Supplementary material to:

What surface radiative fluxes reveal about Arctic cloud modelling accuracy

Yaël Le Gars[1], Jean-Christophe Raut[1], Louis Marelle[1]
[1]LATMOS/IPSL, Sorbonne Université, UVSQ, CNRS, Paris, France

This document provides additional figures and tables supporting the main manuscript.

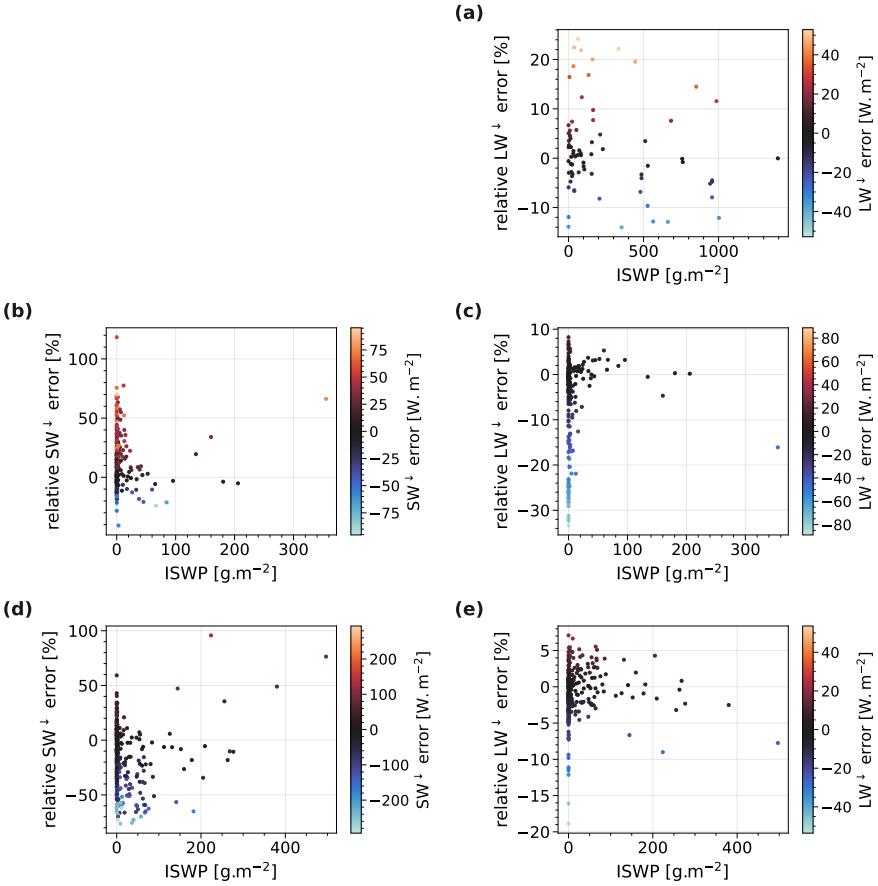

Figure S1: Radiative fluxes biases as a function of modelled ice and snow water path (ISWP), showing relative error (model minus observation) on y-axis and colour-coded by the raw error. **(a)** $LW^{\downarrow}$ errors during P1, **(b)** $SW^{\downarrow}$ errors during P2, **(c)** $LW^{\downarrow}$ errors during P2, **(d)** $SW^{\downarrow}$ errors during P3 and **(e)** $LW^{\downarrow}$ biases during P3.

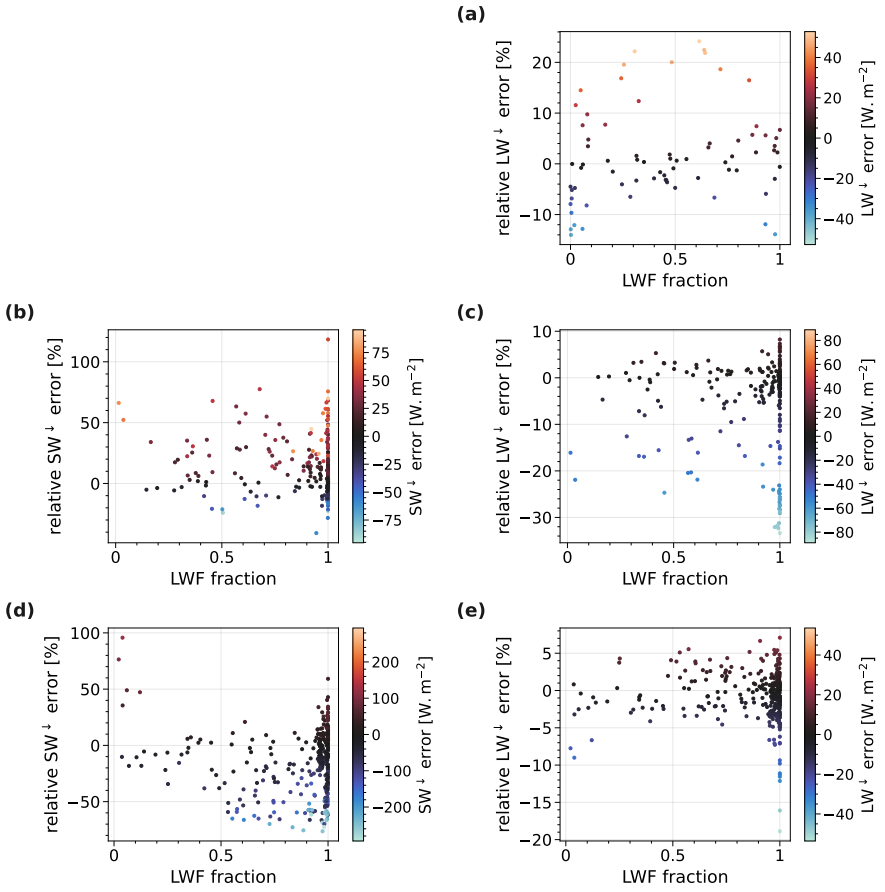

Figure S2: Radiative fluxes biases as a function of modelled liquid water fraction (LWF), showing relative error (model minus observation) on y-axis and colour-coded by the raw error. **(a)** $LW^{\downarrow}$ errors during P1, **(b)** $SW^{\downarrow}$ errors during P2, **(c)** $LW^{\downarrow}$ errors during P2, **(d)** $SW^{\downarrow}$ errors during P3 and **(e)** $LW^{\downarrow}$ biases during P3.

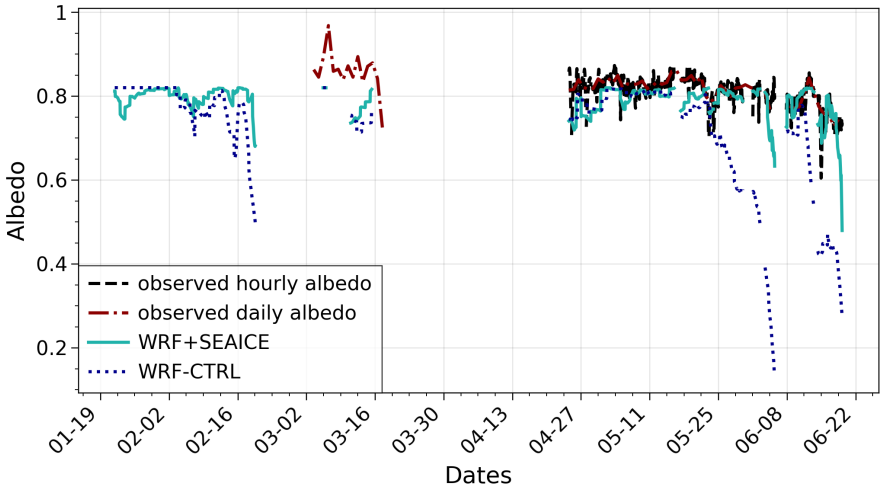

Figure S3: Temporal serie of observed (daily and hourly) and modelled (WRF-CTRL and WRF-SEAICE) hourly surface Albedo. Observed daily albedo is provide by N-ICE measurements at noon. Observed hourly albedo is calculated as the ratio of hourly measured $SW^{\uparrow}/SW$ for comparison.

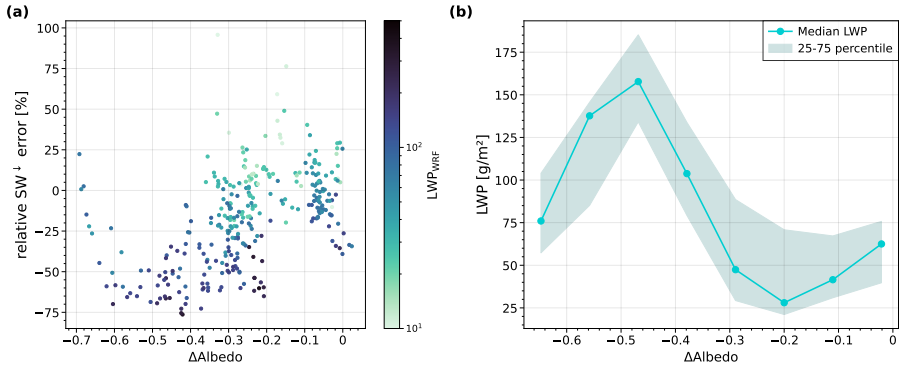

Figure S4: **(a)** P3 $SW^{\downarrow}$ errors distribution as a function of surface albedo biases with LWP_{WRF} colored during. **(b)** binned LWP values distribution with respect to surface albedo biases.

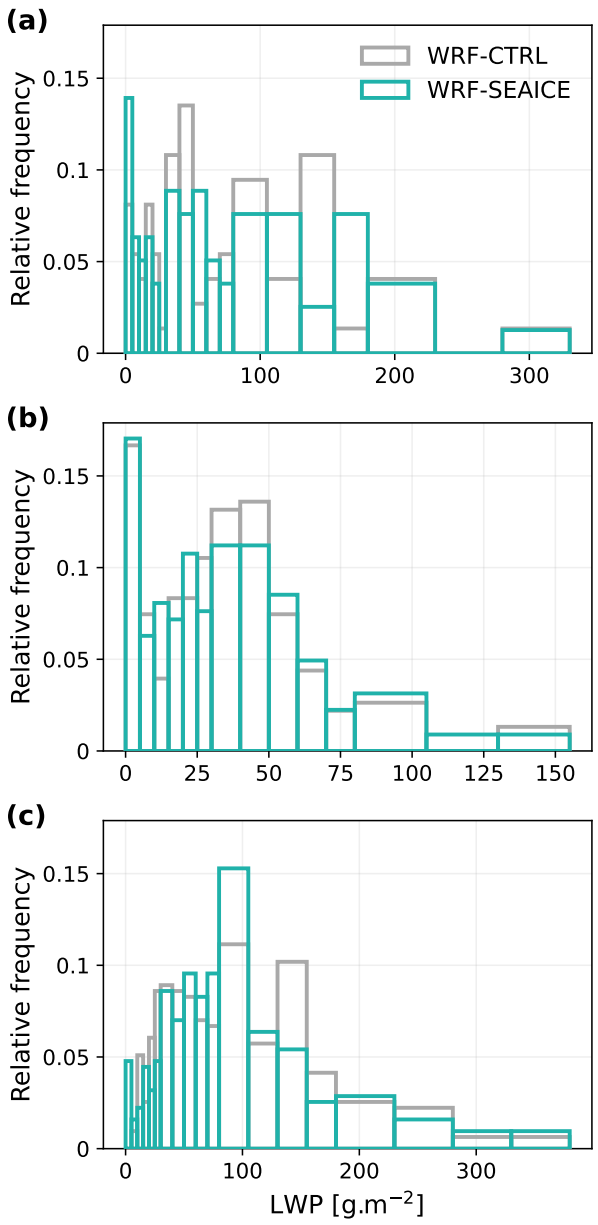

Figure S5: Adaptative binned distribution of LWP values, comparing WRF-CTRL and WRF-SEAICE for a) P1, b) P2 and c) P3. Bin size of 5 g.m^{-2} when LWP $\leq$ 30 g.m^{-2}, 10 when LWP $\leq$ 80 g.m^{-2} and 25 otherwise.

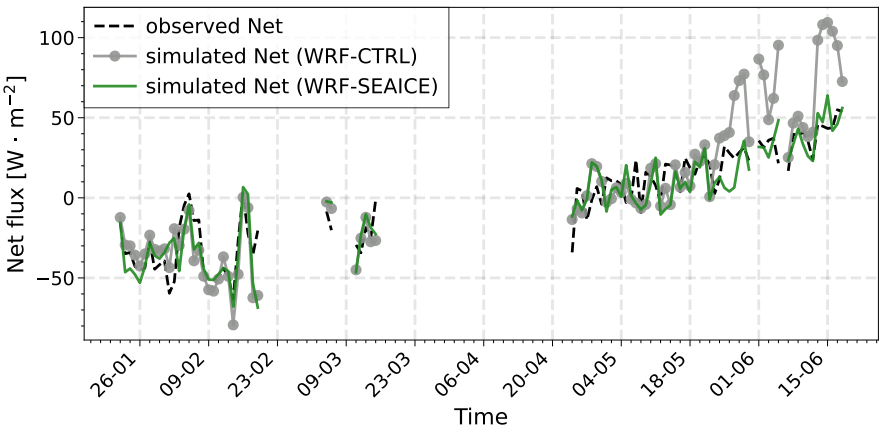

Figure S6: Time series of observed (dashed black) and simulated net radiation from WRF-CTRL (dotted gray) and WRF-SEAICE (solid green) along the N-ICE drift.

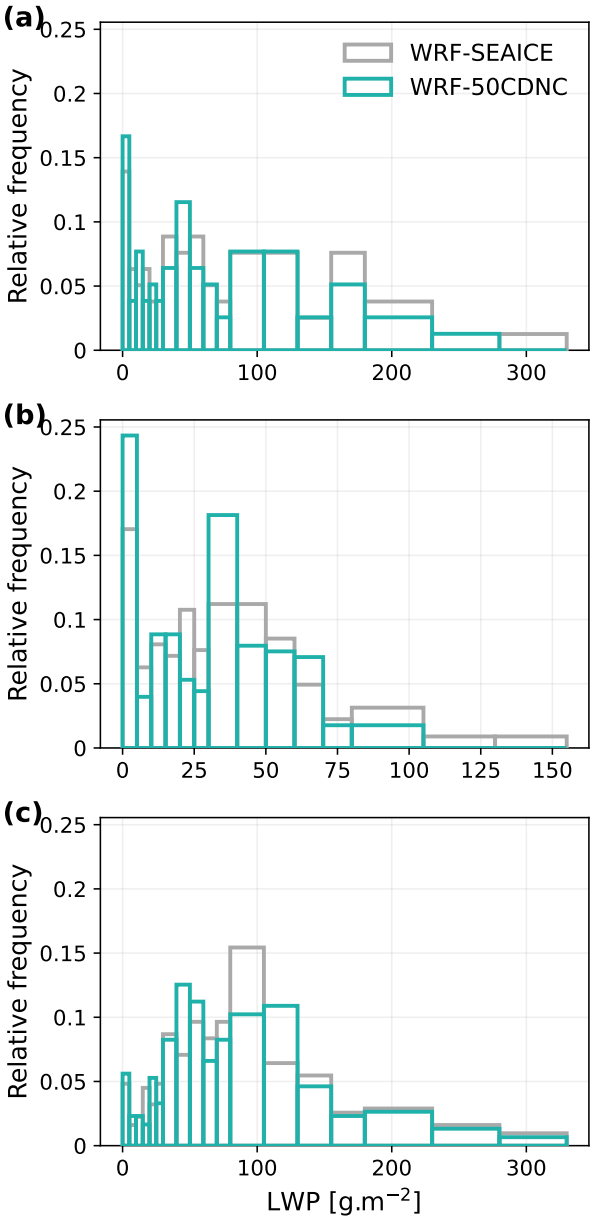

Figure S7: Adaptative binned distribution of LWP values, comparing WRF-SEAICE (100 CDNC) and WRF-50CDNC for a) P1, b) P2 and c) P3. Bin size of 5 g.m^{-2} when LWP $\leq$ 30 g.m^{-2}, 10 when LWP $\leq$ 80 g.m^{-2} and 25 otherwise.

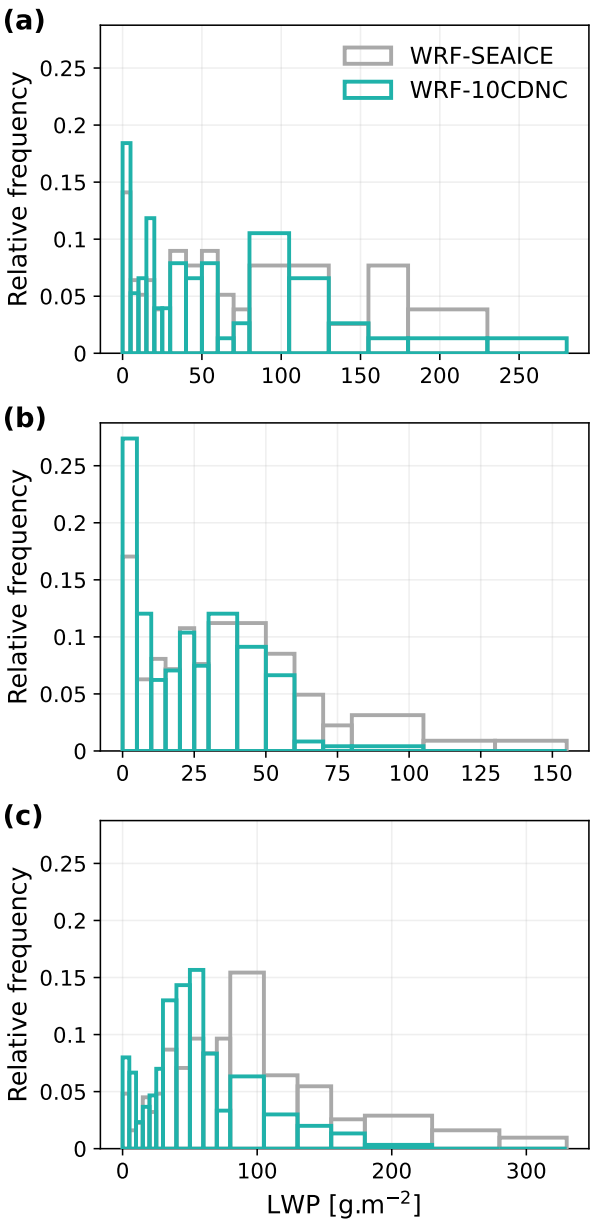

Figure S8: Adaptative binned distribution of LWP values, comparing WRF-SEAICE (100 CDNC) and WRF-10CDNC for a) P1, b) P2 and c) P3. Bin size of 5 g.m^{-2} when LWP $\leq$ 30 g.m^{-2}, 10 when LWP $\leq$ 80 g.m^{-2} and 25 otherwise.