

Measuring the impact of a new snow model using surface energy budget process relationships

Jonathan J. Day¹, Gabriele Arduini¹, Irina Sandu¹, Linus Magnusson¹, Anton Beljaars¹, Gianpaolo Balsamo¹, Mark Rodwell¹ and David Richardson¹

¹European Centre for Medium-Range Weather Forecasts, Reading, UK

Contents of this file

Figures S1 to S8

Introduction

Figures are all referenced in the main document and need no additional explanation.

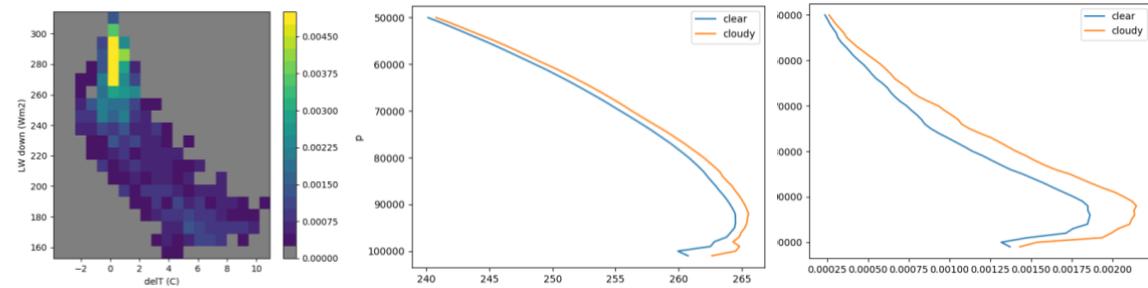


Figure S1. 2d histogram of downwelling longwave radiation and static stability (10m temp – skin temp) (left). Mean radiosonde temperature profiles for the radiatively clear-stably stratified state ($LW_{\downarrow} < 210$) and cloudy-well mixed state ($LW_{\downarrow} > 210$) states (middle). (right) as (middle) but for specific humidity. All data are from Sodankylä, Finland (DJF2017/18).

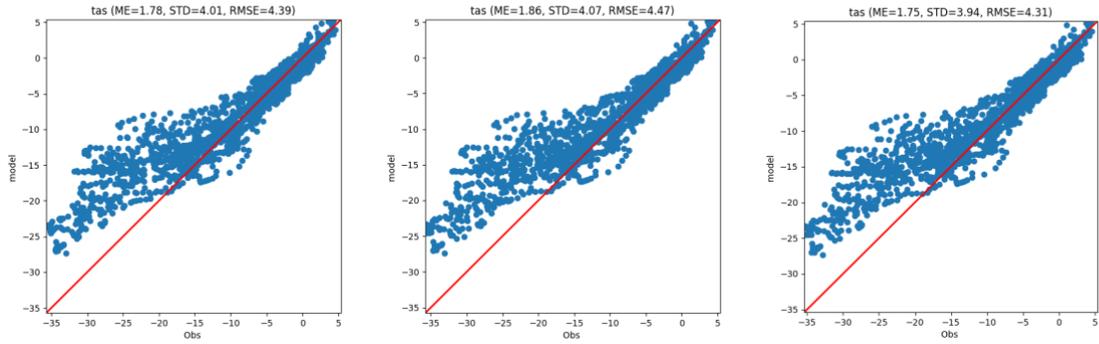


Figure S2. Verification of day-2 2m-temperature from SL forecasts at various locations at Sodankyla: Automatic weather station (left), Intensive Observing Area (Open), Intensive Observing Area (Forest).

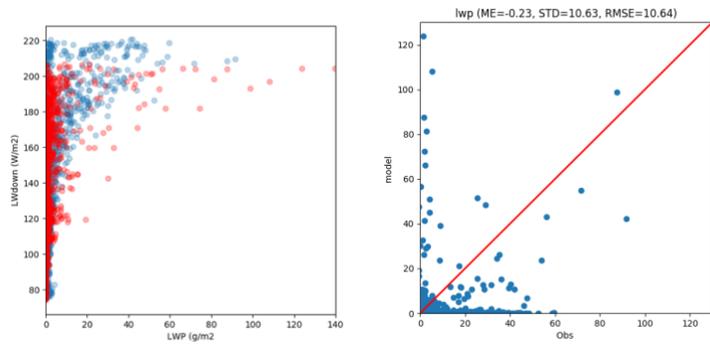


Figure S3. LW_{\downarrow} as a function of LWP (left) in SL forecasts at day-2 (red) and observations (blue). Scatter plot of observed vs CTRL LWP (right).

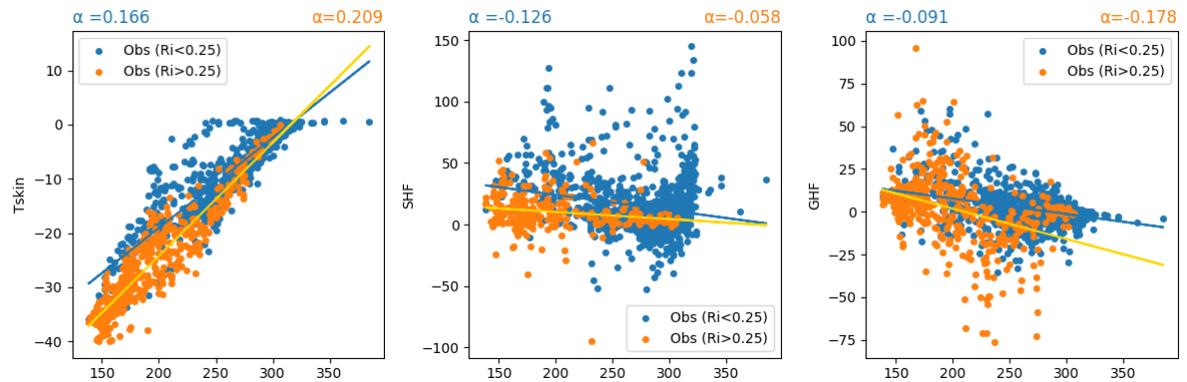


Figure S4. Process relationship diagrams and sensitivity parameters for skin temperature (Tskin; left), sensible heat flux (SHF; middle) and ground heat flux (GHF; right) for Sodankylä, Finland.

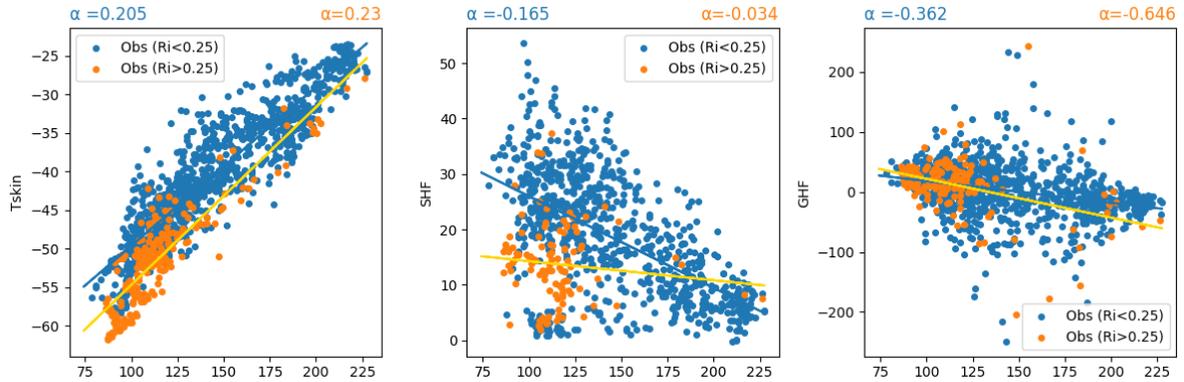


Figure S5. Process relationship diagrams and sensitivity parameters for skin temperature (Tskin; left), sensible heat flux (SHF; middle) and ground heat flux (GHF; right) for Summit, Greenland.

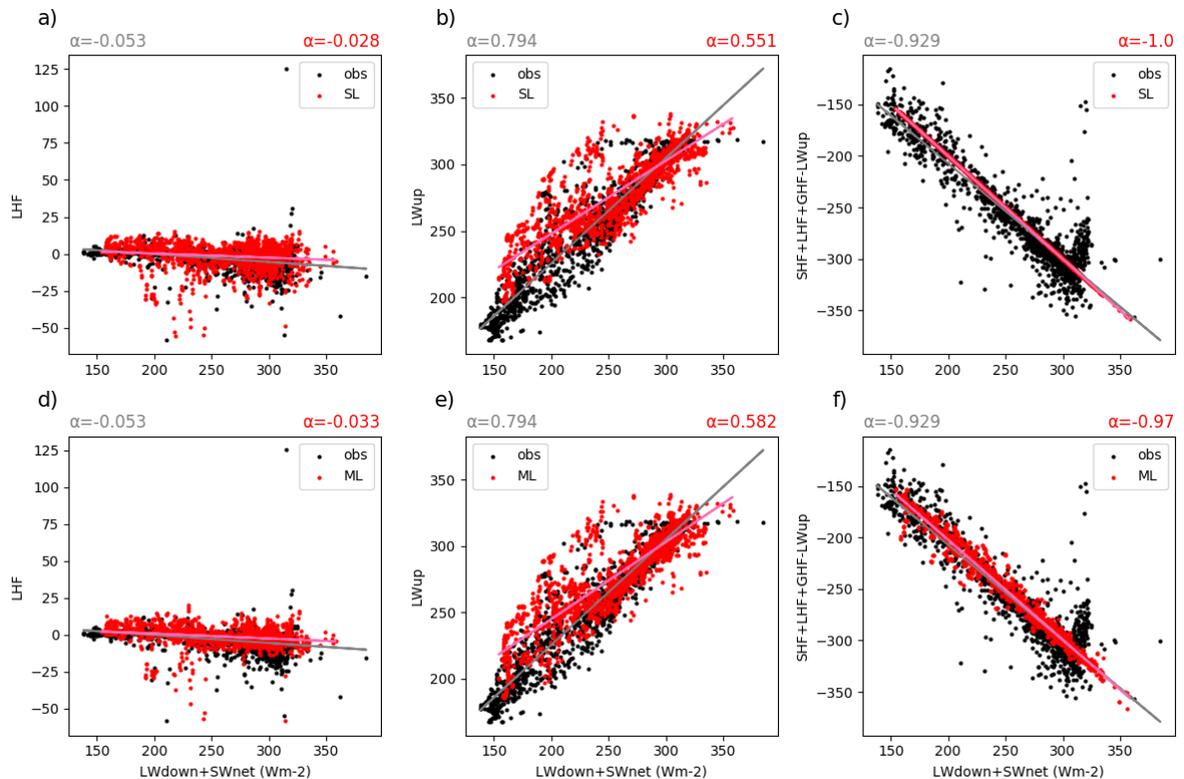


Figure S6. process relationship diagrams and sensitivity parameters for Latent Heat Flux (LHF; left), upwelling longwave radiation (LW \uparrow ; middle) and total response term (SHF+LHF+GHF-LW \uparrow ; right) for Sodankyla, Finland. Observed values are shown in grey in both rows, model values are shown in red for single layer snow (a-c) and multi-layer snow (d-e). The line of best fit is shown for observations (grey line) and each model (pink line).

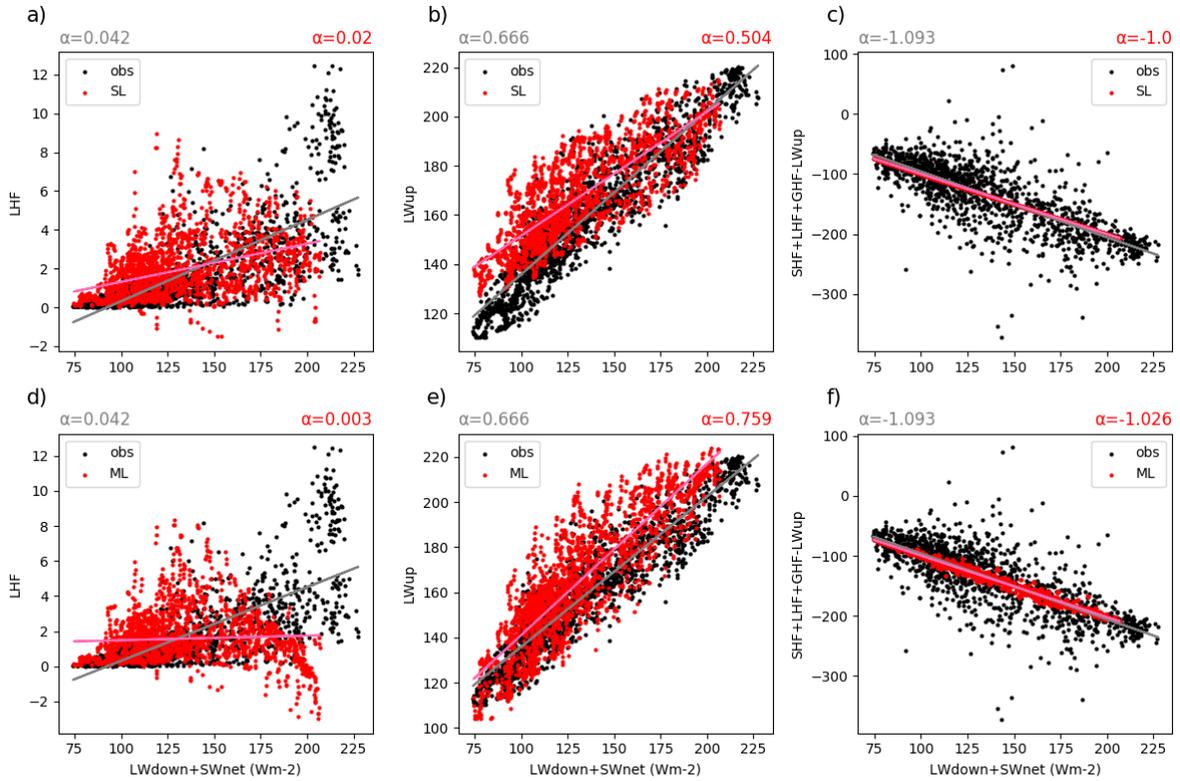


Figure S7. process relationship diagrams and sensitivity parameters for Latent Heat Flux (LHF; left), upwelling longwave radiation (LW \uparrow ; middle) and total response term (SHF+LHF+GHF-LW \uparrow ; right) for Summit, Greenland. Observed values are shown in black, model values are shown in red for single layer snow (a-c) and multi-layer snow (d-f). The line of best fit is shown for observations (grey line) and each model (pink line).

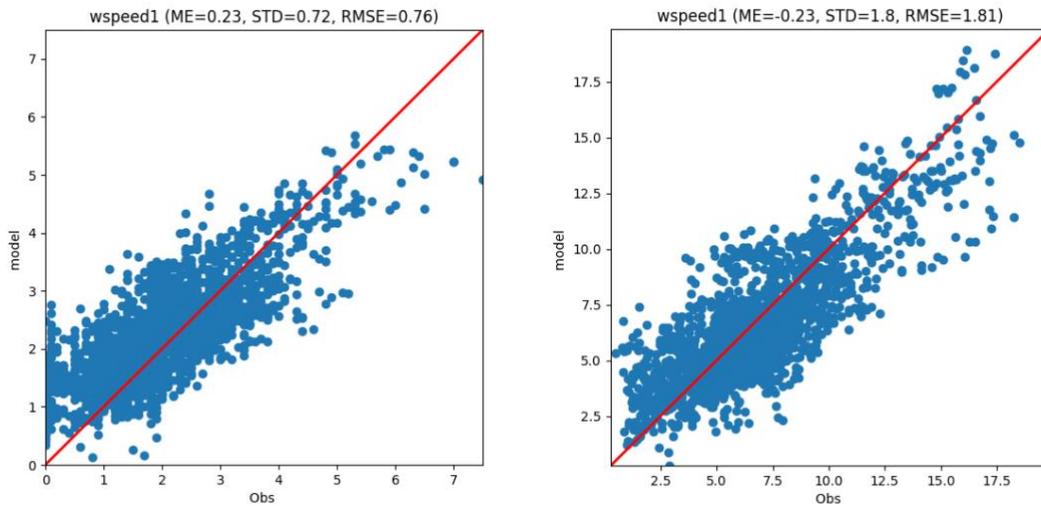


Figure S8. Verification of day-2 lowest model level wind (~10m) from SL forecasts at Sodankyla (left) and Summit (right).