# Supplement to "Air-snowpack exchange of bromine, ozone and mercury in the springtime Arctic simulated by the 1-D model PHANTAS – Part 1: In-snow bromine activation and its impact on ozone"

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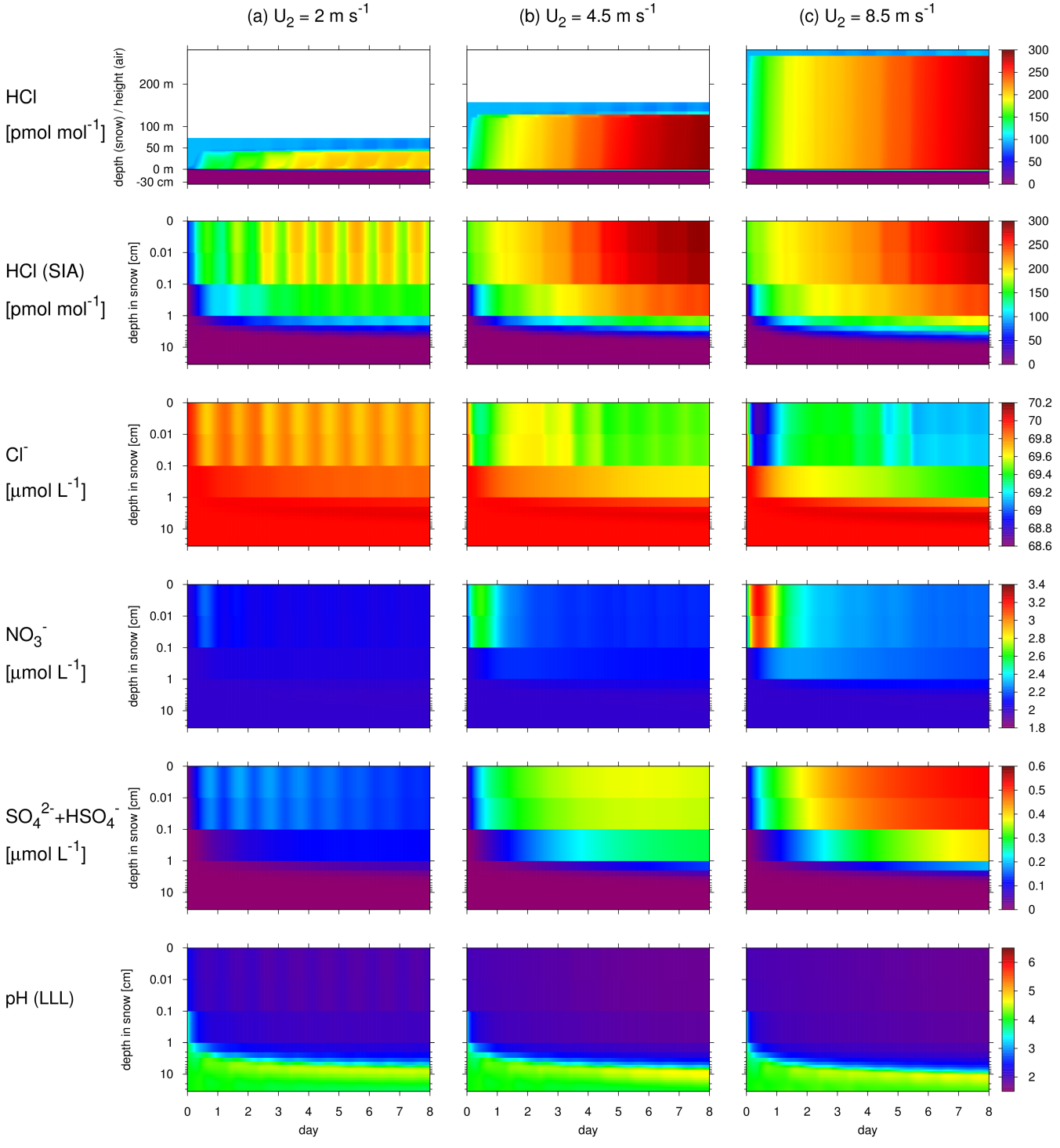


**Fig. S1.** Time-height cross sections for the mixing ratios of HCl (top row for the entire model domain from the bottom of the SIA and to the top of the atmosphere and second row for the SIA only), bulk concentrations of chloride ($Cl^-$, third row), nitrate ($NO_3^-$, fourth row) and sulfate ($SO_4^{2-} + HSO_4^-$, fifth row) in snowpack grains, and pH in the LLL on the surface of snowpack grains (bottom row) from model runs with $U_2 = 2$ m s$^{-1}$ **(a)**, 4.5 m s$^{-1}$ **(b)**, and 8.5 m s$^{-1}$ **(c)**. $N = 0.031\,\mathrm{s}^{-1}$ for all the model runs.

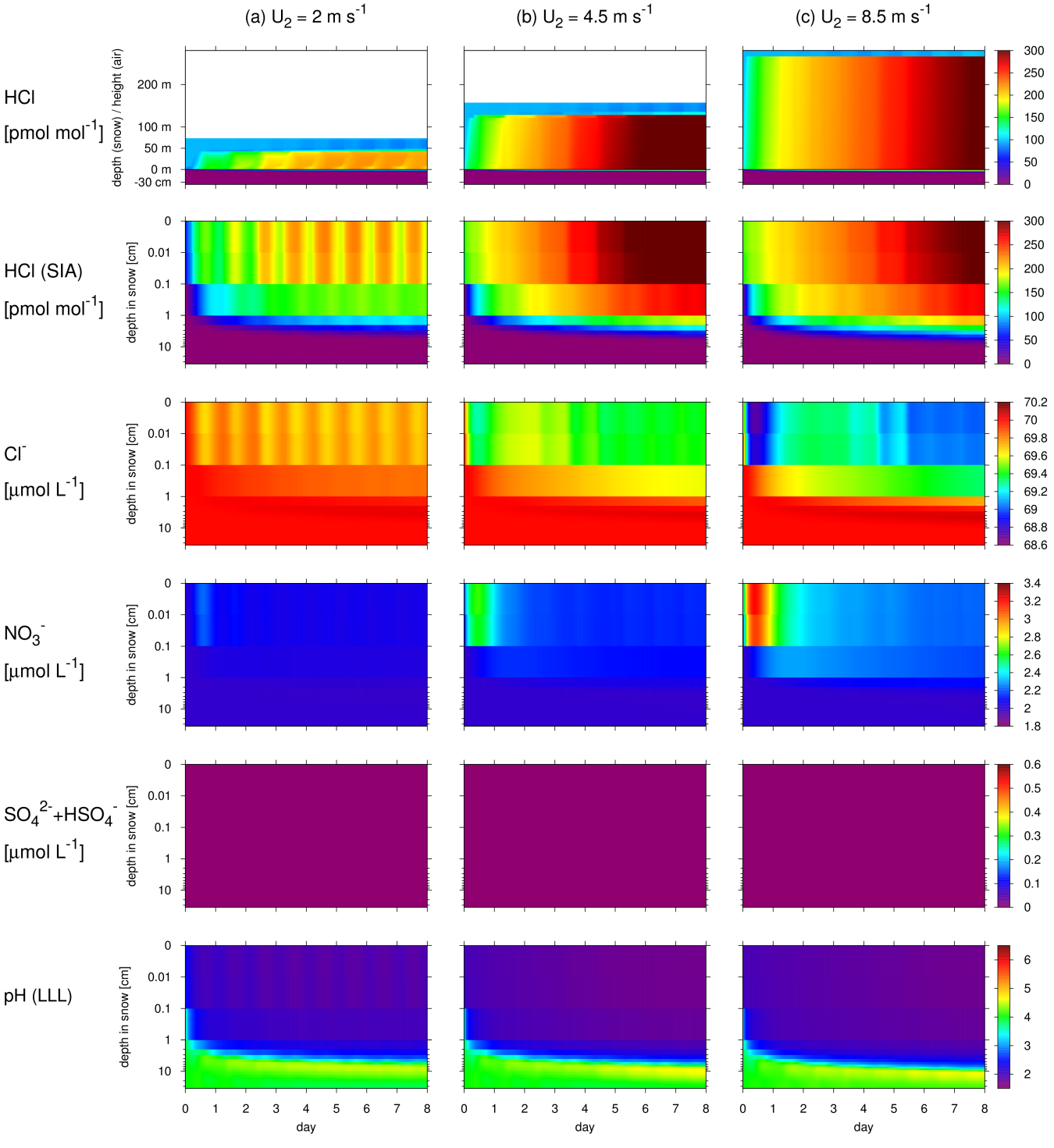


**Fig. S2.** The same as Fig. S1 but from sensitivity runs where $SO_4^{2-}$ being produced in and/or entering the LLL of the snowpack was assumed to be lost irreversibly at the first-order rate of $10^3\ s^{-1}$ as an ad-hoc representation of the precipitation of mirabilite ($Na_2SO_4 \cdot 10\,H_2O$) from a brine with high sodium content.

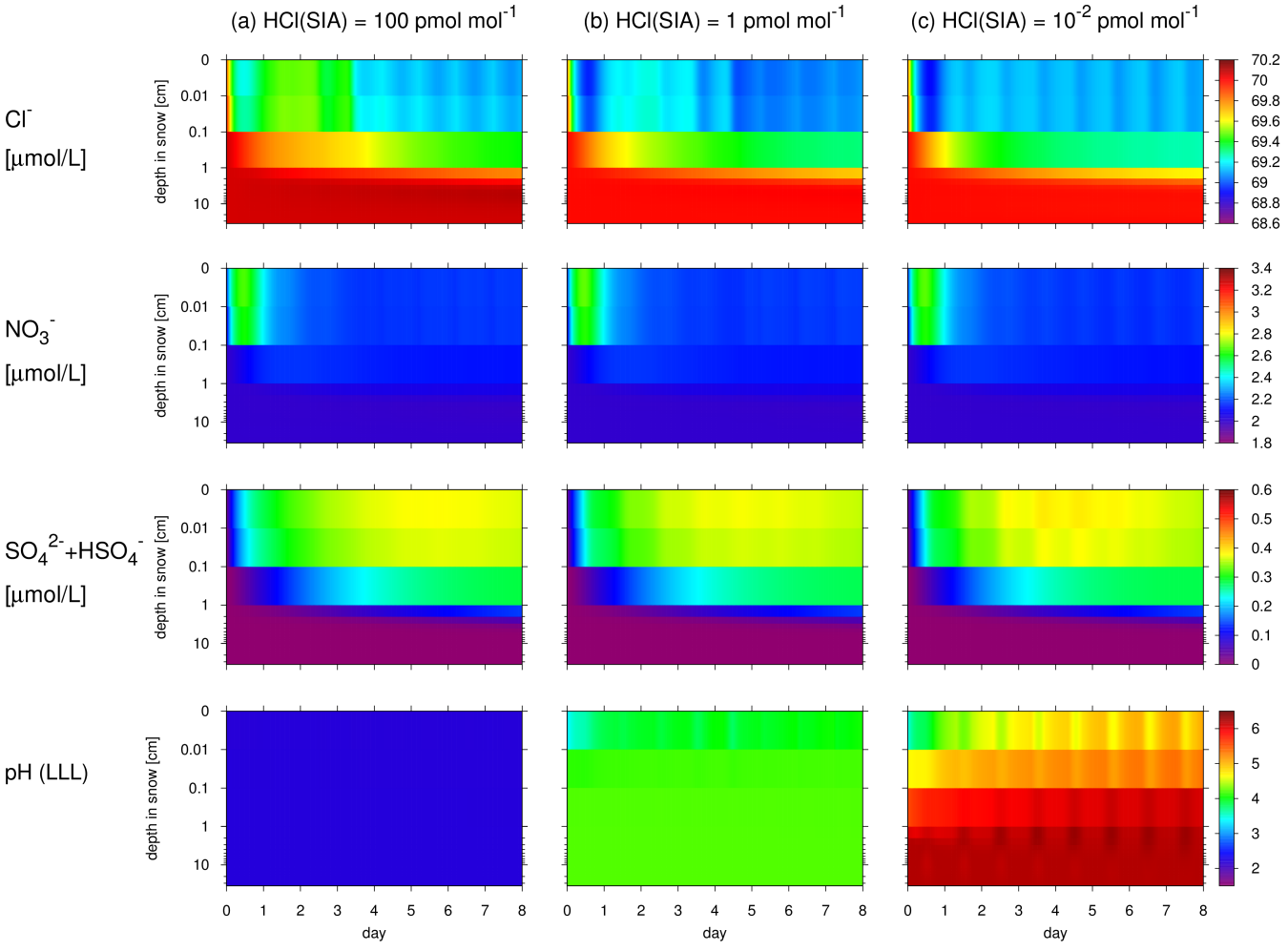


**Fig. S3.** The same as Fig. S1 but without plots for the mixing ratios of HCl from sensitivity runs with $U_2 = 4.5$ m s$^{-1}$ where the HCl mixing ratios were fixed at arbitrary values in the SIA, viz. 100 pmol mol$^{-1}$ **(a)**, 1 pmol mol$^{-1}$ **(b)** and 0.01 pmol mol$^{-1}$ **(c)**, and in the ambient air (100 pmol mol$^{-1}$ in all cases).

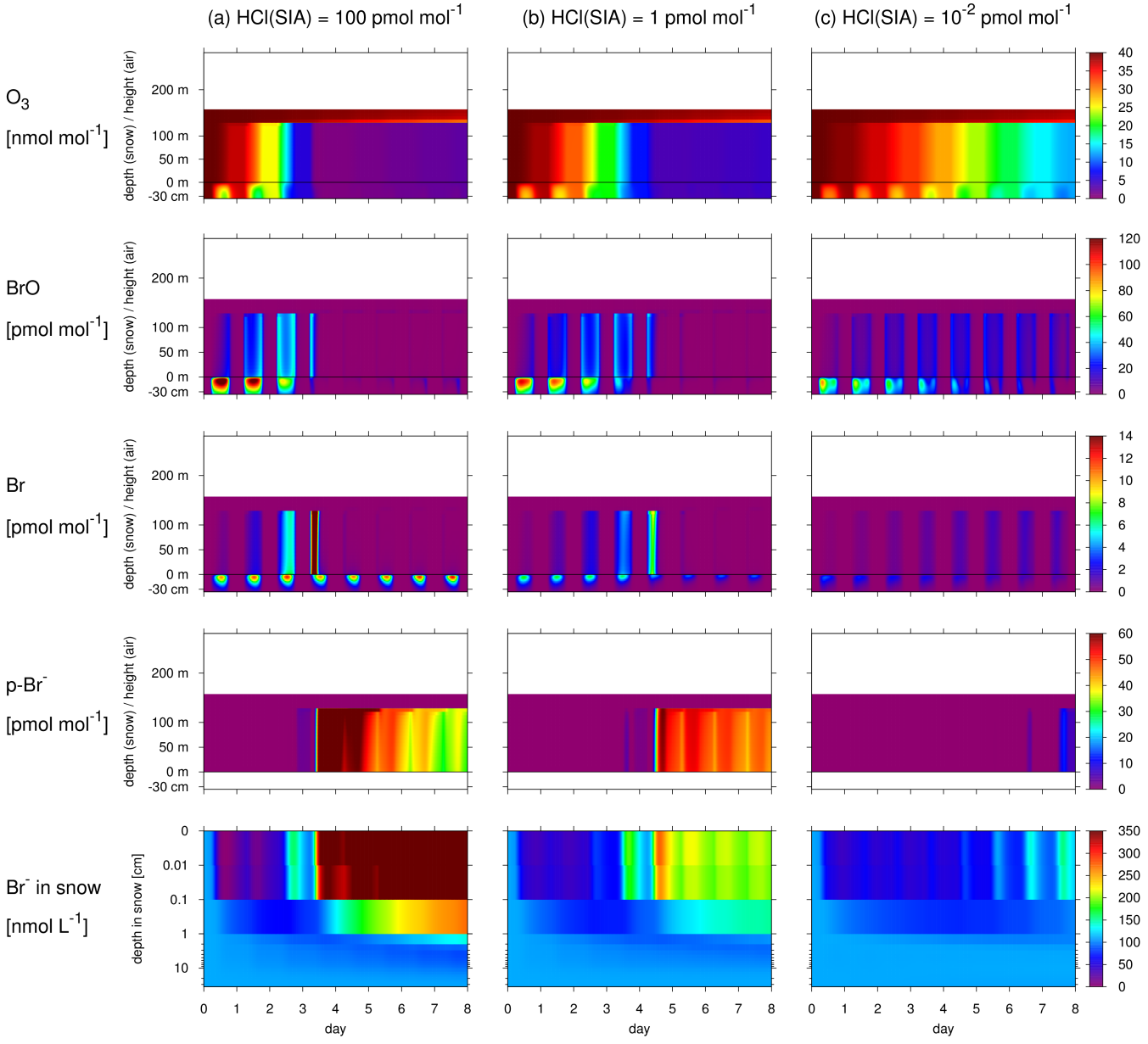


**Fig. S4.** Time-height cross sections for the mixing ratios of $O_3$ (top row), BrO (second row), Br-atom (third row), and aerosol bromide ($p\text{-}Br^-$, fourth row), and for the bulk concentrations of bromide in snowpack grains (bottom row) from the same model runs presented in Fig. S3, i.e. at $U_2 = 4.5$ m s$^{-1}$ and using the fixed mixing ratios of HCl in the SIA at 100 pmol mol$^{-1}$ **(a)**, 1 pmol mol$^{-1}$ **(b)** and 0.01 pmol mol$^{-1}$ **(c)** and in the ambient air at 100 pmol mol$^{-1}$.