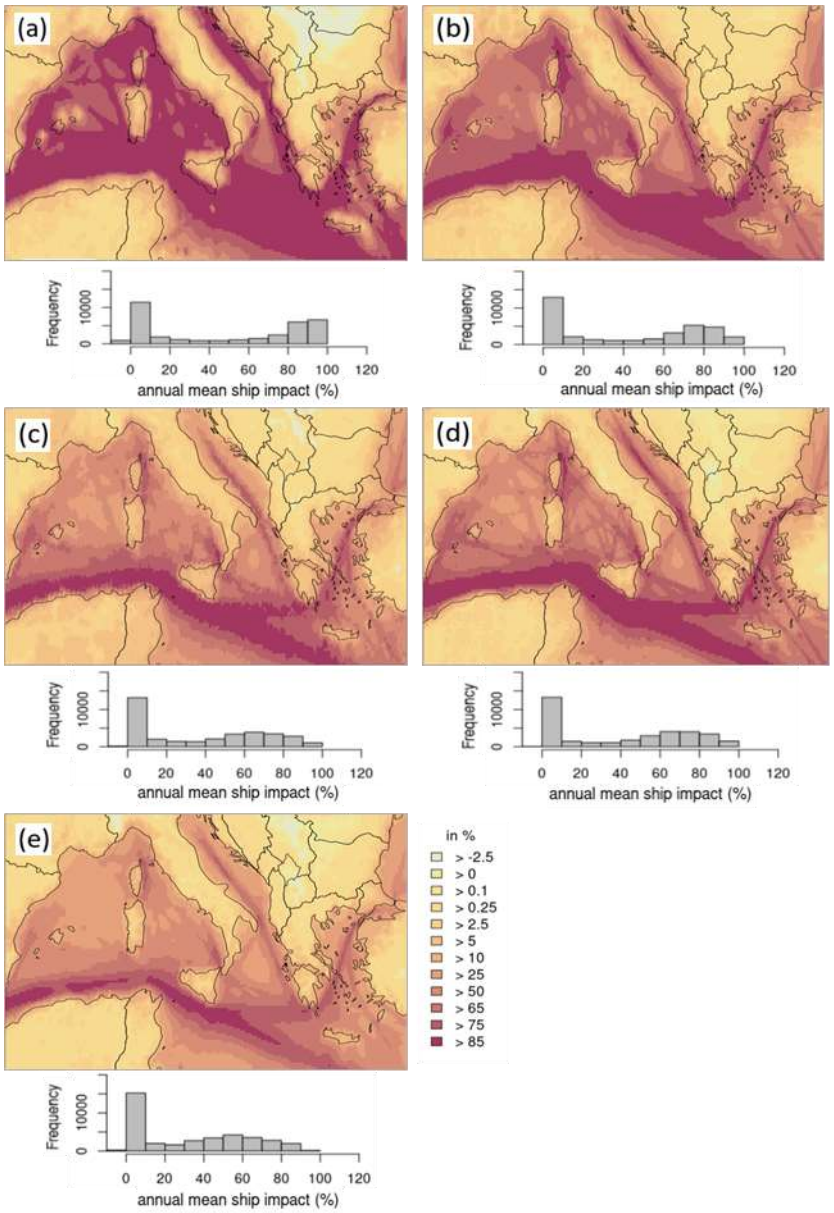

Figure S15: **Annual mean NO_2 relative potential ship impact. (a) = CAMx, (b) = CHIMERE, (c) = CMAQ, (d) = EMEP, (e) = LOTOS-EUROS. Below the domain figure is the respective frequency distribution displayed for the annual mean SO_2 potential ship impact, referred to the whole model domain.**

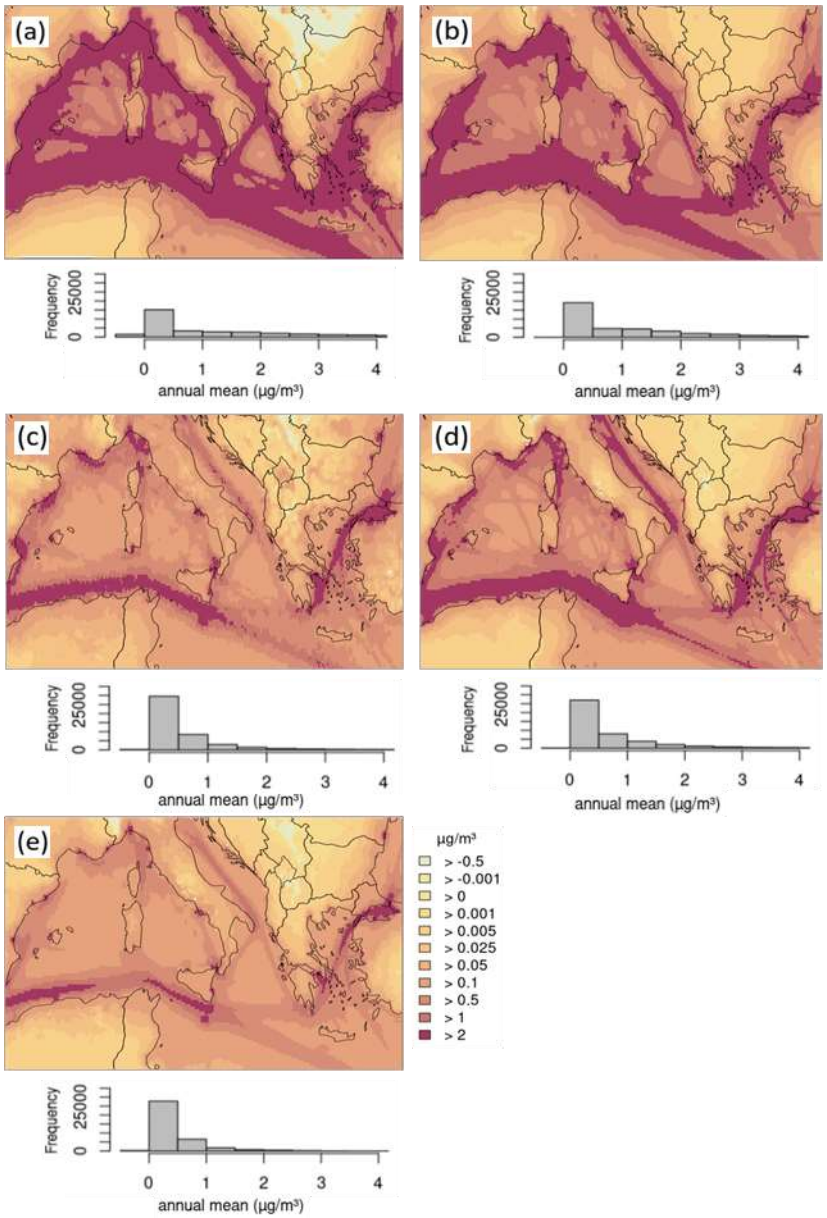

Figure S16: Annual mean NO_2 absolute potential ship impact. (a) = CAMx, (b) = CHIMERE, (c) = CMAQ, (d) = EMEP, (e) = LOTOS-EUROS. Below the domain figure is the respective frequency distribution displayed for the annual mean SO_2 potential ship impact, referred to the whole model domain.

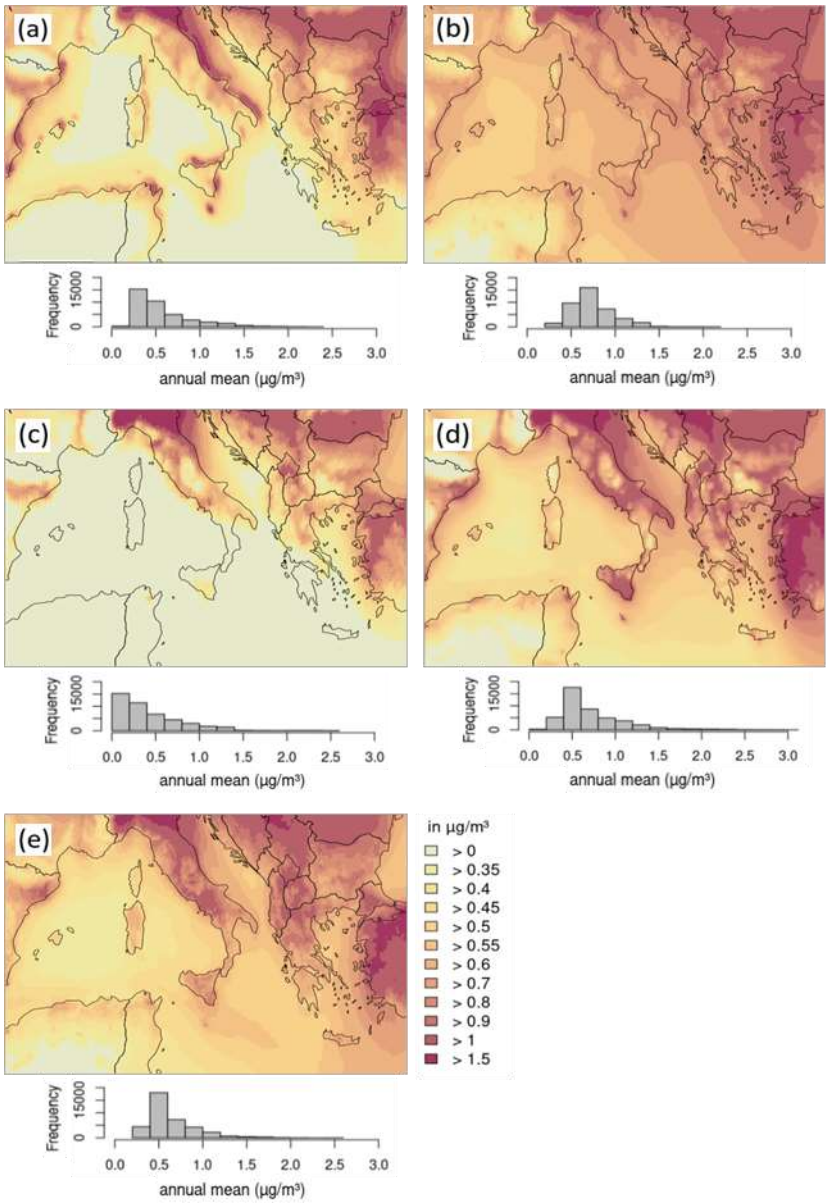

Figure S17: Annual mean NH_4^+ total concentration. (a) = CAMx, (b) = CHIMERE, (c) = CMAQ, (d) = EMEP, (e) = LOTOS-EUROS. Below the domain figure is the respective frequency distribution displayed for the annual mean NH_4 concentration, referred to the whole model domain.

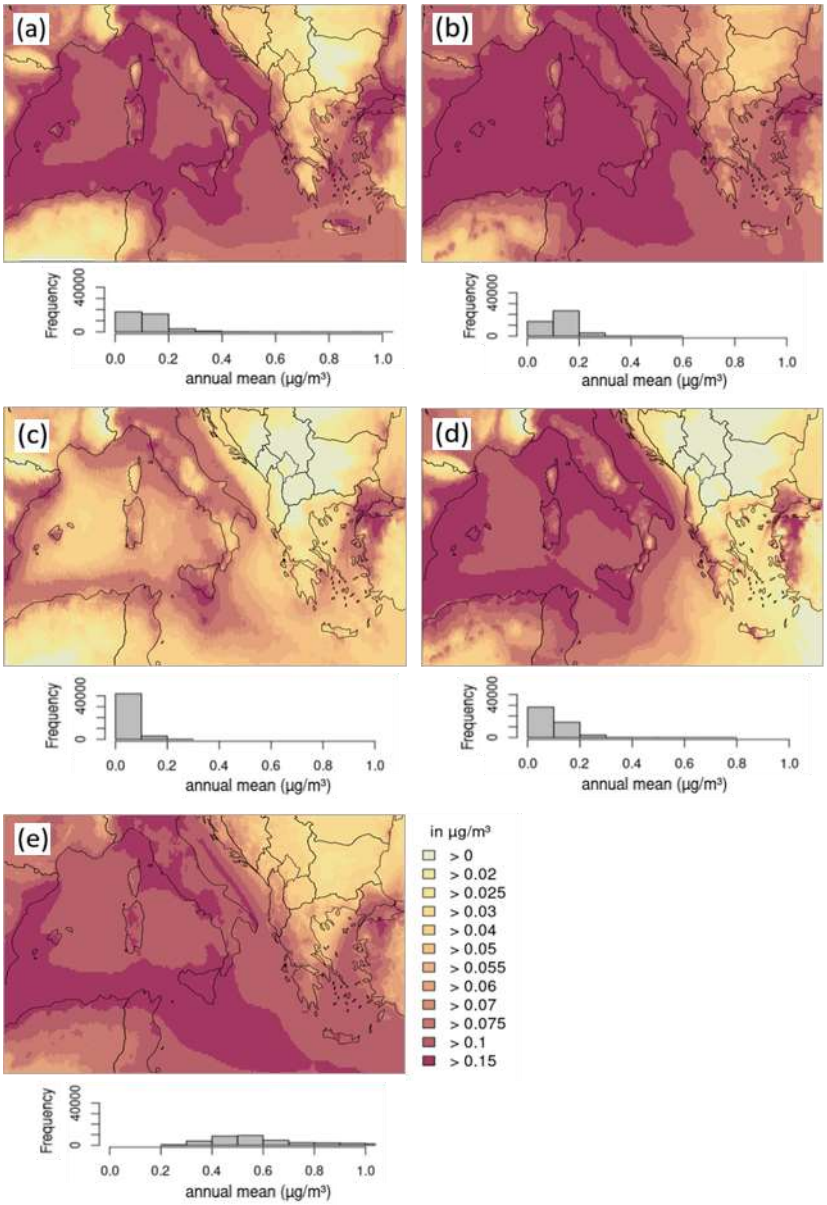

Figure S18: Annual mean NH_4^+ absolute potential ship impact. (a) = CAMx, (b) = CHIMERE, (c) = CMAQ, (d) = EMEP, (e) = LOTOS-EUROS. Below the domain figure is the respective frequency distribution displayed for the annual mean NH_4 potential ship impact, referred to the whole model domain.

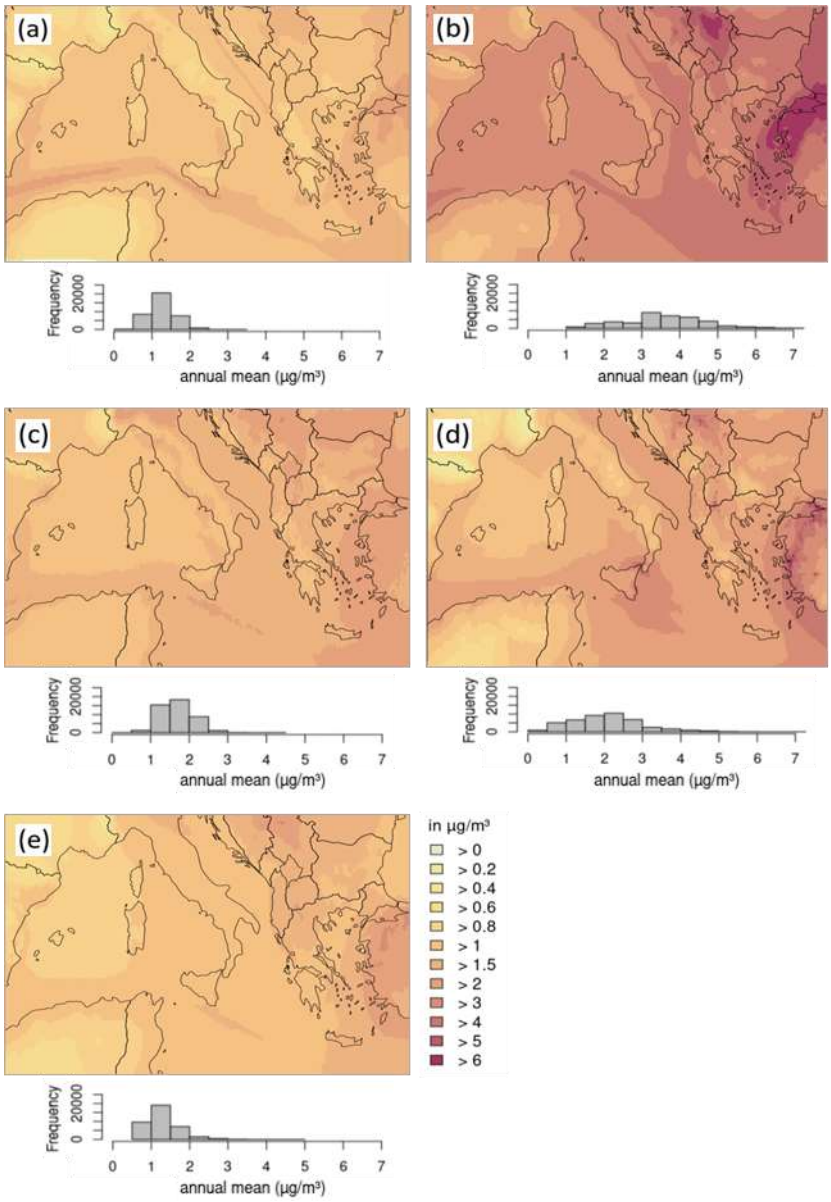

Figure S19: Annual mean SO_4^{2-} total concentration. (a) = CAMx, (b) = CHIMERE, (c) = CMAQ, (d) = EMEP, (e) = LOTOS-EUROS. Below the domain figure is the respective frequency distribution displayed for the annual mean SO_4 concentration, referred to the whole model domain.

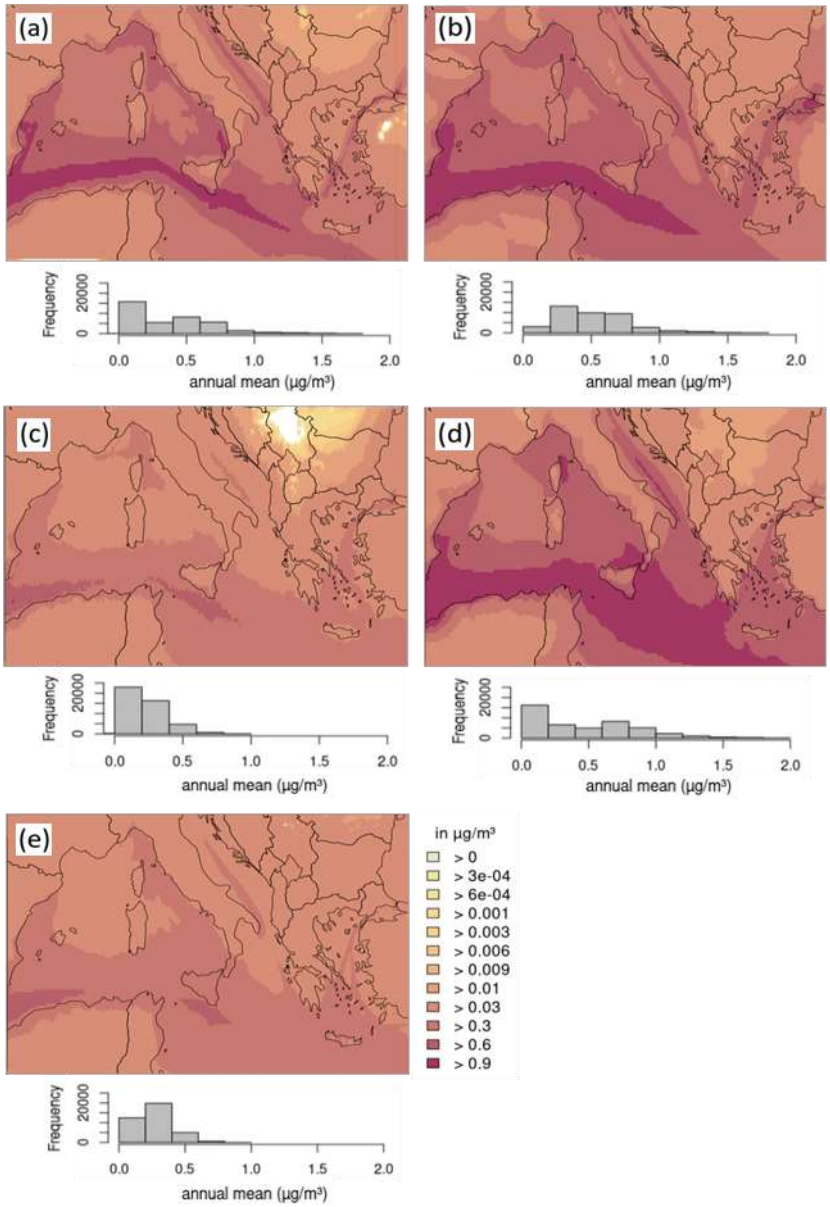

Figure S20: Annual mean SO_4^{2-} absolute potential ship impact. (a) = CAMx, (b) = CHIMERE, (c) = CMAQ, (d) = EMEP, (e) = LOTOS-EUROS. Below the domain figure is the respective frequency distribution displayed for the annual mean SO_4 potential ship impact, referred to the whole model domain.

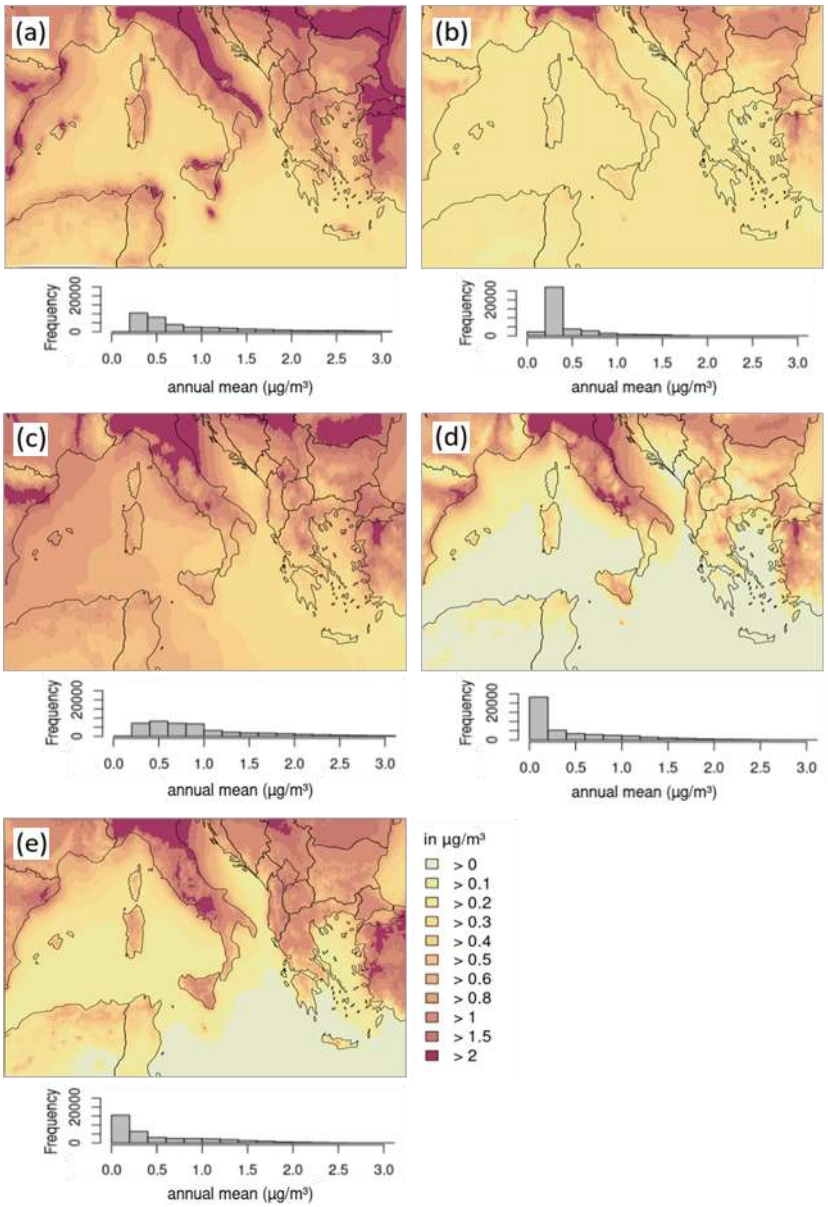

Figure S21: Annual mean NO_3^- total concentration. (a) = CAMx, (b) = CHIMERE, (c) = CMAQ, (d) = EMEP, (e) = LOTOS-EUROS. Below the domain figure is the respective frequency distribution displayed for the annual mean NO_3 concentration, referred to the whole model domain.

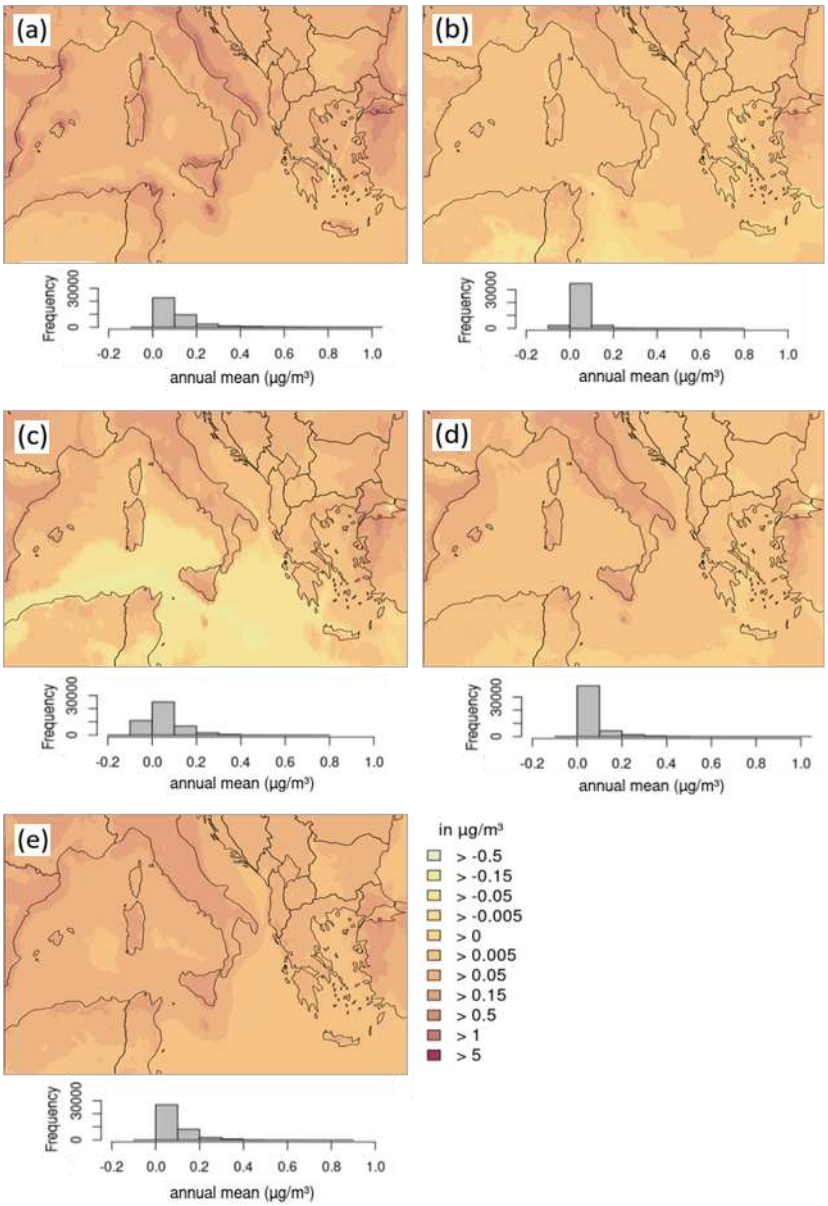

Figure S22: Annual mean NO_3^- absolute potential ship impact. (a) = CAMx, (b) = CHIMERE, (c) = CMAQ, (d) = EMEP, (e) = LOTOS-EUROS. Below the domain figure is the respective frequency distribution displayed for the annual mean NO_3 potential ship impact, referred to the whole model domain.

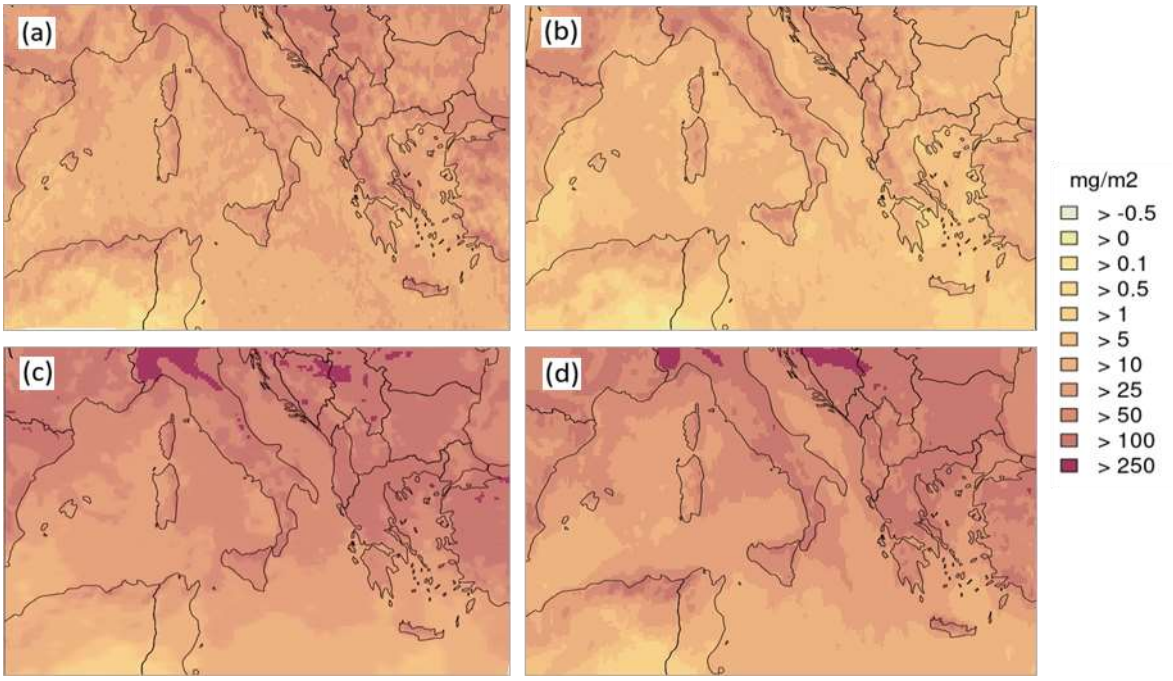

Figure S23: NH_4^+ wet deposition annual sum. (a) = CAMx, (b) = CHIMERE, (c) = CMAQ, (d) = LOTOS-EUROS.

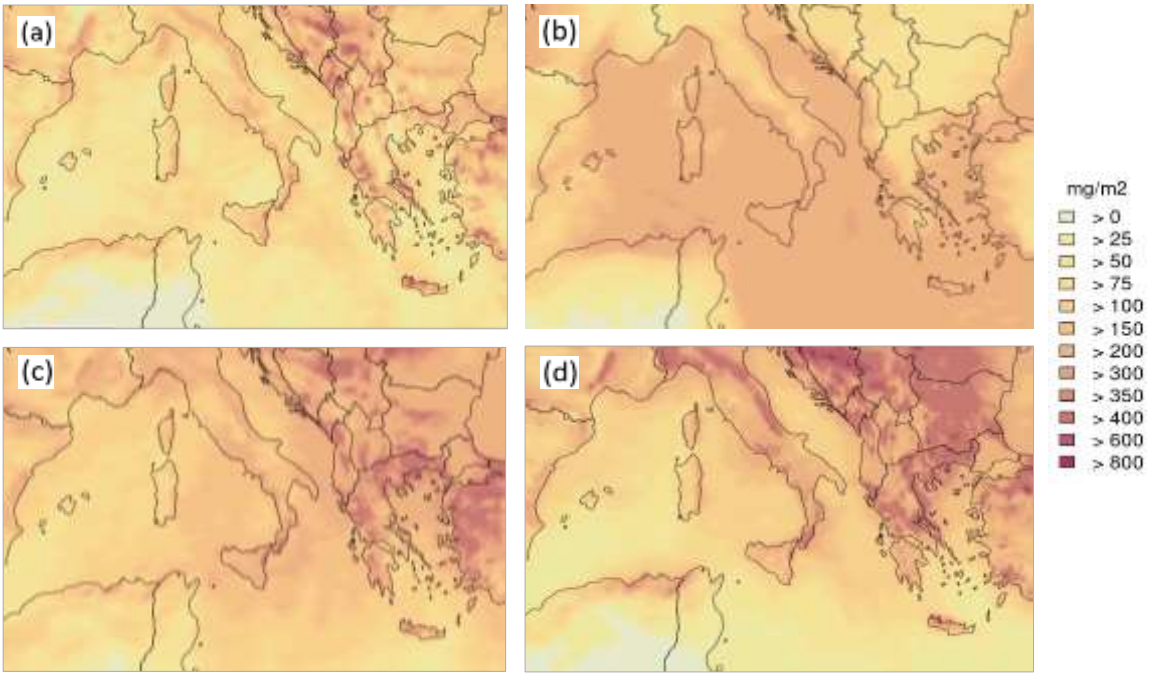

Figure S24: SO_4^{2-} wet deposition annual sum. (a) = CAMx, (b) = CHIMERE, (c) = CMAQ, (d) = LOTOS-EUROS.

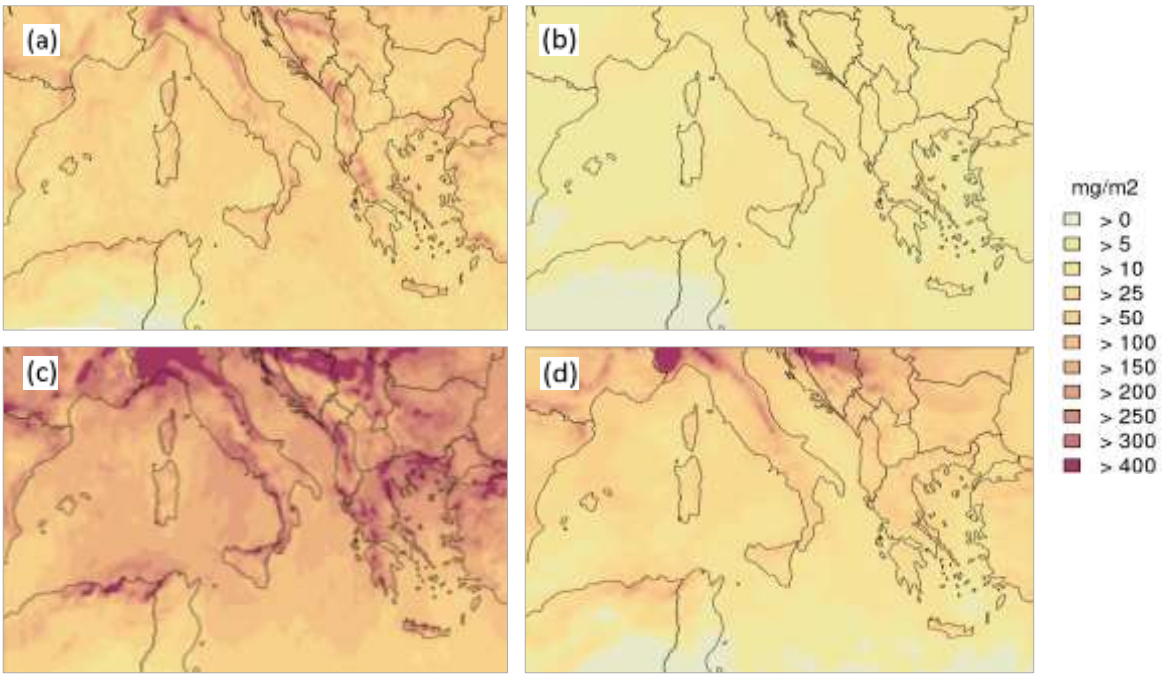

Figure S25: NO_3 wet deposition annual sum. (a) = CAMx, (b) = CHIMERE, (c) = CMAQ, (d) = LOTOS-EUROS.

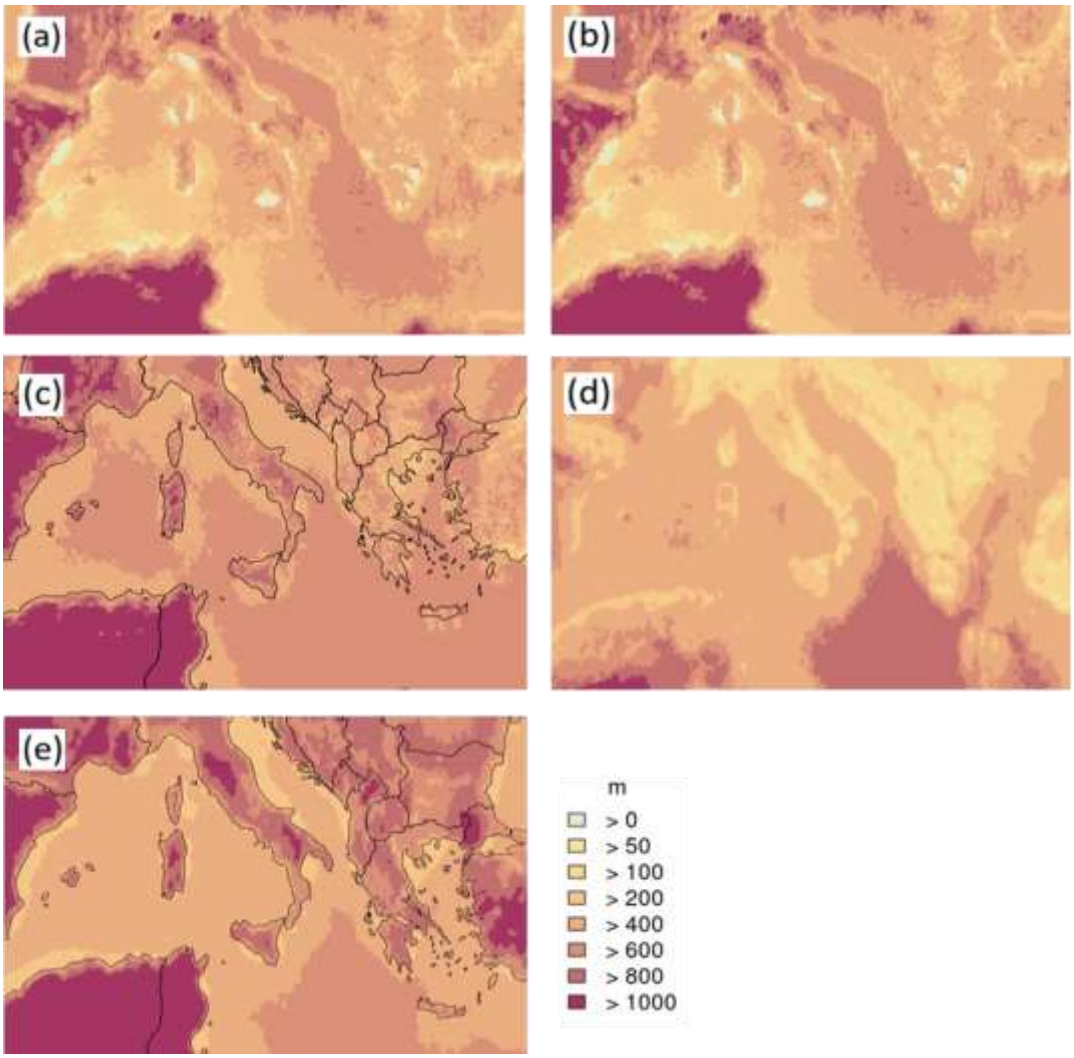

Figure S26: Median height of ABL at 4PM. (a) = CAMx, (b) = CHIMERE, (c) = CMAQ, (d) = EMEP, (e) = LOTOS-EUROS.

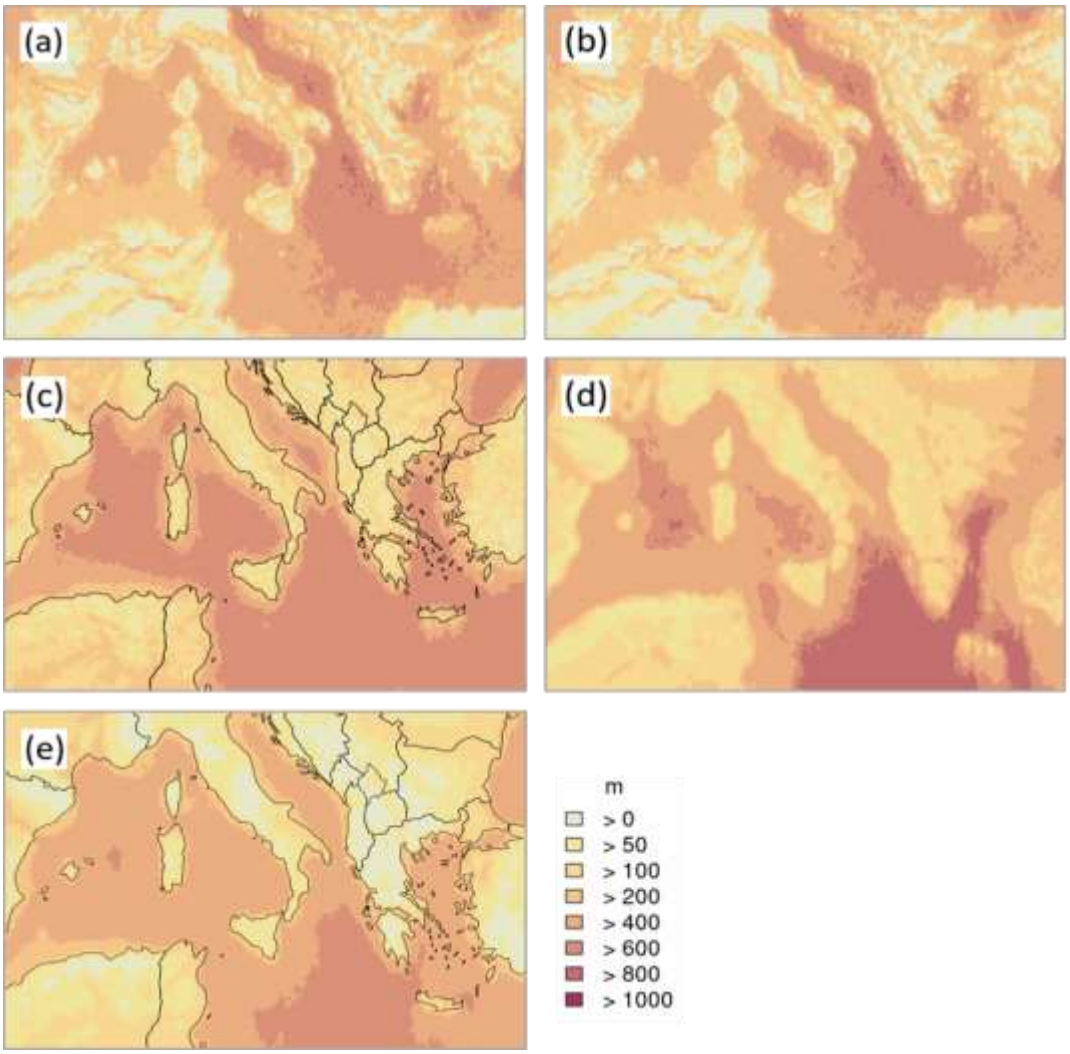

Figure S27: Median height of ABL at 4AM. (a) = CAMx, (b) = CHIMERE, (c) = CMAQ, (d) = EMEP, (e) = LOTOS-EUROS.

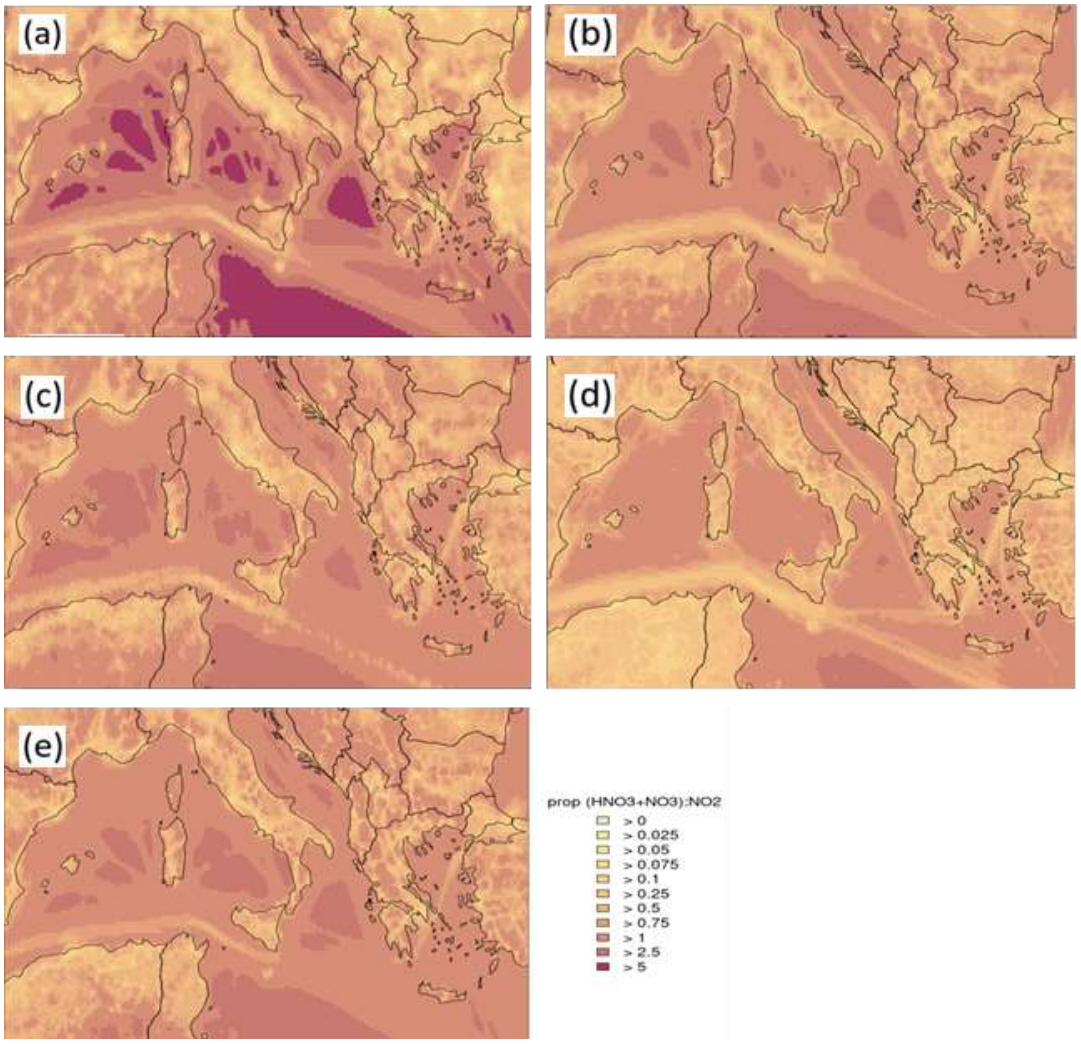

Figure S28: Ratio (HNO_3+NO_3^-):NO_2. (a) = CAMx, (b) = CHIMERE, (c) = CMAQ, (d) = EMEP, (e) = LOTOS-EUROS.

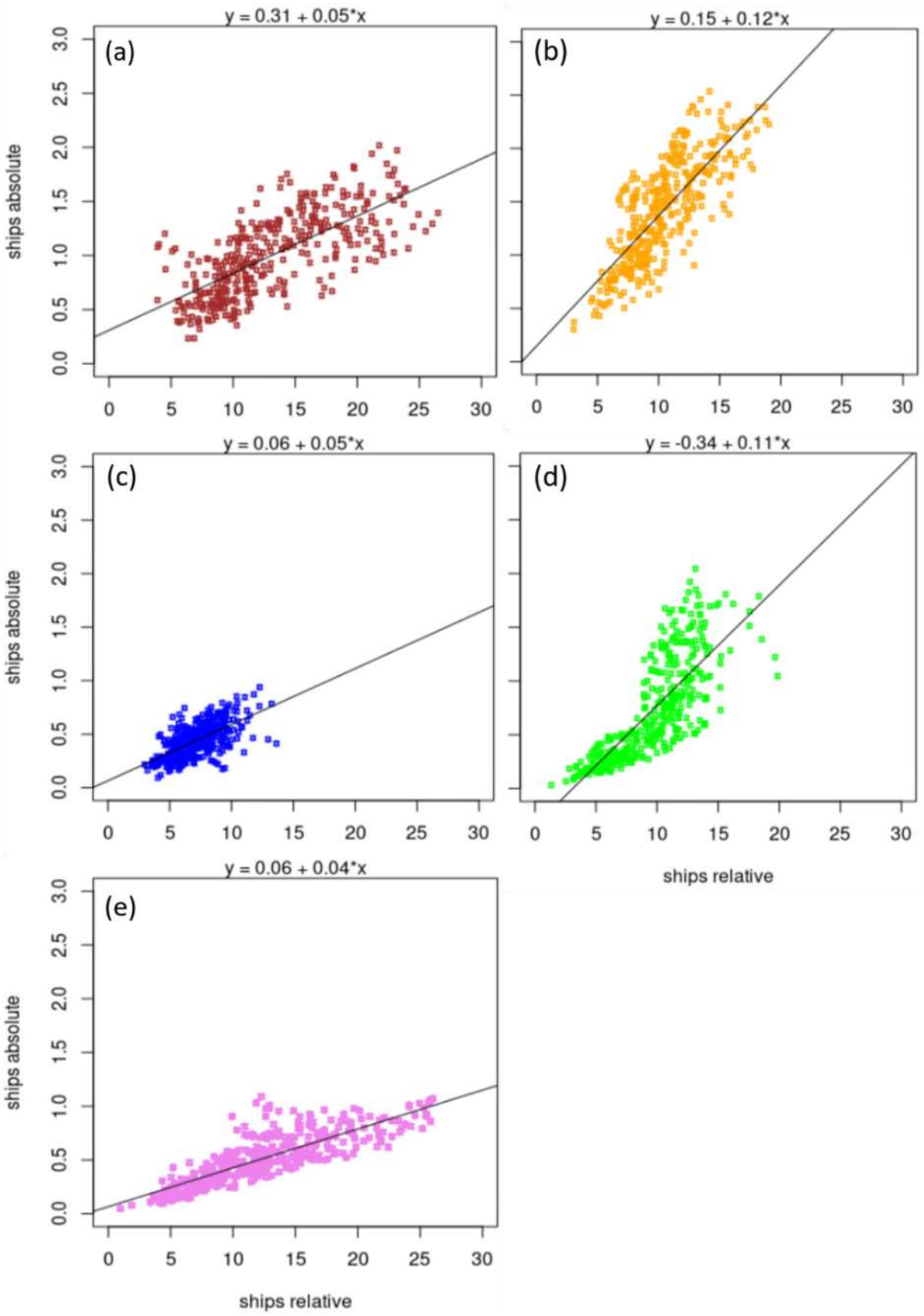

Figure S29: Relative ship impact plotted against absolute potential ship impact. (a) = CAMx, (b) = CHIMERE, (c) = CMAQ, (d) = EMEP, (e) = LOTOS-EUROS.

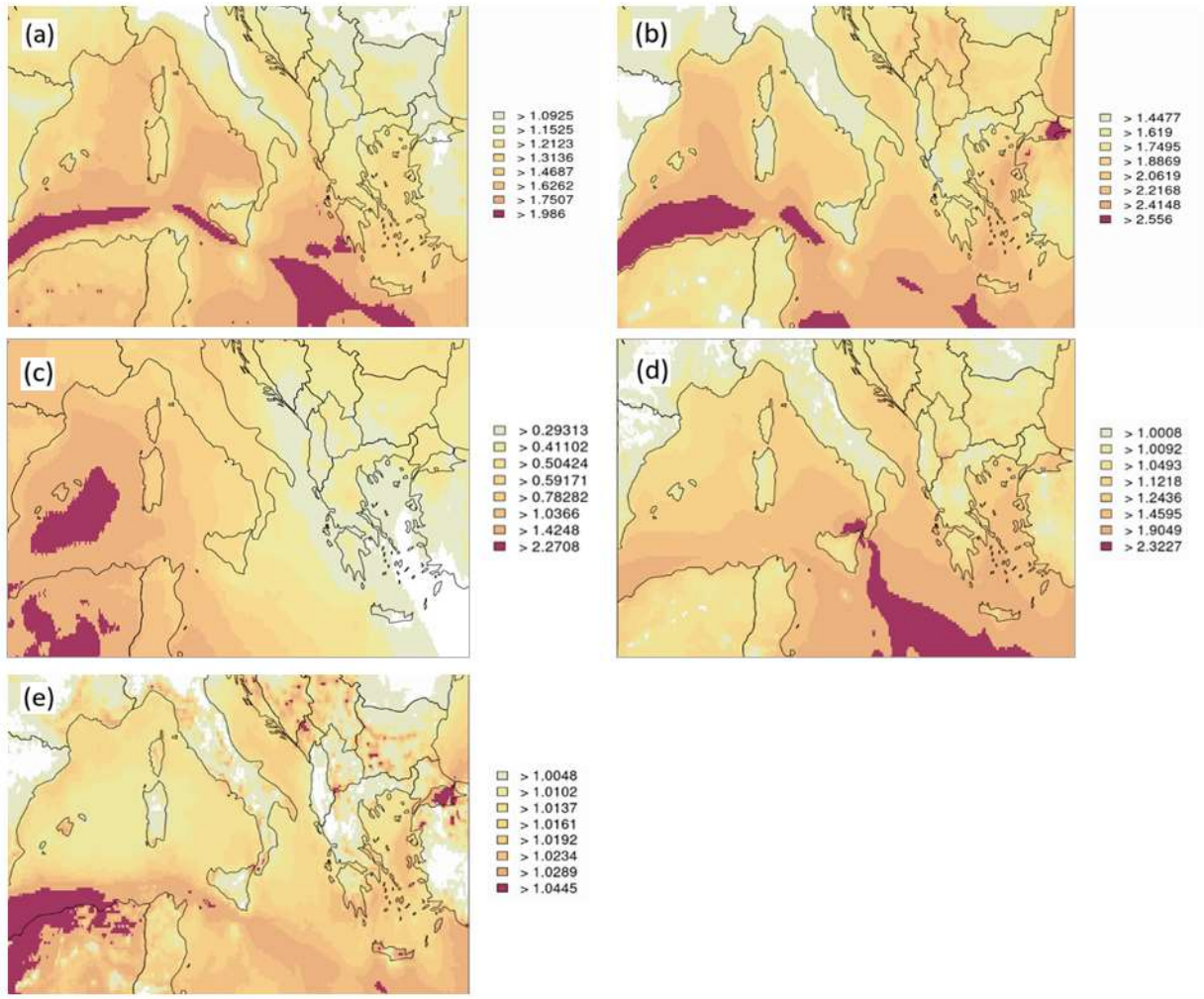

Figure S30: Maps display the ratio ($2*SO_4^{2-} + NO_3^-$):NH_4^+; calculated in mol. (a) = CAMx, (b) = CHIMERE, (c) = CMAQ, (d) = EMEP, (e) = LOTOS-EUROS.

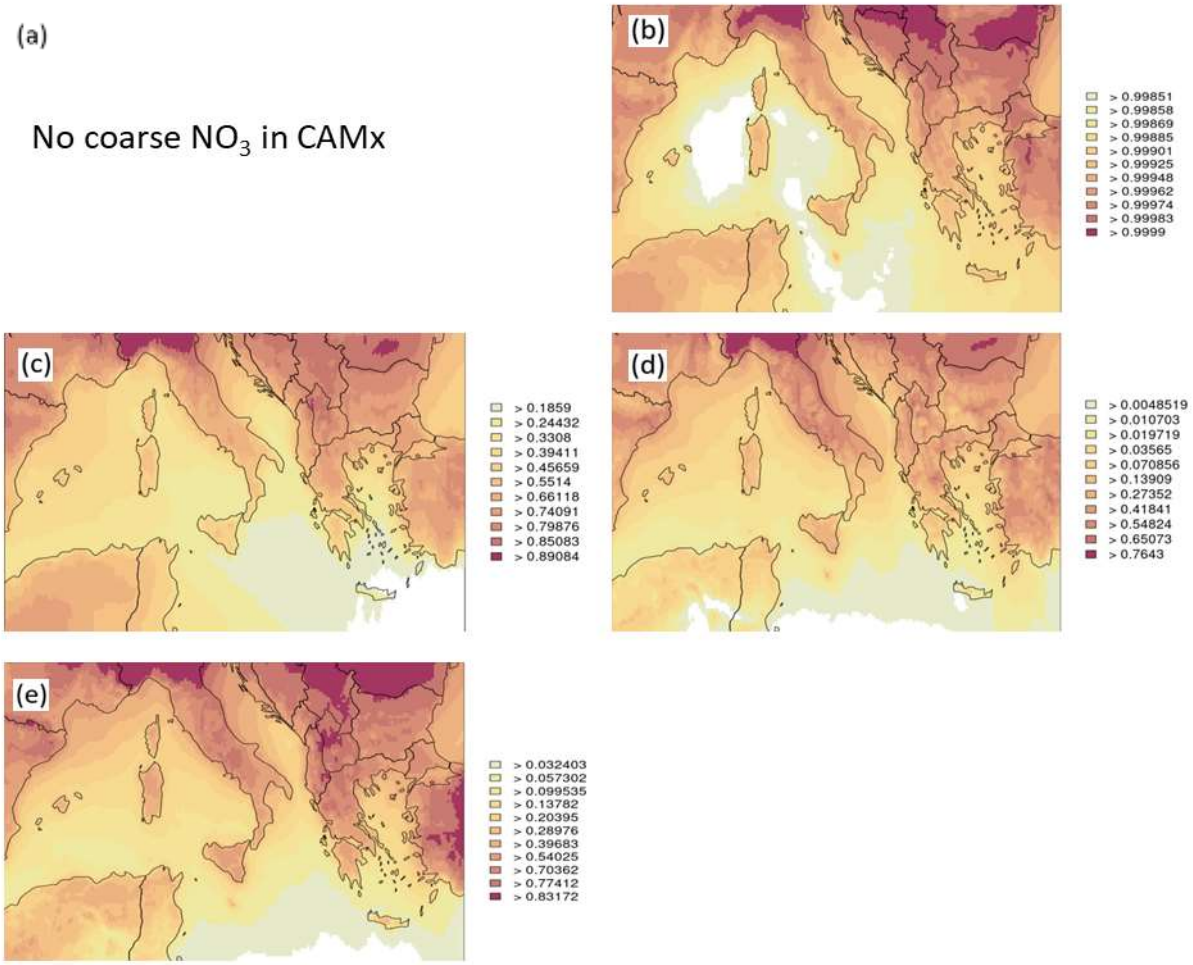

Figure S31: Maps display the ratio for the concentrations (NO_3^- fine):(NO_3^- fine + NO_3^- coarse). (b) = CHIMERE, (c) = CMAQ, (d) = EMEP, (e) = LOTOS-EUROS.

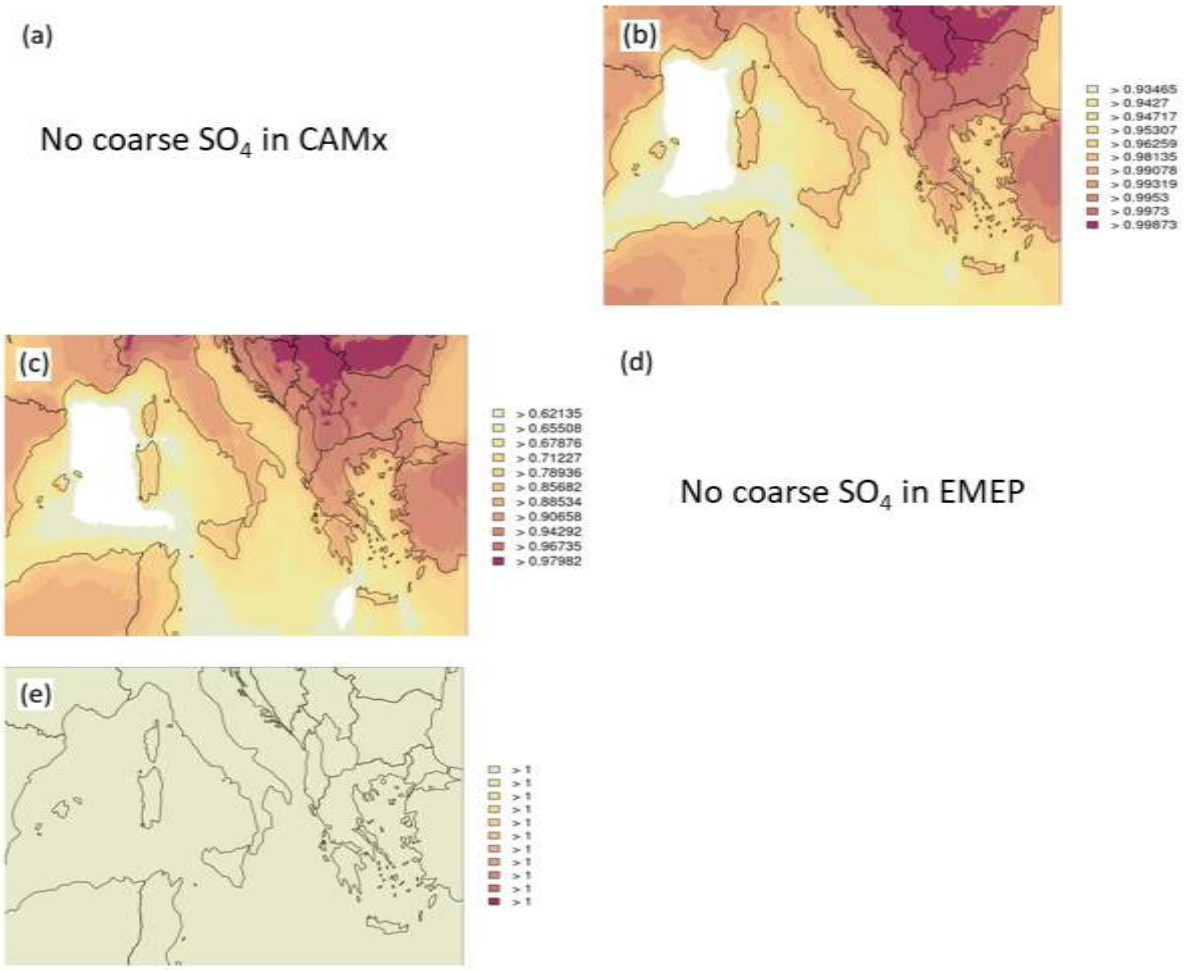

Figure S32: Maps display the ratio for the concentrations (SO_4^{2-} fine):(SO_4^{2-} coarse). (b) = CHIMERE, (c) = CMAQ, (d) = EMEP, (e) = LOTOS-EUROS.