

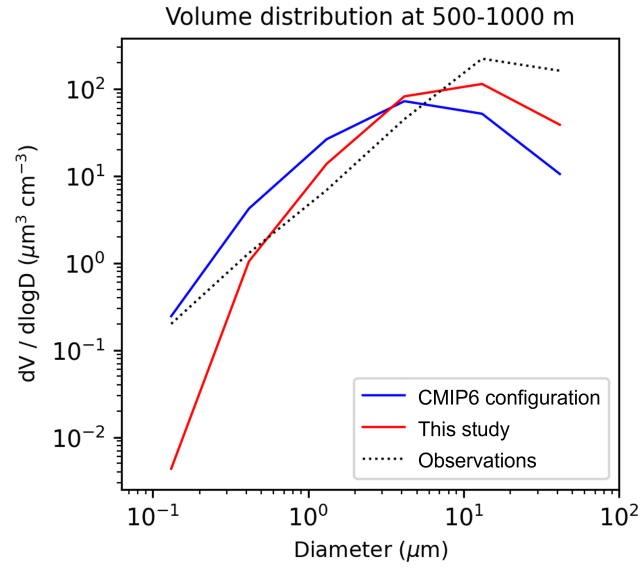


Figure S1: VSD between 500-1000 m altitude at the Sahara for the configuration used in this paper (red), the model tuning used in the HadGEM3-GA7.1 CMIP6 configuration (blue), and the Fennec aircraft observations (black dotted).

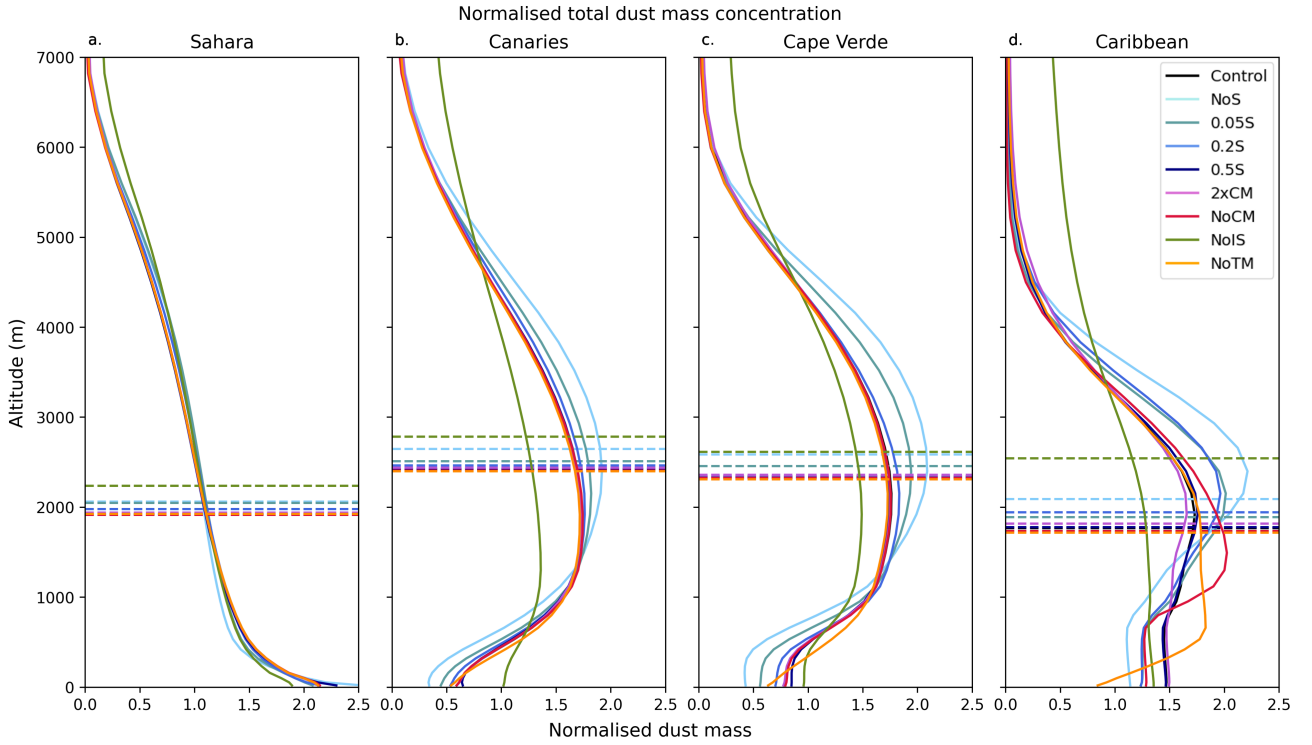


Figure S2: Normalised profile of total dust mass concentration (solid line) and the total dust MCA (dashed line) in all RE off experiments. The profiles are normalised by the mean concentration over the depth of the model atmosphere.

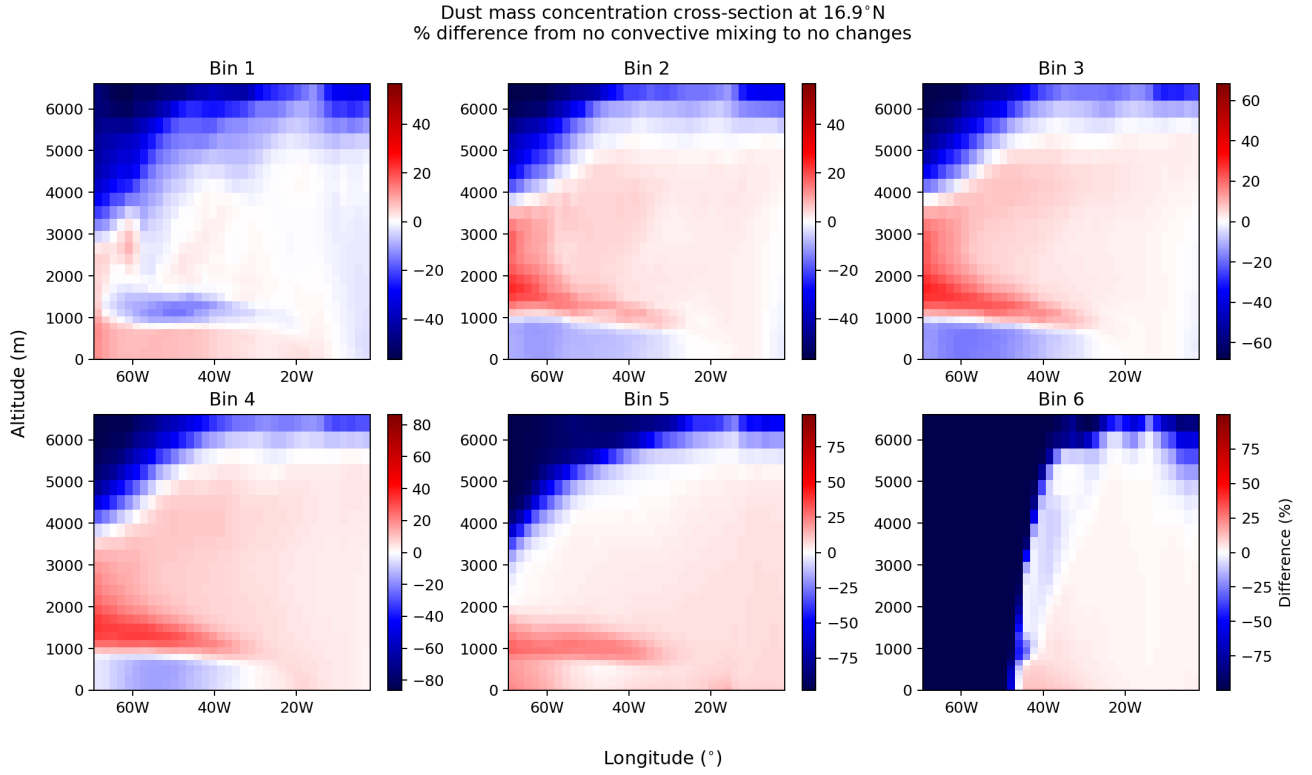


Figure S3: Impact of NoCM experiment: Cross section of percentage difference of the size-resolved mass concentration in the NoCM and Control experiments. At 16.9°N, the cross sections span from 70°W to 0°E, and extend up to 6.5 km. The colour bar scale varies between each plot.

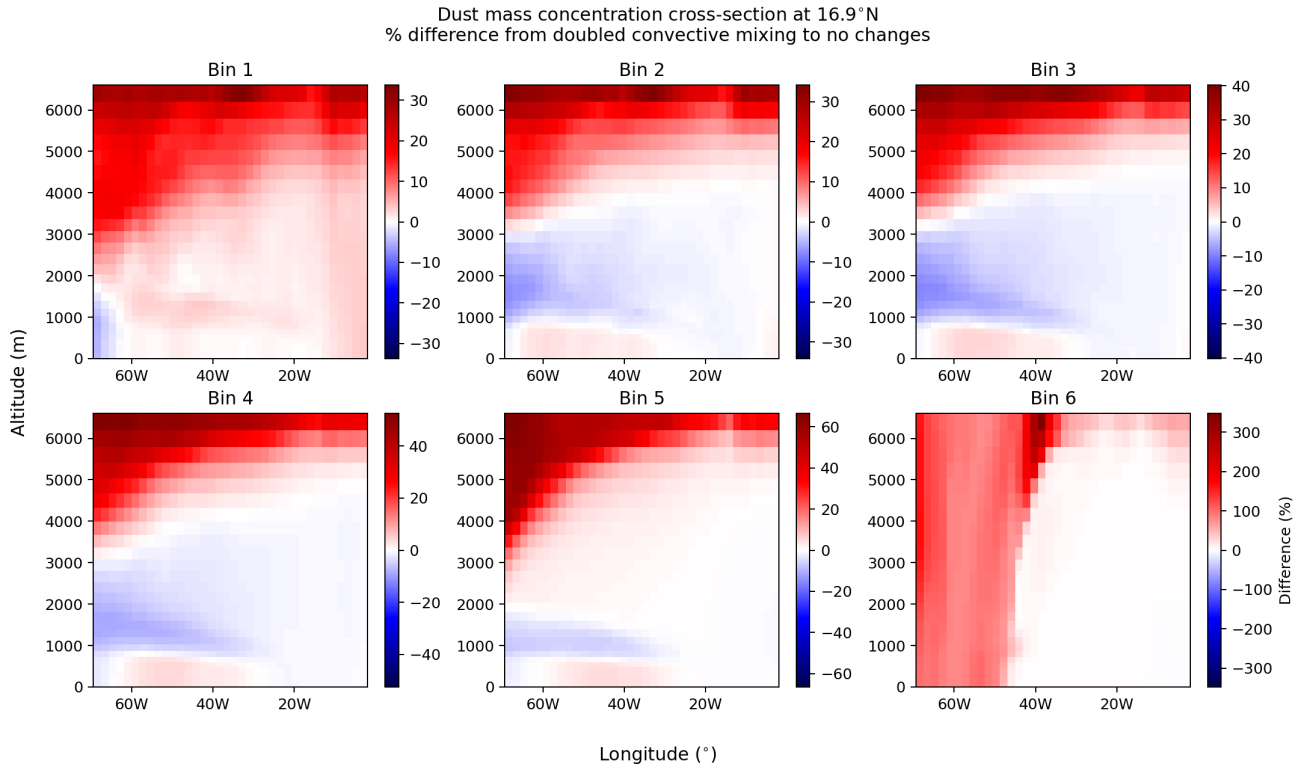


Figure S4: Impact of 2xCM experiment: Cross section of percentage difference of the size-resolved mass concentration in the 2xCM and Control experiments. At 16.9°N, the cross sections span from 70°W to 0°E, and extend up to 6.5 km. The colour bar scale varies between each plot.

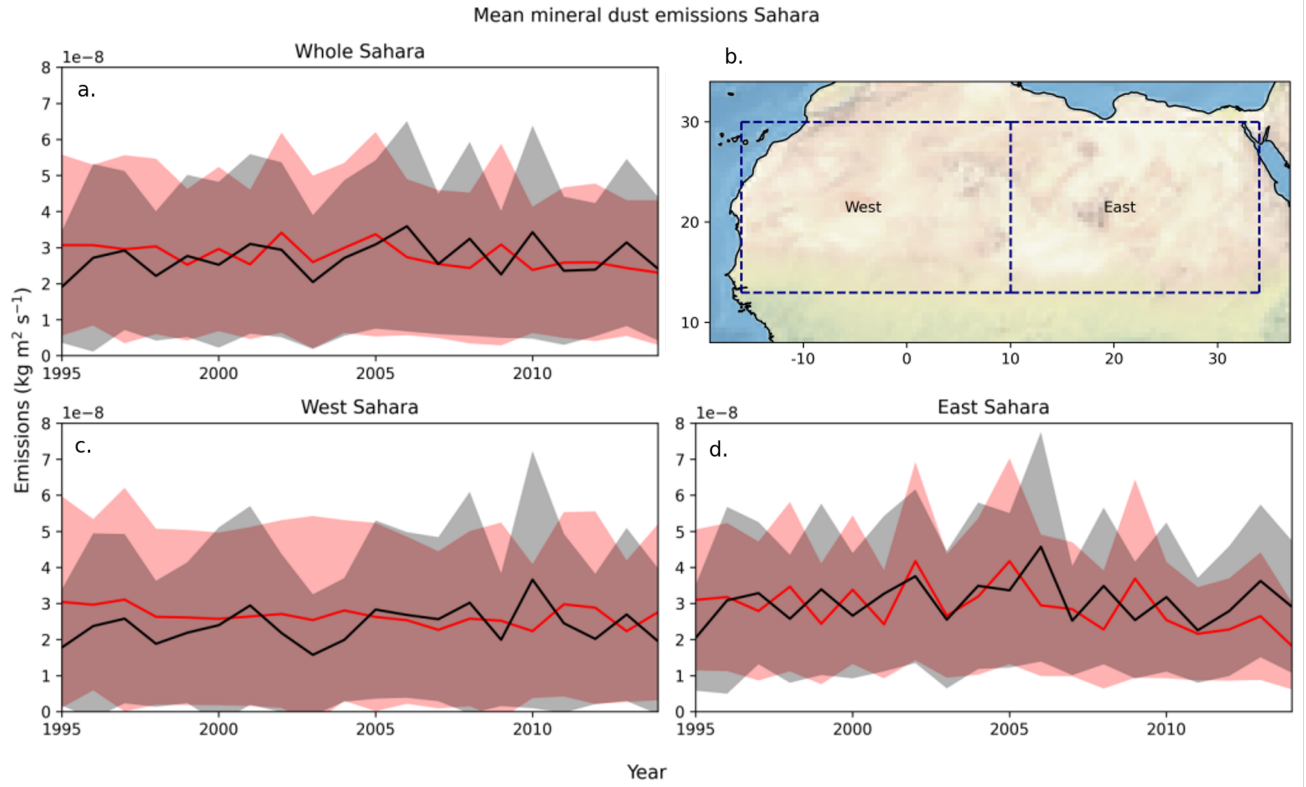


Figure S5: Mean dust emissions in REControl (black) and 3xSW (red) across three regions shown by the box regions in b); the whole Sahara (a; east and west), west Sahara (c), and east Sahara (d). The standard deviation is shown by the shading.

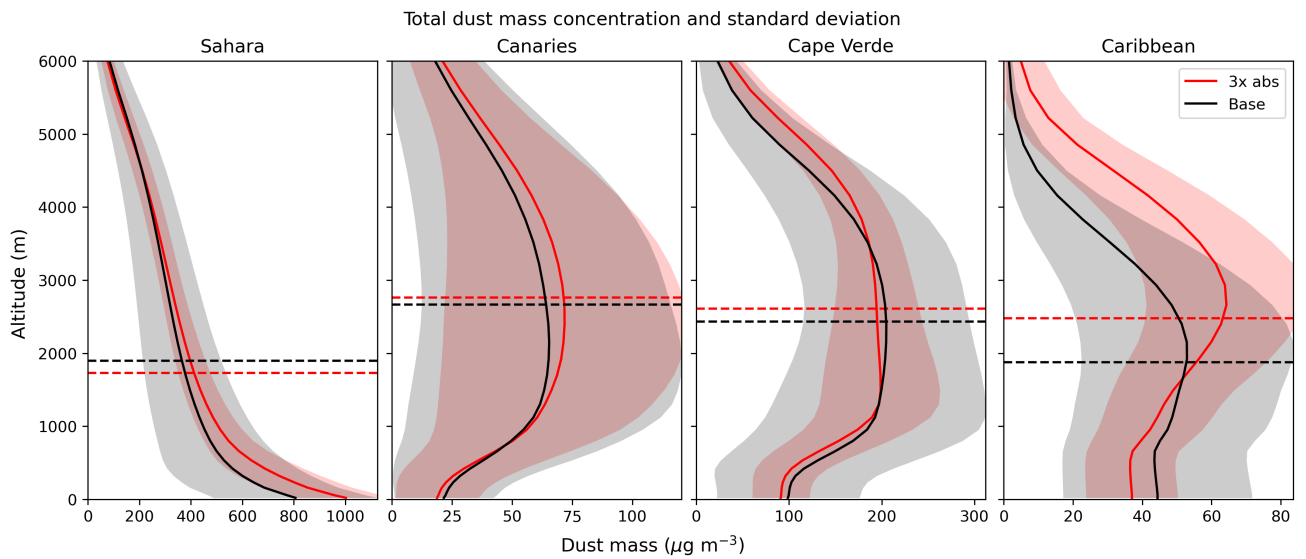


Figure S6: Mean total dust mass concentration profiles at the Sahara, Canaries, Cape Verde, and Caribbean in the REcontrol (black) and 3xSW (red). The shading shows the standard deviation. The dashed lines represent the MCA of the experiments throughout the depth of the model atmosphere.

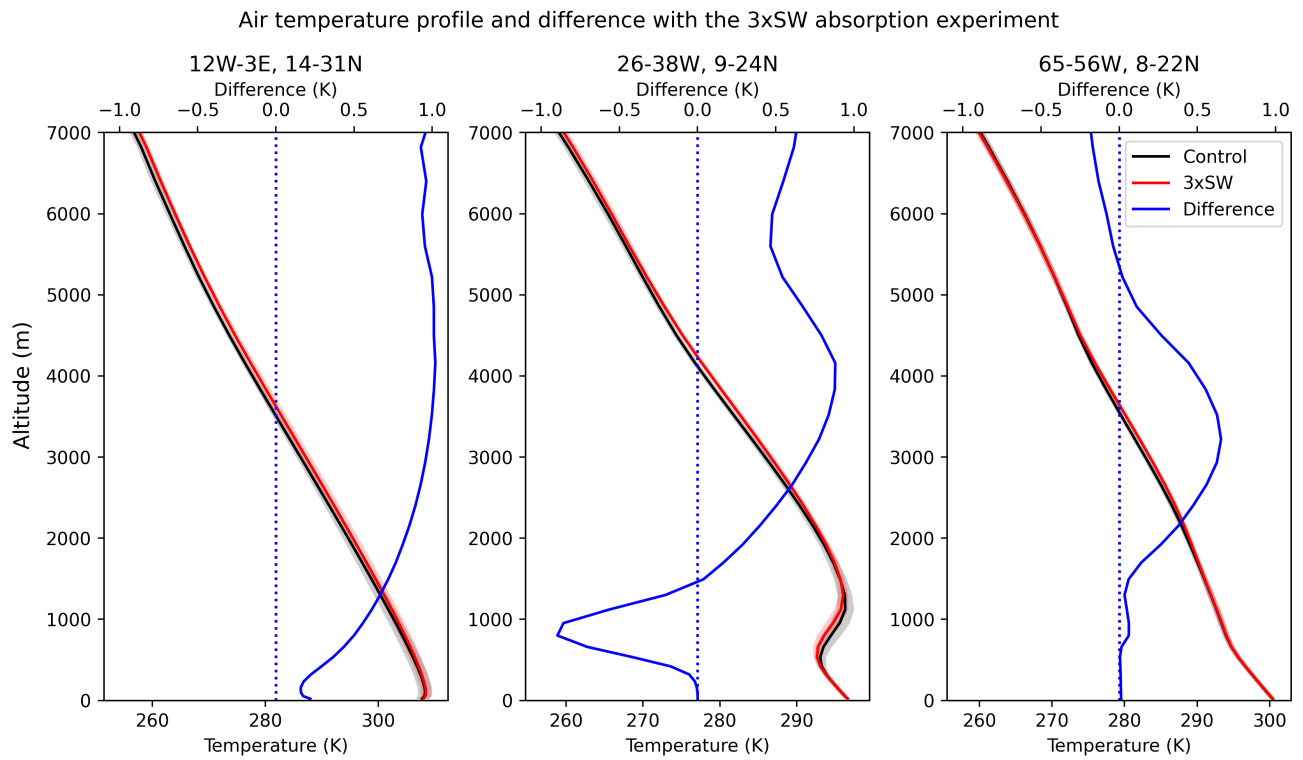


Figure S7: Mean air temperature (in K) profiles at the west Sahara, mid-east Atlantic, and Caribbean in the REcontrol (black) and 3xSW (red) on the lower x-axis, with the difference shown in blue (in K) on the upper x-axis. The vertical dotted line represents no difference between the two profiles.