



## **Revisiting the relationship between Arctic sea-ice thickness and snow depth through climate-model simulations**

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The thickness of snow covering sea ice is a crucial parameter in any algorithm deriving sea-ice thickness from satellite-measured sea-ice freeboard. Here we investigate whether such snow thickness can robustly be estimated by assuming a simple correlation between snow thickness and sea-ice thickness. Such correlation is sometimes applied in schemes that aim at correcting the multi-year Warren snow climatology for the more recent past. In order to quantify the relationship between sea-ice thickness and snow depth, we analyse the correlation of ice thickness and snow depth in a multi-century pre-industrial model simulation and in a transient historical simulation performed with the Max Planck Institute Earth System Model (MPI-ESM). We find correlation coefficients to be low in the central Arctic, while they show substantial regional and temporal variations in the vicinity of the ice edge. Our results point towards possibly substantial errors in algorithms that assume too simplistic a relationship between sea-ice thickness and snow depth.