

Supplementary material

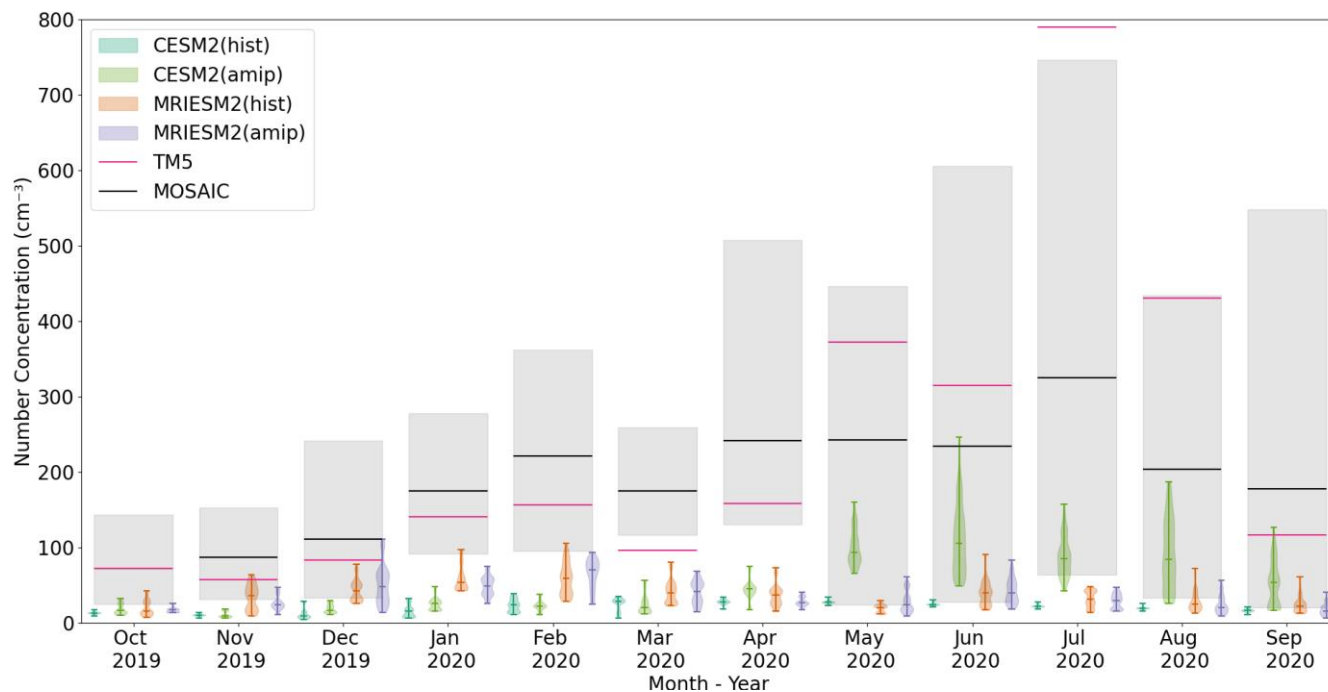
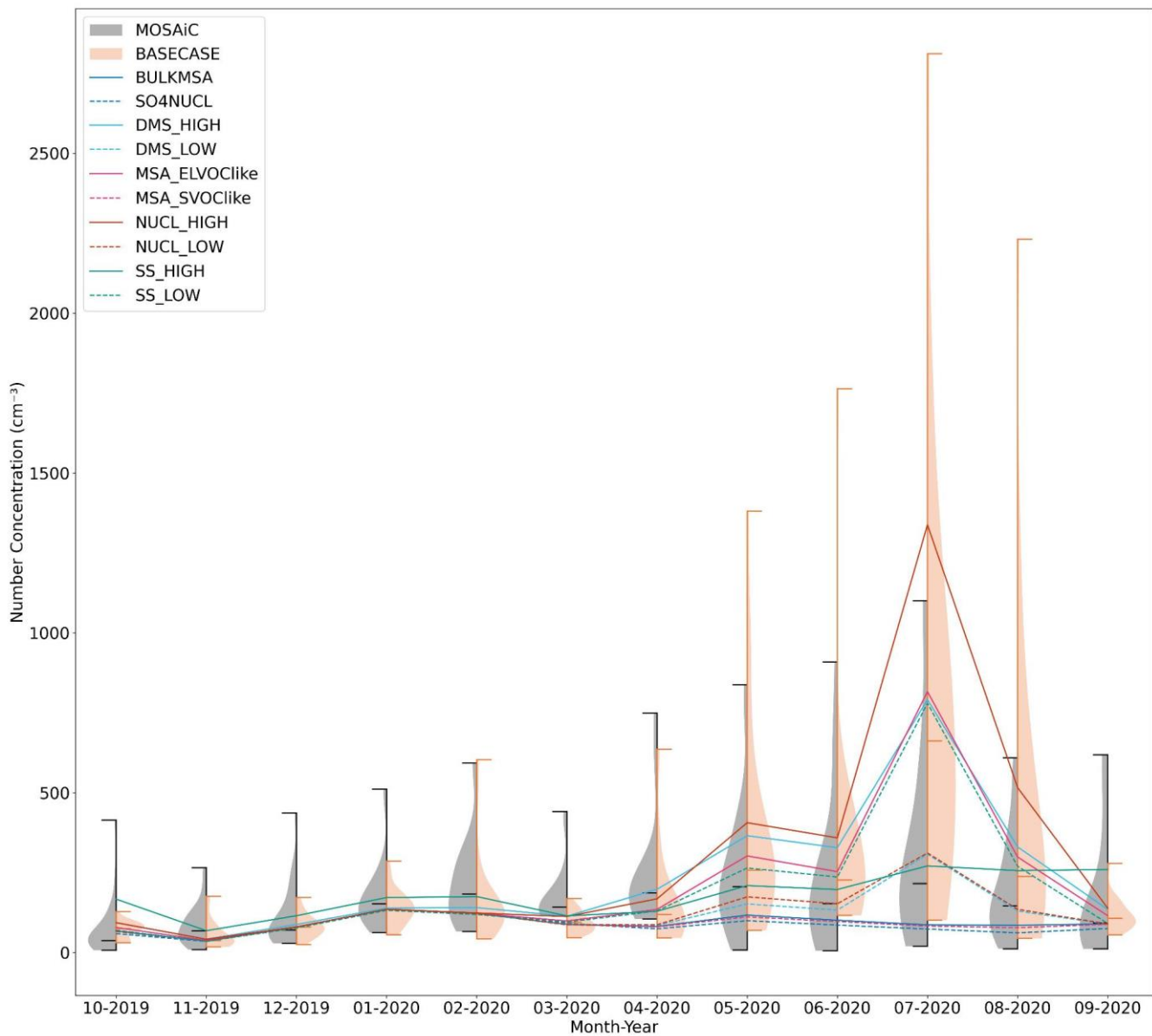
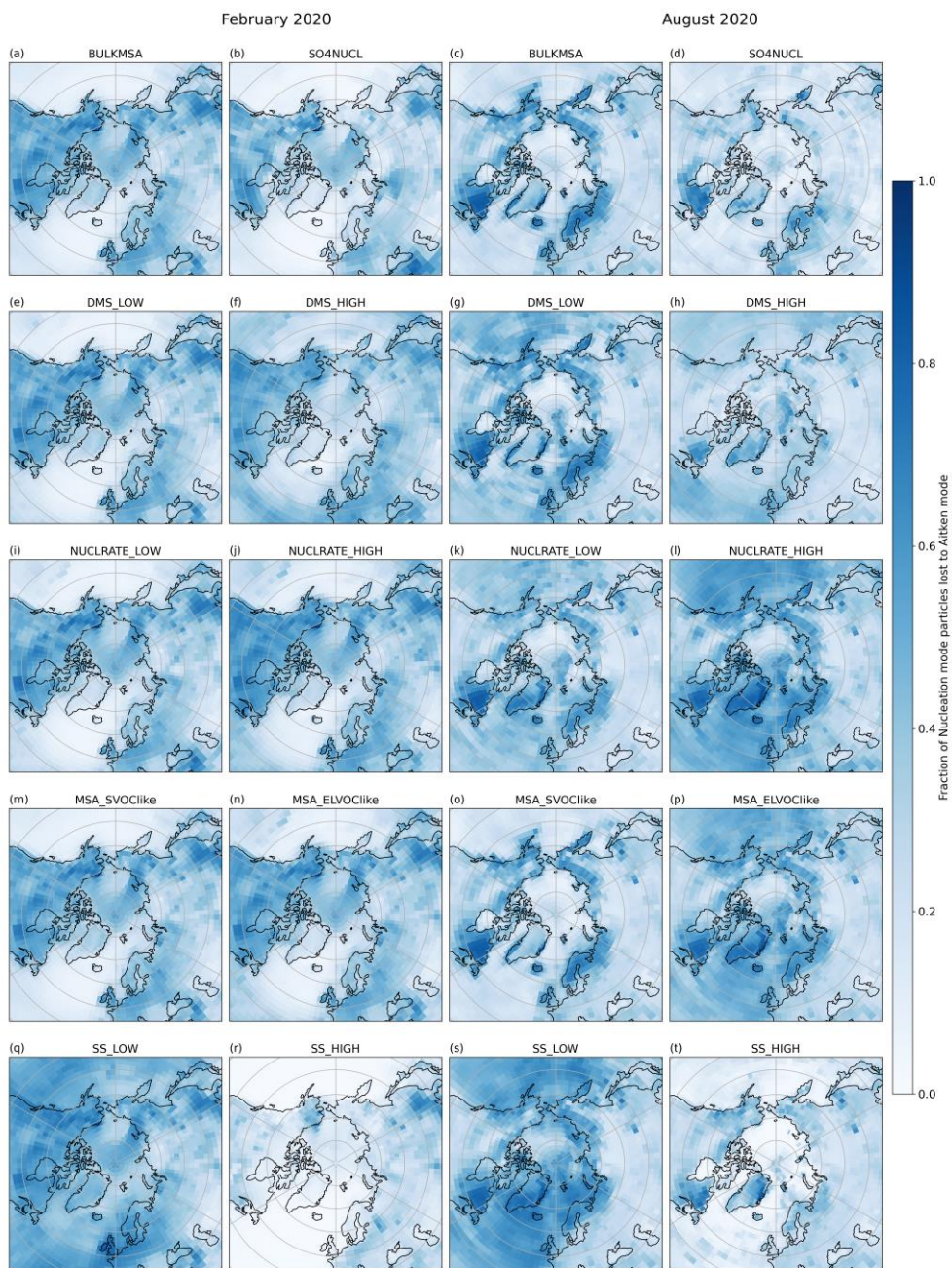


Fig S1: Aerosol number concentration value comparison between *AMIP* and *historical* experiments in CMIP6 models along the MOSAiC track, TM5 modelled values and measured values during the expedition



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Fig S2: Violin plot of the daily average CN from the MOSAiC expedition and the simulation, BASECASE, along the MOSAiC track. MOSAiC and BASECASE values are plotted as the left and right half violin, respectively, with the shaded area showing the probability density function of the CN values. The horizontal lines at the top and bottom of the violins represent the maximum and minimum, and the line in the middle is the median. The 11 simulations run for this study are shown as line plots, with the point corresponding to each month representing the median value for the month.



15 **Fig S3: Spatial plot of the fraction of particles in Nucleation mode that are lost to Aitken mode. The values could represent the strength of the condensation and coagulation sink present. The first two columns show the different experiments for February 2020, and the next two columns show the different experiments for August 2020**

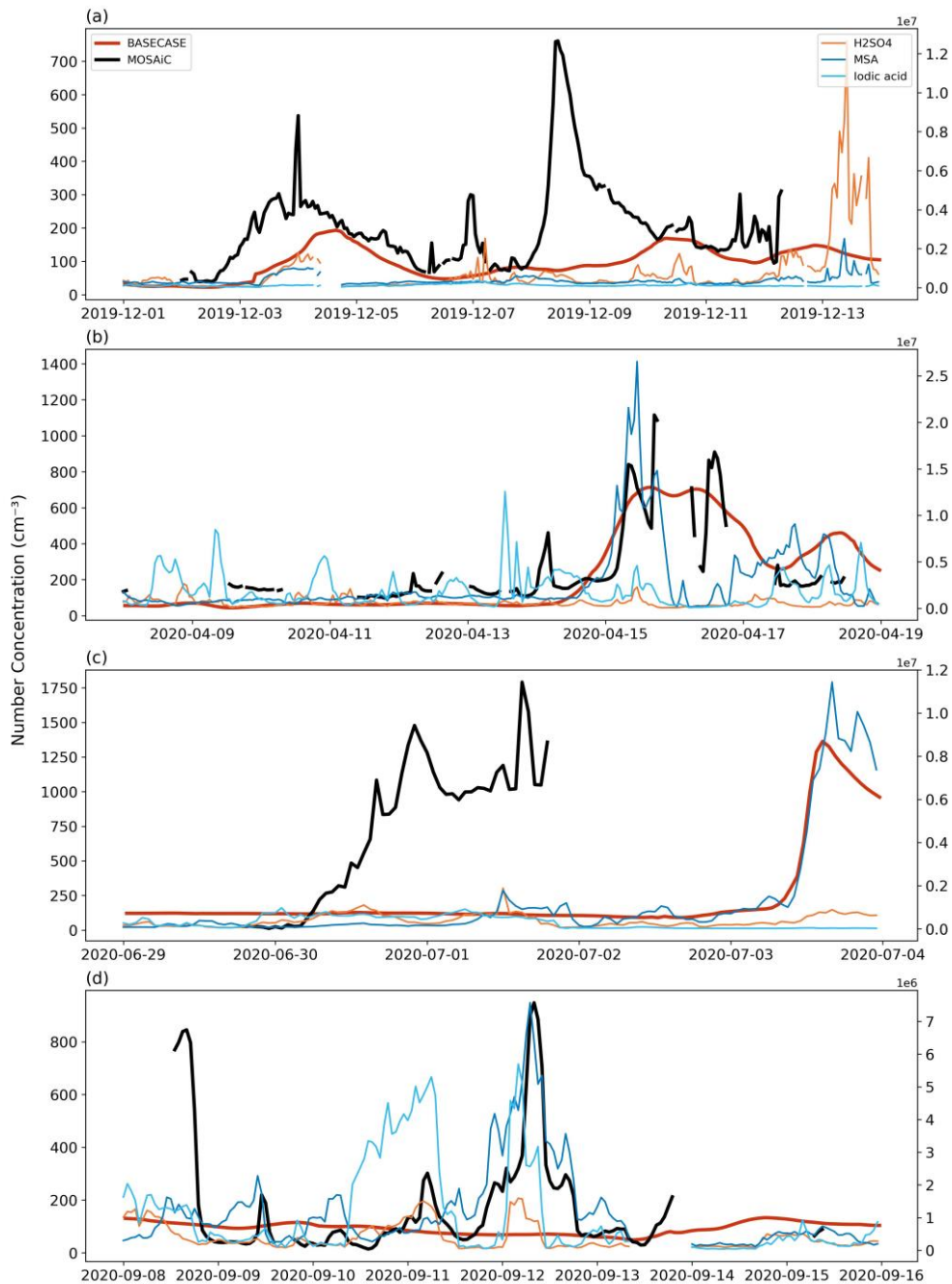


Fig S4: CN values plotted for the BASECASE simulation and the MOSAiC expedition for 4 aerosol events that occurred during the MOSAiC expedition. Concentration of aerosol precursor vapours are also plotted on the same time scale and the value axis on the right. The four events are from four different seasons: (a) winter (1 December

20 2019 - 14 December 2019), (b) spring (8 April 2020 - 19 April 2020), (c) summer (29 June 2020 - 4 July 2020) and (d) autumn (8 September 2020 - 16 September 2020).