Supplement of Atmos. Chem. Phys., 24, 9323–9338, 2024
https://doi.org/10.5194/acp-24-9323-2024-supplement

Supplement of

On the sensitivity of aerosol–cloud interactions to changes in sea surface temperature in radiative–convective equilibrium

Suf Lorian and Guy Dagan

Correspondence to: Guy Dagan (guy.dagan@mail.huji.ac.il)

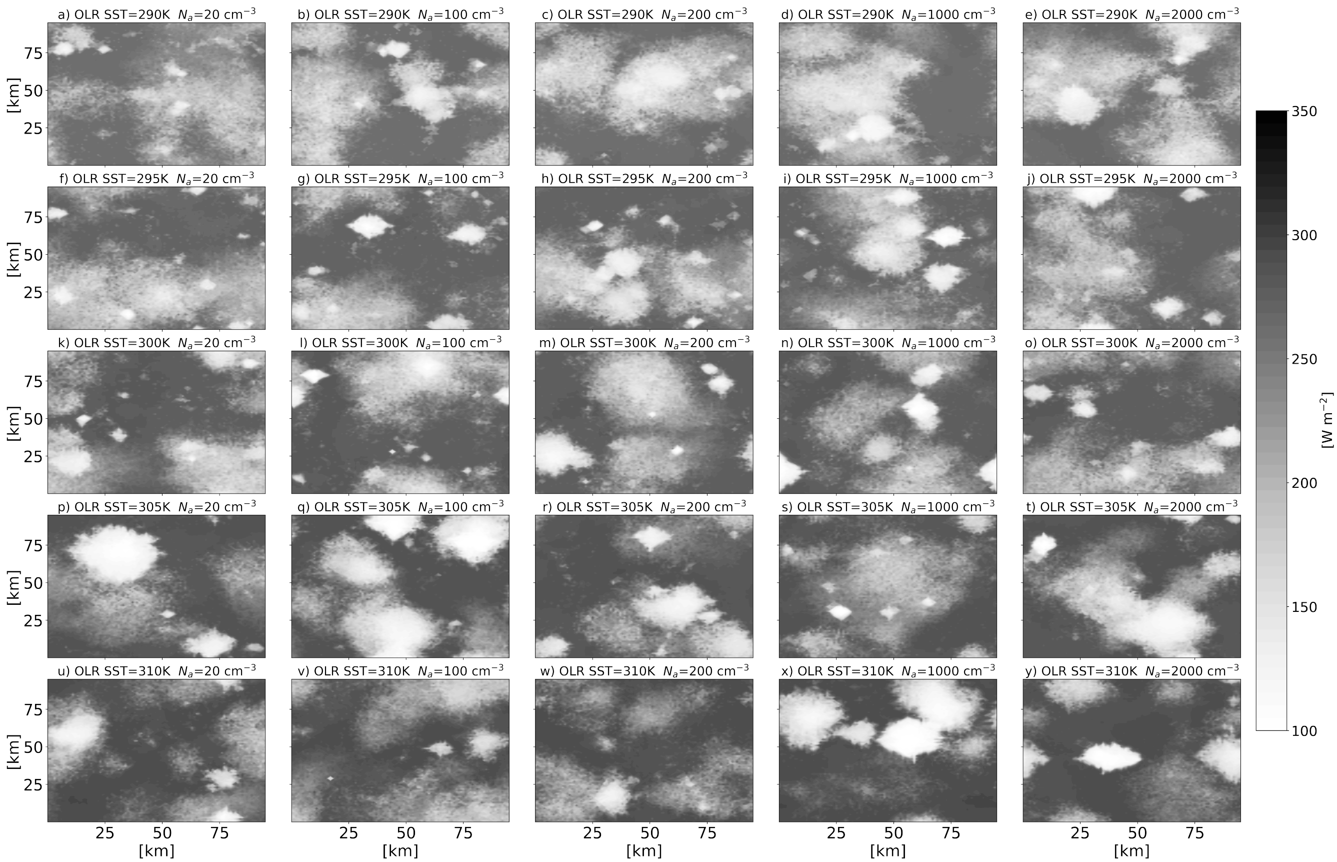

Figure S1. Snapshots of the outgoing longwave radiation (OLR) of the different simulations.

Table S1. Cloud regime's liquid water path ($\mathcal{L}$) and ice water path ($\mathcal{I}$) boundaries.

Cloud regime	$\mathcal{L}$ [g m^{-2}]	$\mathcal{I}$ [g m^{-2}]
No clouds	$0<\mathcal{L}<1$	$0<\mathcal{I}<1$
1) Thick ice	$0<\mathcal{L}<1$	$16<\mathcal{I}$
2) Thin ice	$0<\mathcal{L}<1$	$1<\mathcal{I}<16$
3) Shallow	$1<\mathcal{L}$	$0<\mathcal{I}<16$
4) Deep	$1<\mathcal{L}$	$16<\mathcal{I}$

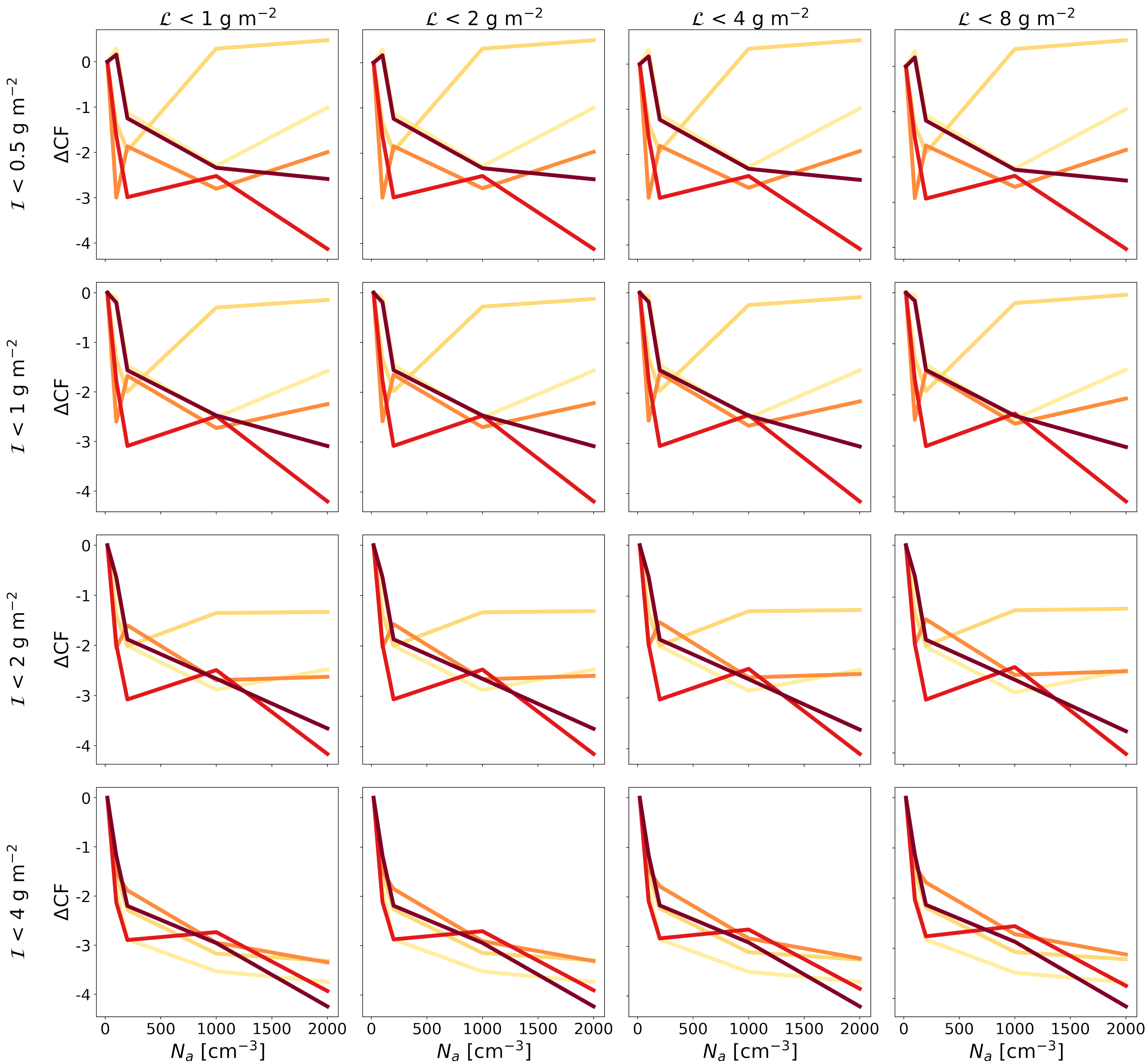

Figure S2. The response of domain and time mean cloud fraction (CF) to an increase in N_a. The values are presented relative to the cleanest run (N_a = 20 cm^{-3}) for each SST, as indicated by the Δ sign. Four different limits of liquid water path ($\mathcal{L}$) and ice water path ($\mathcal{I}$) are considered for the "No clouds" regime to examine its sensitivity.

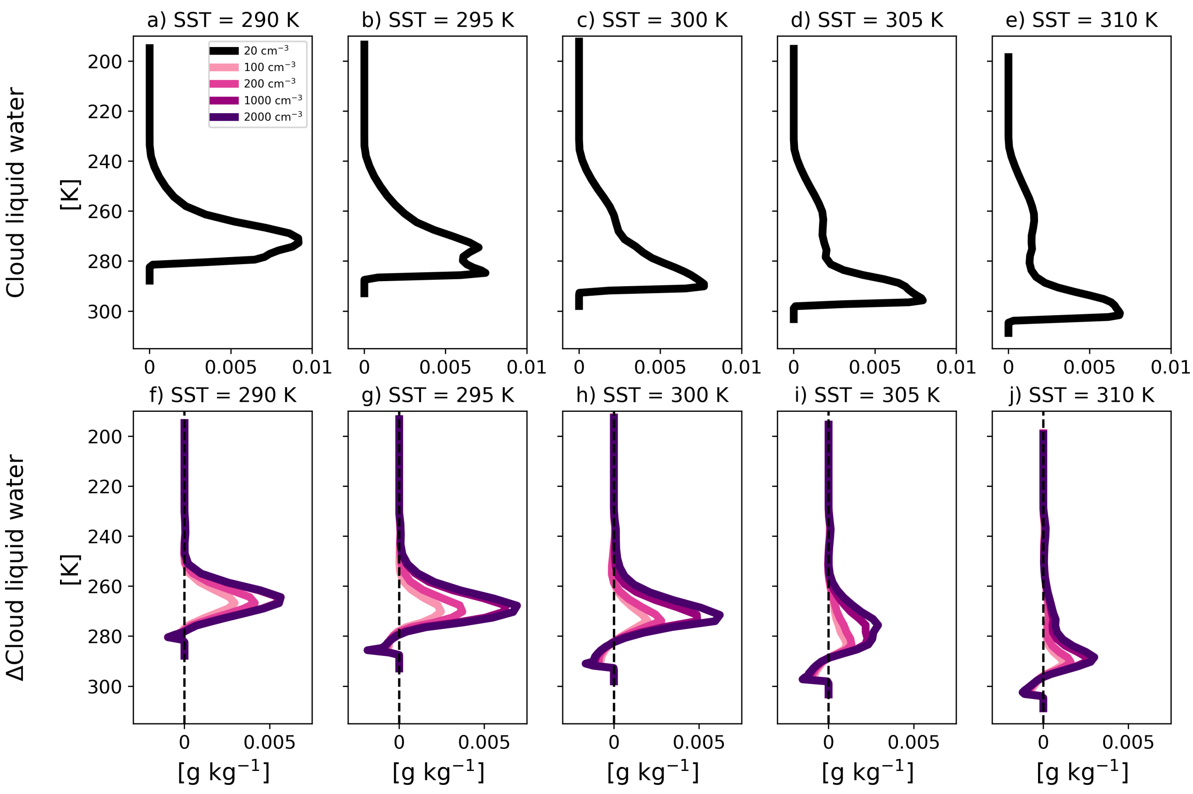

Figure S3. Domain and time mean vertical profiles of cloud liquid water for the cleanest run for each SST (N_a = 20 cm^{-3}; **a**-**e**), and its response to an increase in N_a relative to the cleanest run for each SST (**f**-**j**).

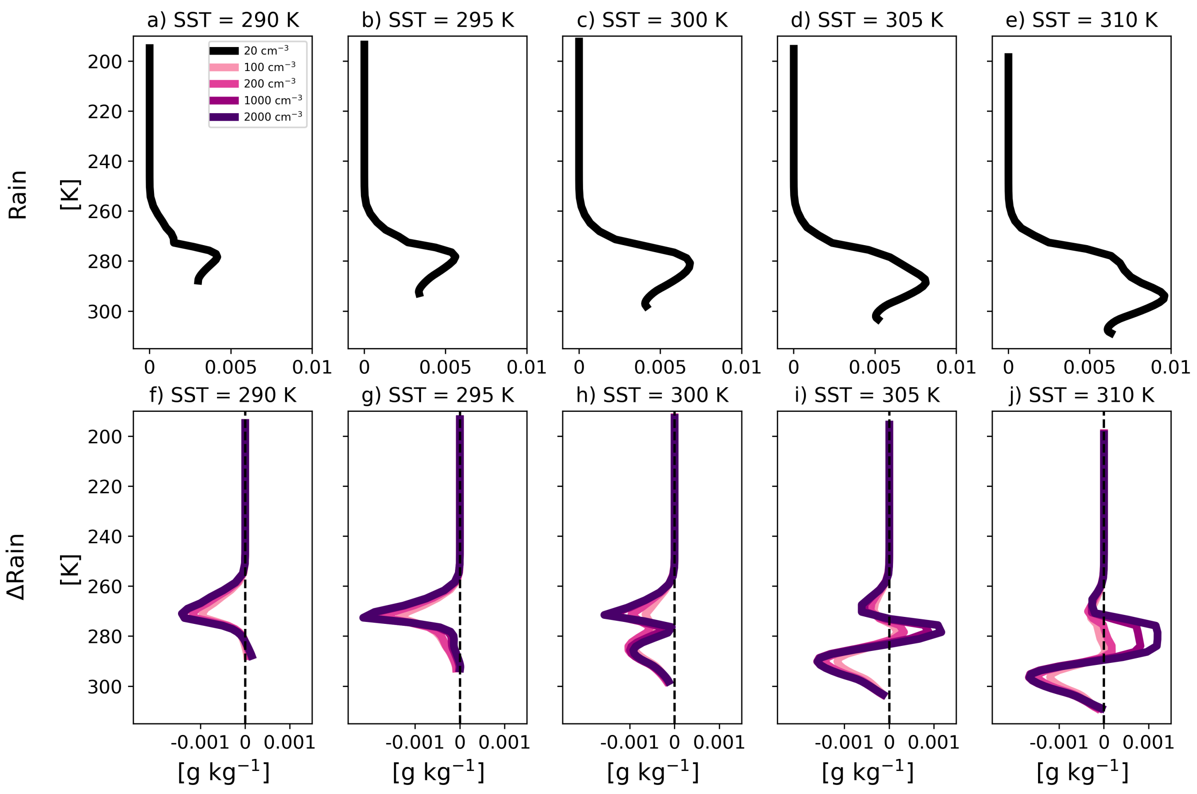

Figure S4. Domain and time mean vertical profiles of rain for the cleanest run for each SST (N_a = 20 cm^{-3}; **a-e**), and its response to an increase in N_a relative to the cleanest run for each SST (**f-j**).

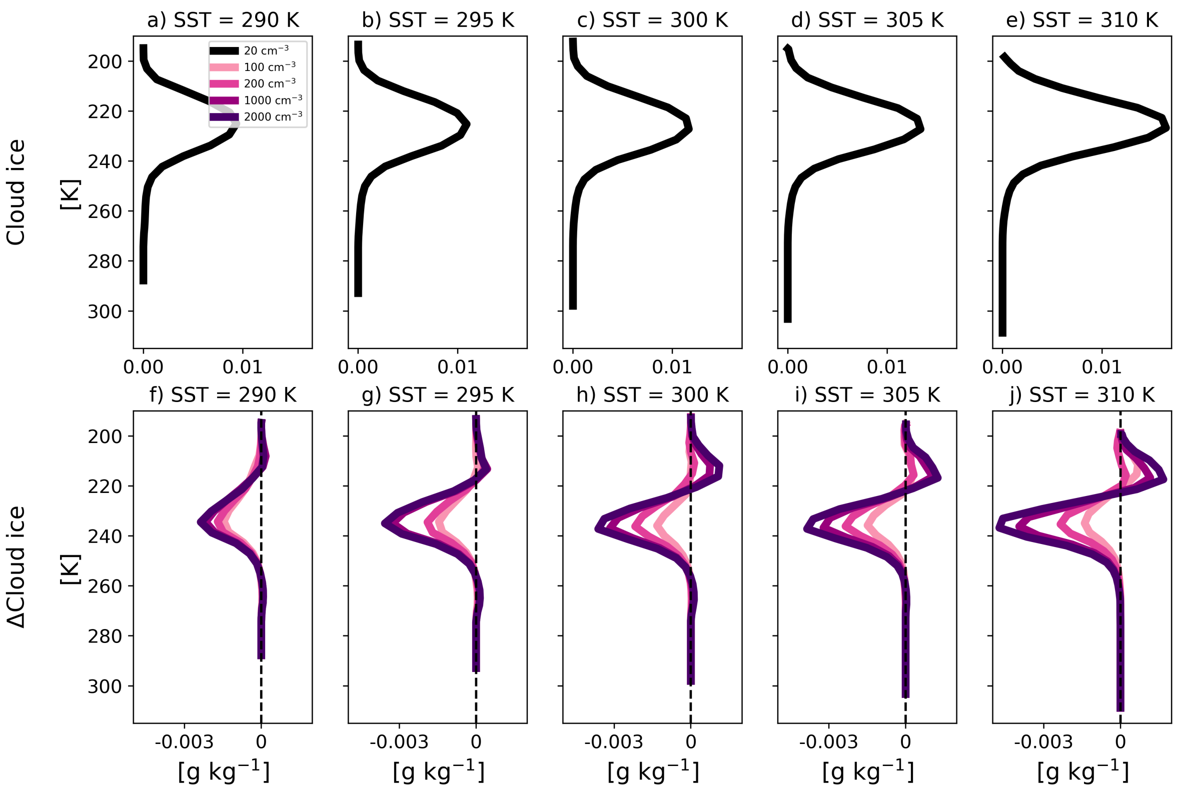

Figure S5. Domain and time mean vertical profiles of cloud ice for the cleanest run for each SST (N_a = 20 cm^{-3}; **a**-**e**), and its response to an increase in N_a relative to the cleanest run for each SST (**f**-**j**).

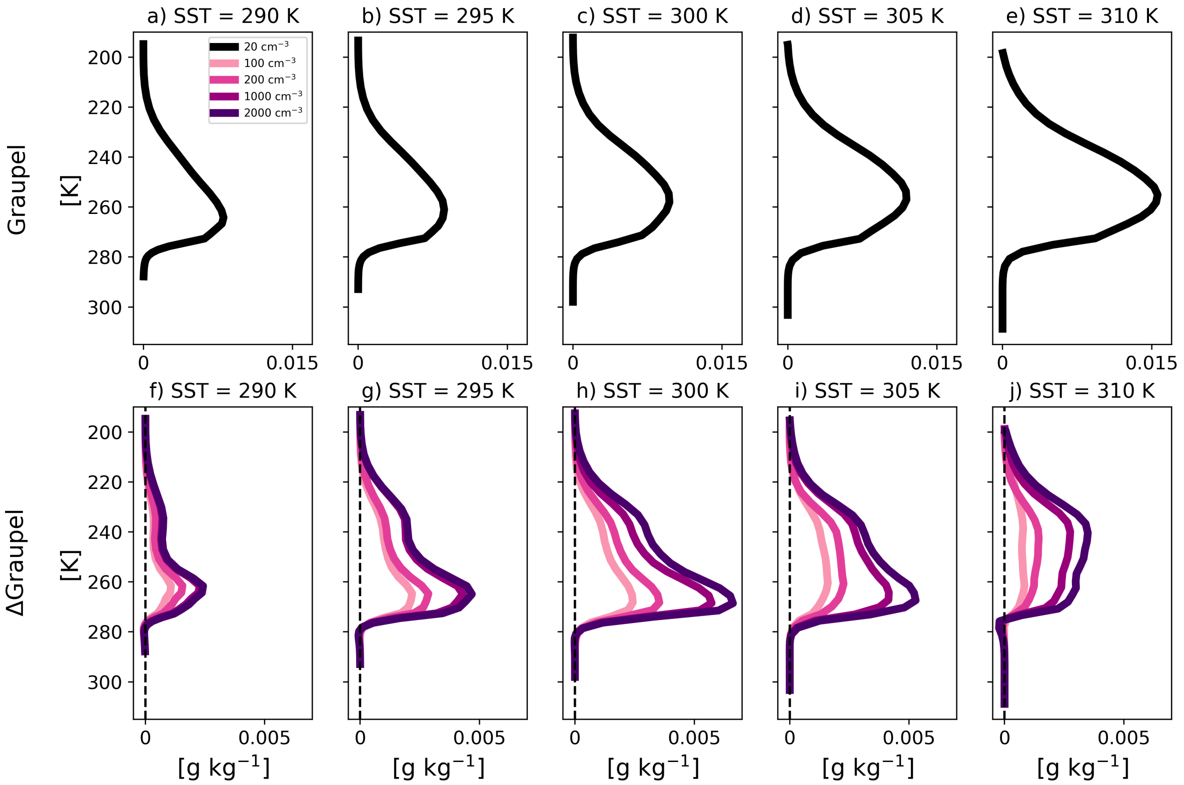

Figure S6. Domain and time mean vertical profiles of graupel for the cleanest run for each SST (N_a = 20 cm^{-3}; **a**-**e**), and its response to an increase in N_a relative to the cleanest run for each SST (**f**-**j**).

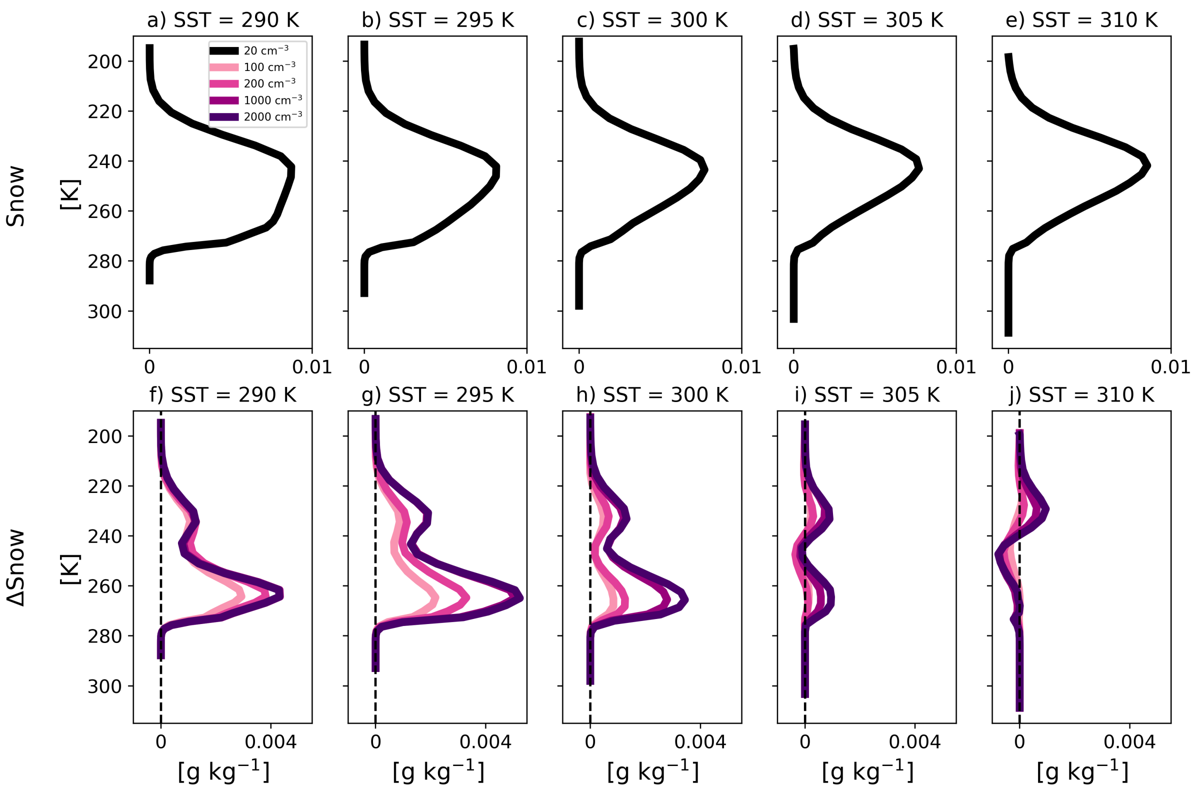

Figure S7. Domain and time mean vertical profiles of snow for the cleanest run for each SST (N_a = 20 cm^{-3}; **a**-**e**), and its response to an increase in N_a relative to the cleanest run for each SST (**f**-**j**).

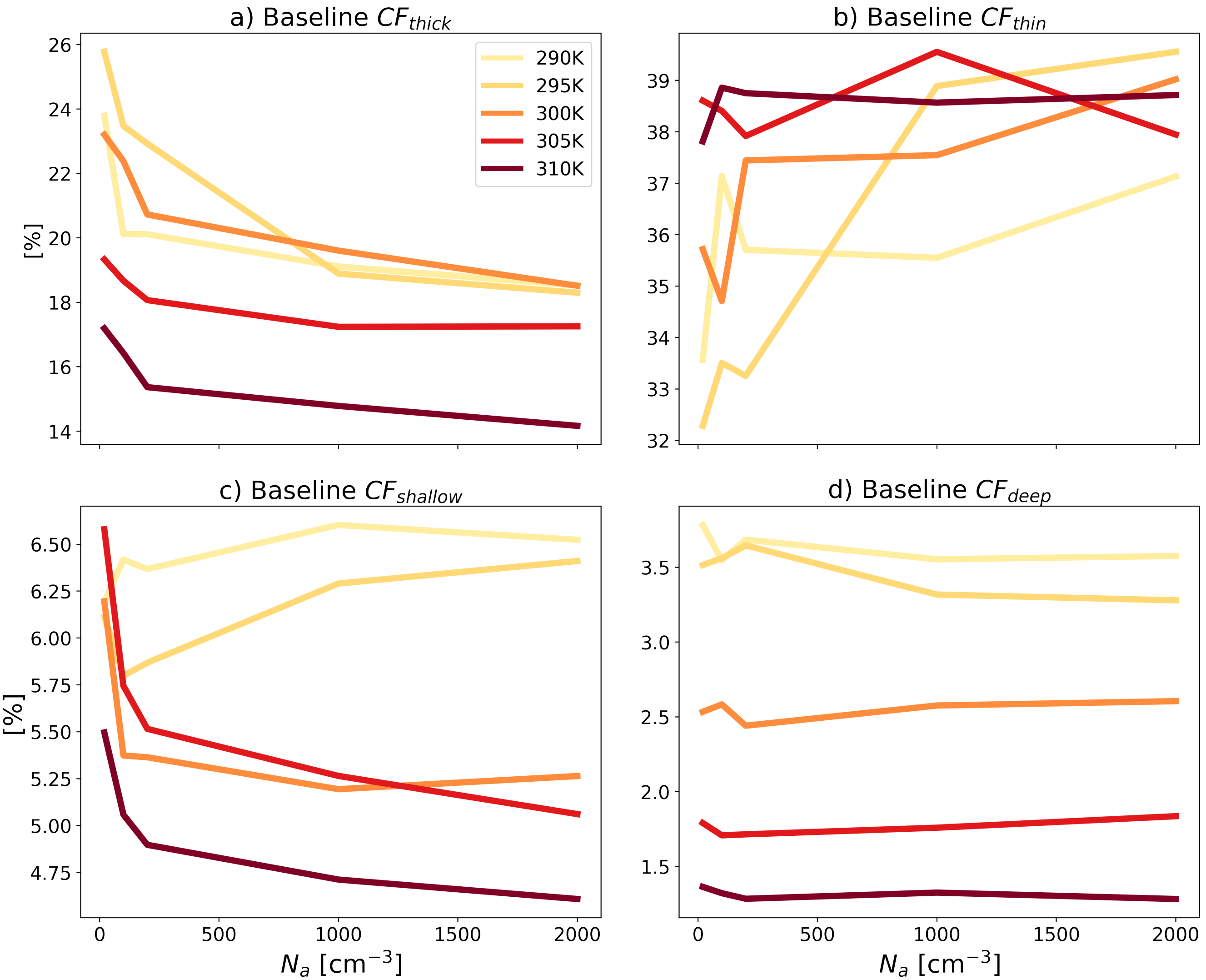

Figure S8. Changes in domain and time mean cloud fraction of thick ice (CF_{thick}; **a**), thin ice (CF_{thin}; **b**), shallow ($CF_{shallow}$; **c**) and deep convective clouds (CF_{deep}; **d**) due to an increase in N_a, for each SST.

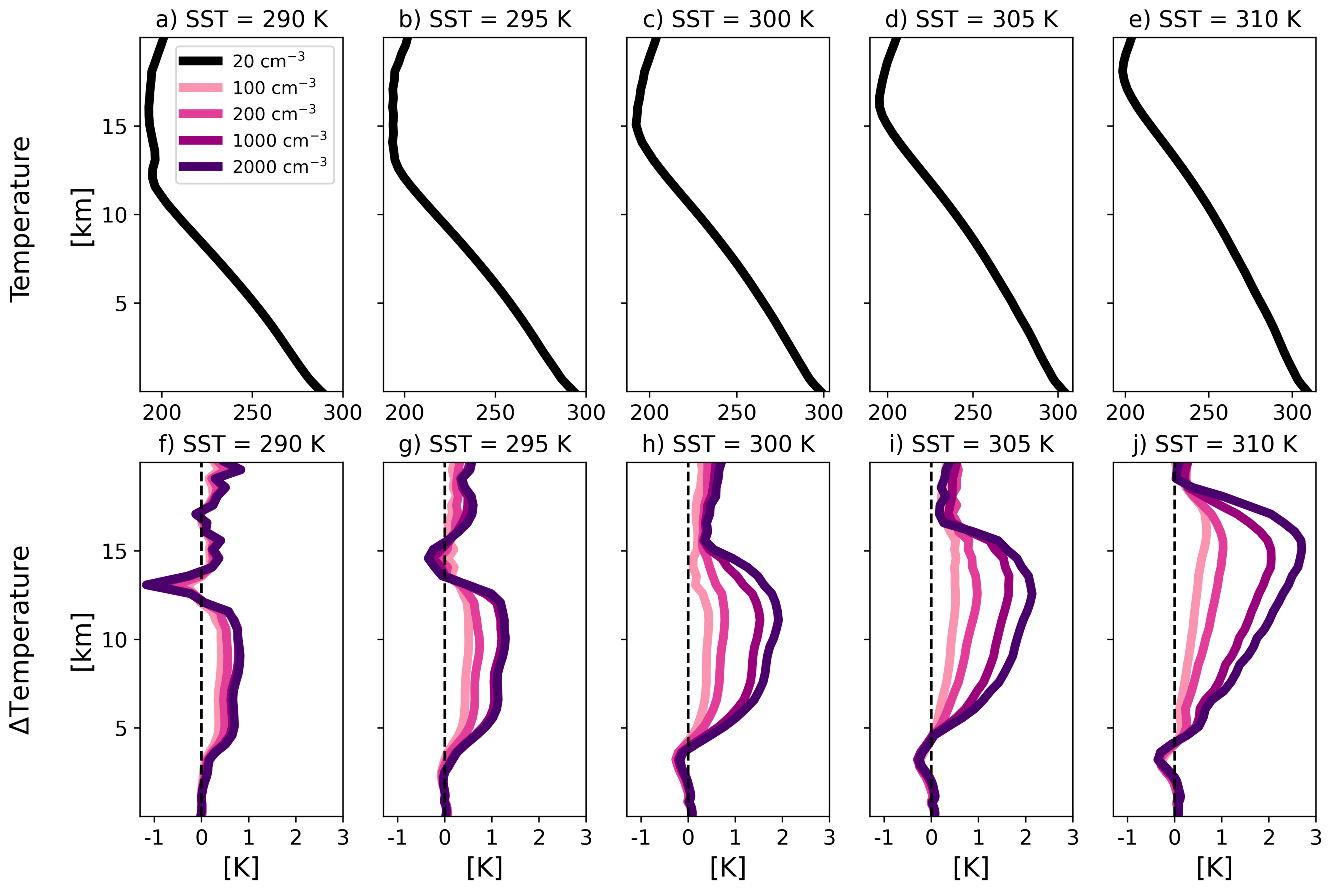

Figure S9. Domain and time mean vertical profiles of temperature for the cleanest run for each SST (N_a = 20 cm^{-3}; **a**-**e**), and its response to an increase in N_a relative to the cleanest run for each SST (**f**-**j**).

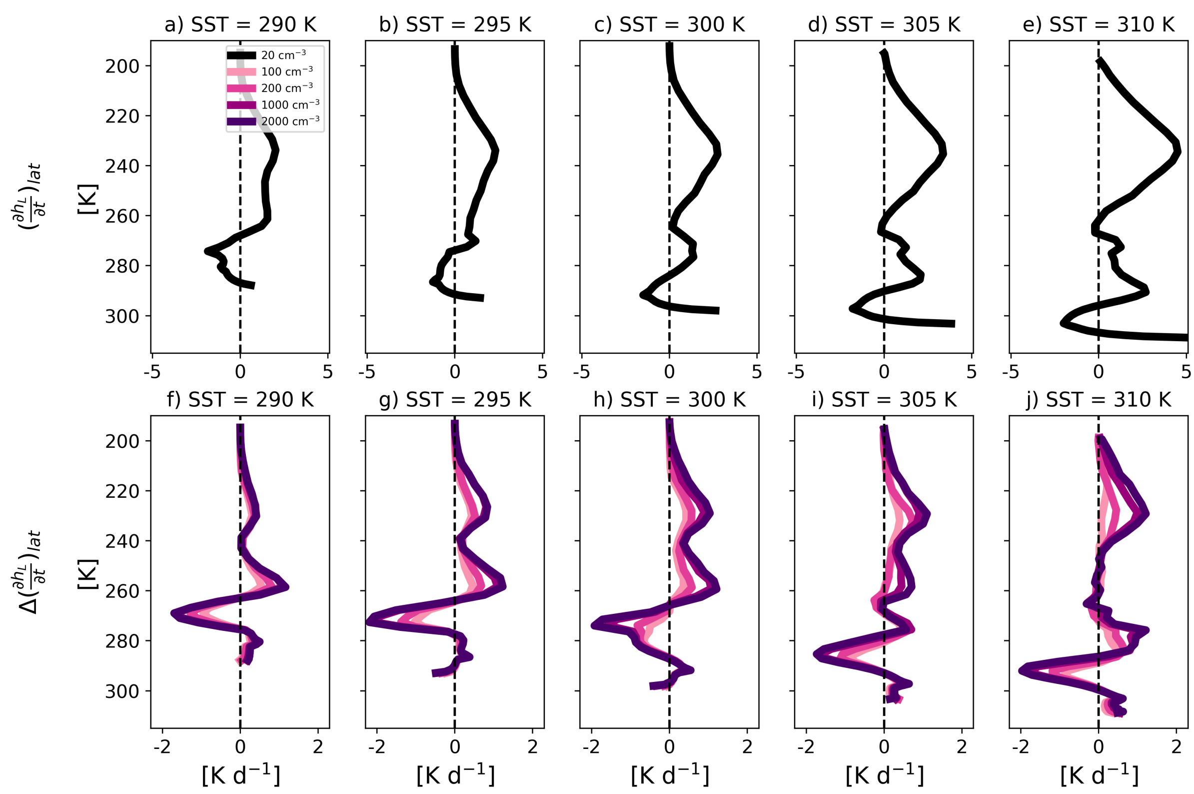

Figure S10. Vertical profiles of the domain time and mean tendency of the liquid/ice water static energy (h_L) due to latent heating for the cleanest run for each SST (N_a = 20 cm^{-3}; **a-e**), and its response to an increase in N_a relative to the cleanest run for each SST (**f-j**).

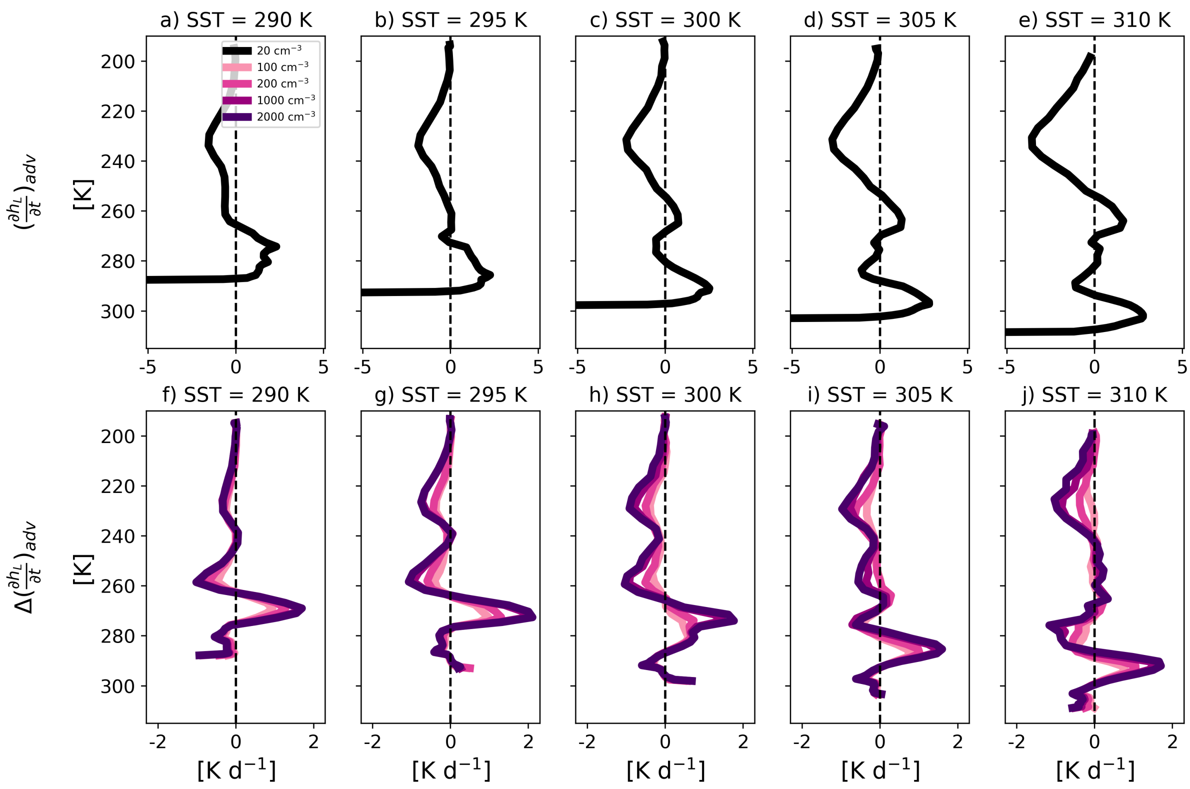

Figure S11. Vertical profiles of the domain time and mean tendency of the liquid/ice water static energy (h_L) due to advection for the cleanest run for each SST (N_a = 20 cm^{-3}; **a**-**e**), and its response to an increase in N_a relative to the cleanest run for each SST (**f**-**j**).

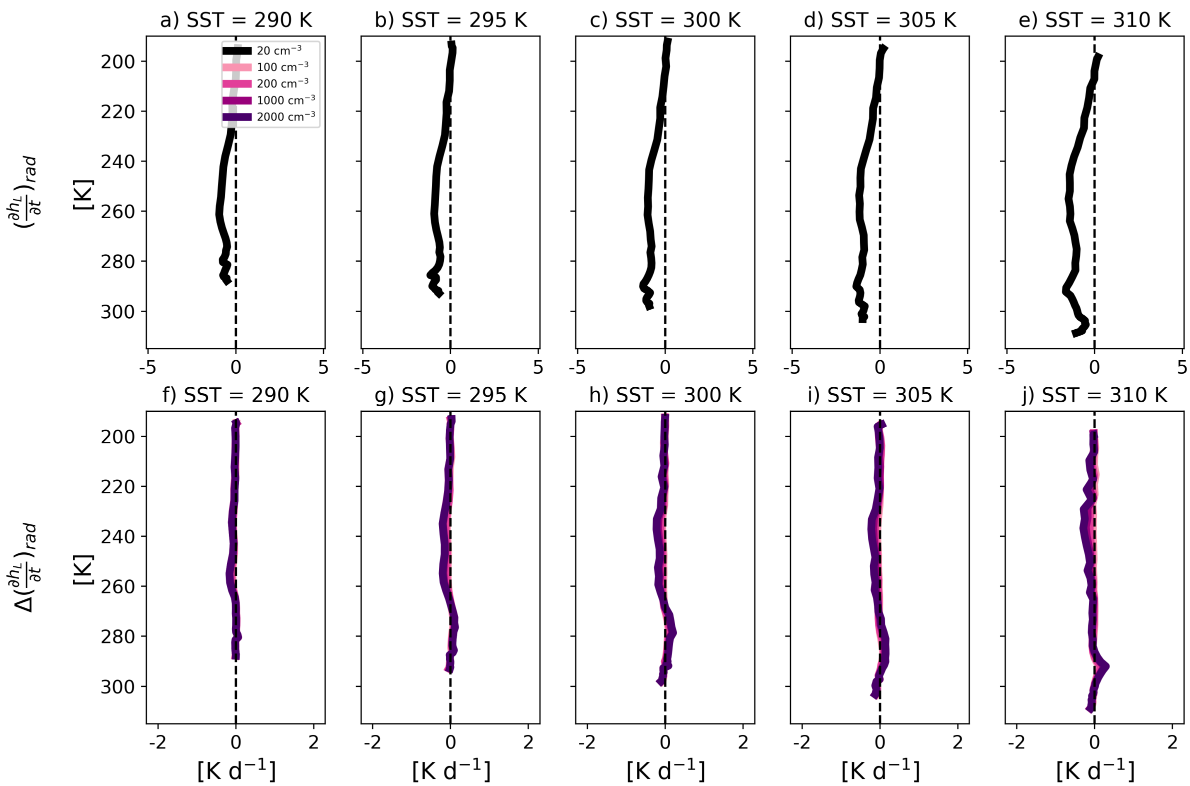

Figure S12. Vertical profiles of the domain time and mean tendency of the liquid/ice water static energy (h_L) due to radiation for the cleanest run for each SST (N_a = 20 cm^{-3}; **a**-**e**), and its response to an increase in N_a relative to the cleanest run for each SST (**f**-**j**).

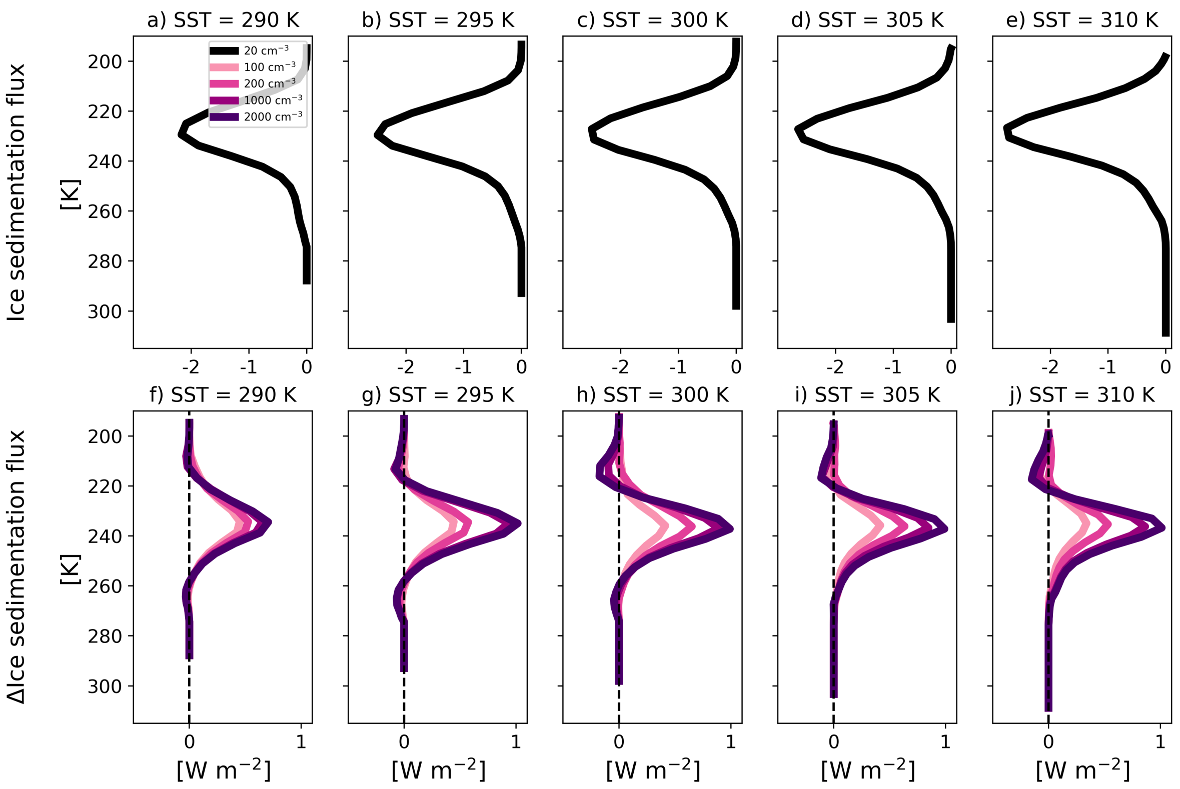

Figure S13. Domain and time mean vertical profiles of ice sedimentation flux for the cleanest run for each SST (N_a = 20 cm^{-3}; **a**-**e**), and its response to an increase in N_a relative to the cleanest run for each SST (**f**-**j**).