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Clouds damp the radiative impacts of polar sea ice loss

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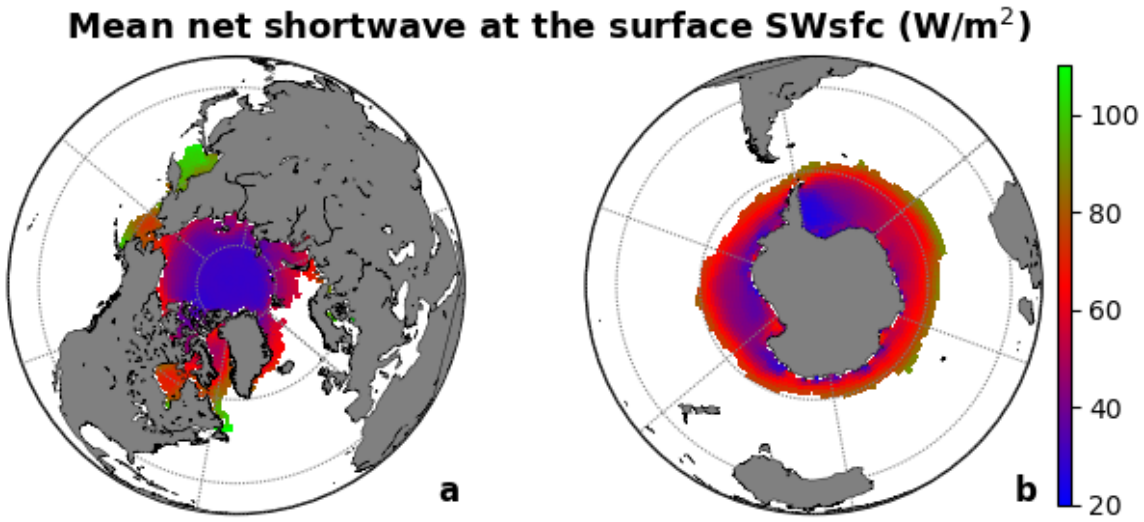


Figure S1 Mean (over 2001-2016) net radiation at the surface (NETsrf) over polar seas based on CERES data.

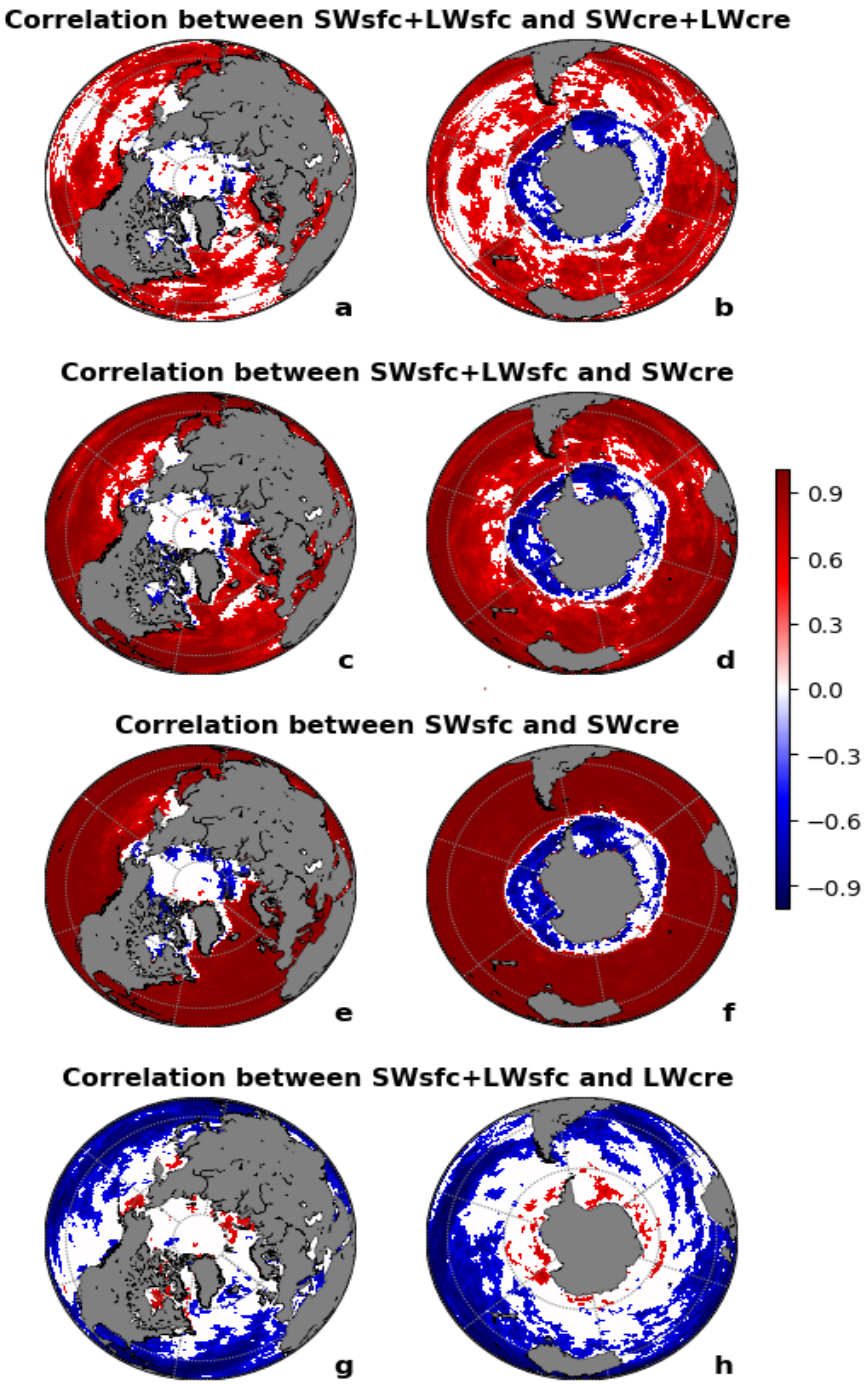


Figure S2 Same as figure 1 but only significant correlations are shown by blue and red colors. To test the significance of the observed correlations, we used the Pearson's correlation test of significance at level $\alpha = 0.05$ for 16-2=14 (16 years) degrees of freedom which correspond to the use of the critical values for Pearson r_0=0.497. This means that all correlation between -0.497 and 0.497 are not significant and set to white color.

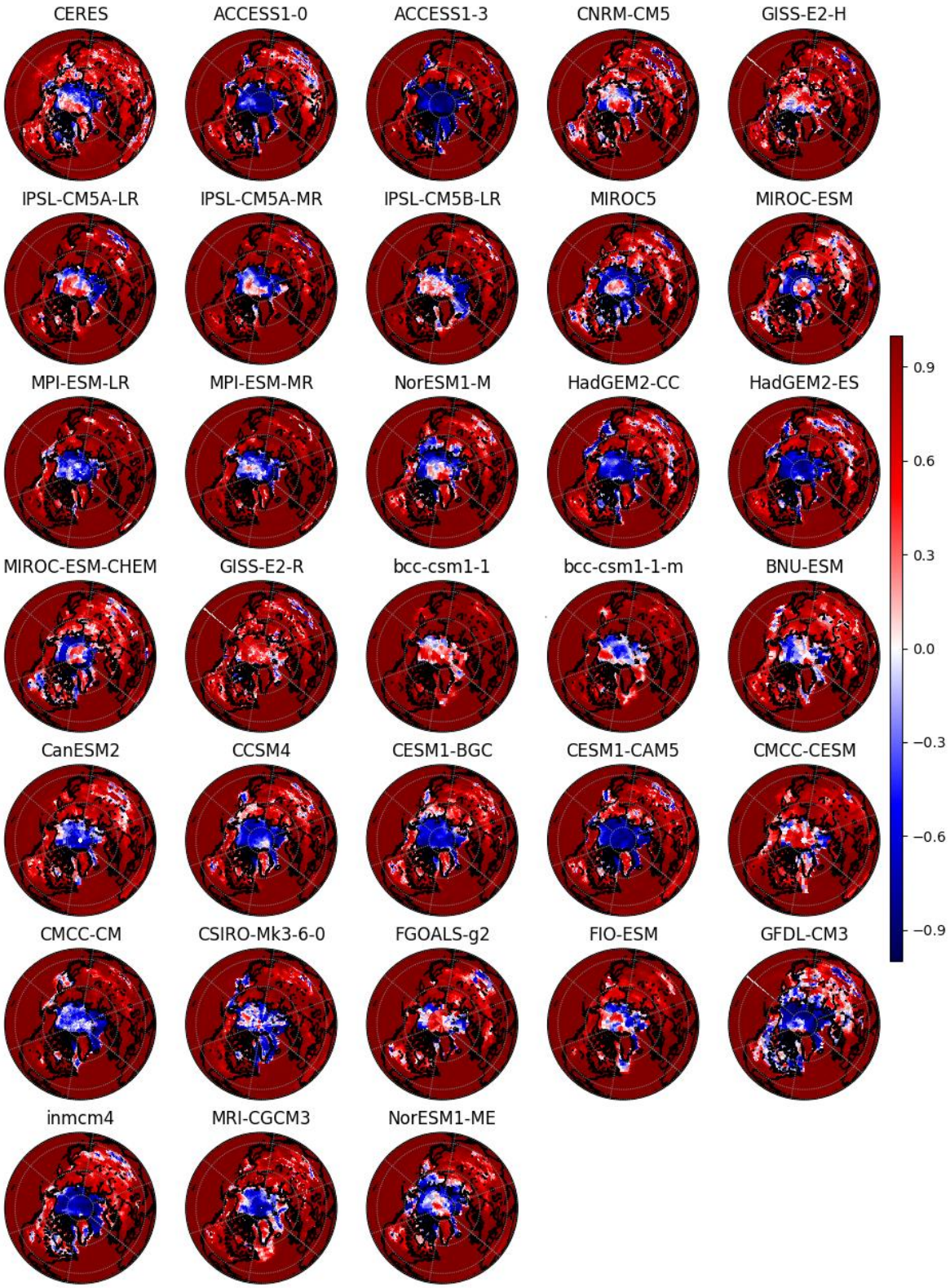


Figure S3 Correlation between SWcre and net solar radiation at the surface SWsfc shown by 32 CMIP5 earth system models and Satellites CERES over 2001-2016 over northern hemisphere.

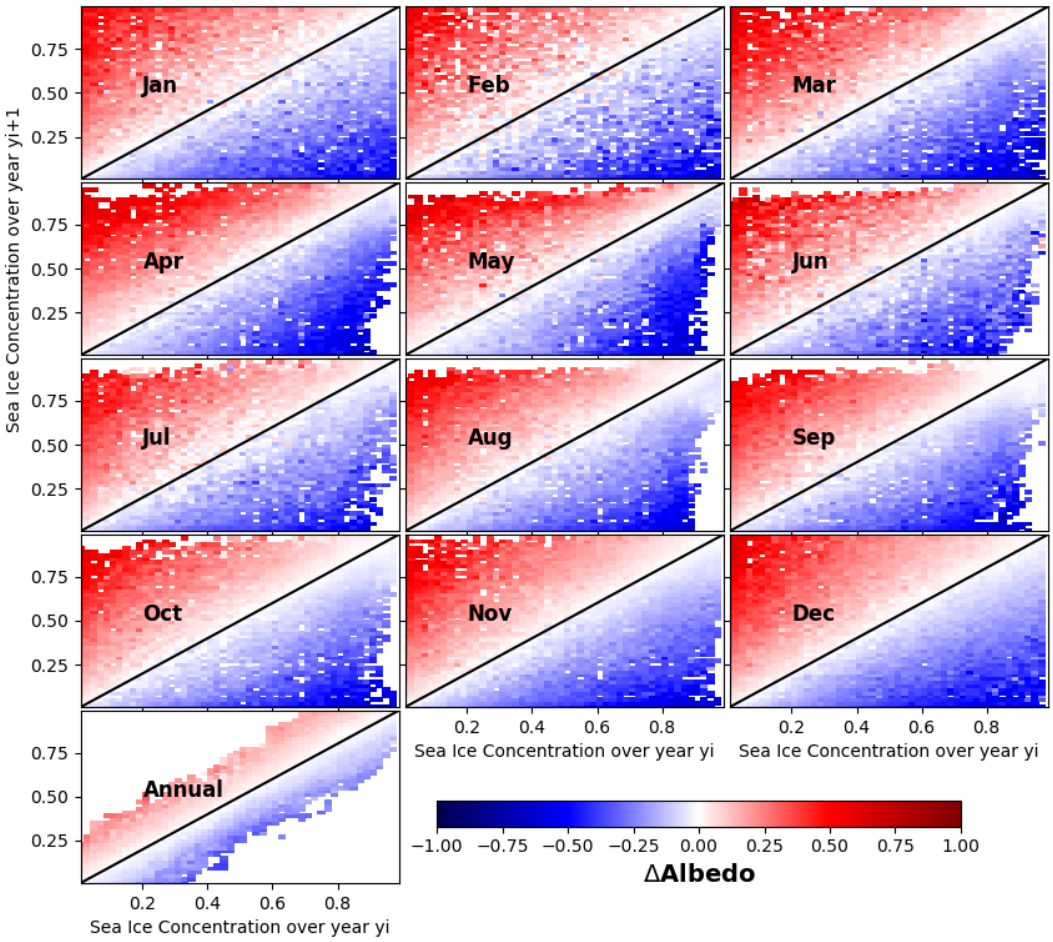
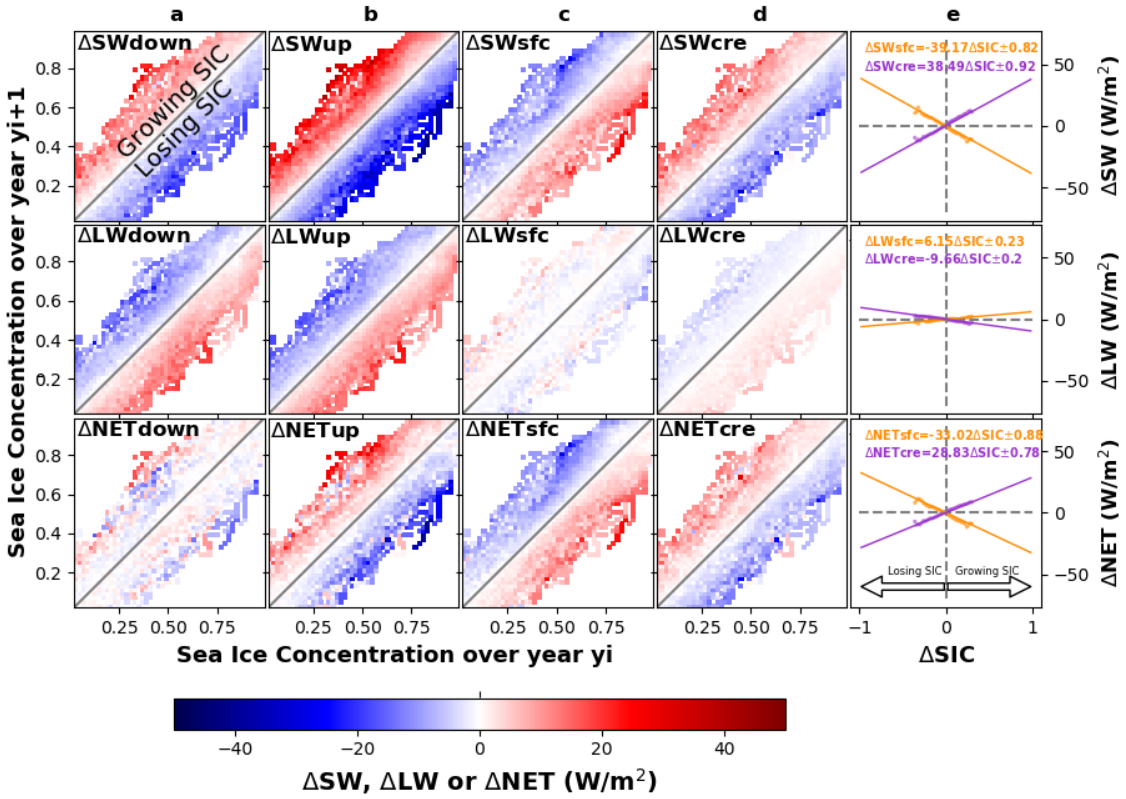


Figure S4 Monthly and annual albedo change between two consecutive years y_{i+1} and y_i over **Antarctic** sea as function of sea ice concentration SIC of the year y_{i+1} and y_i from 2001-2016 time period.



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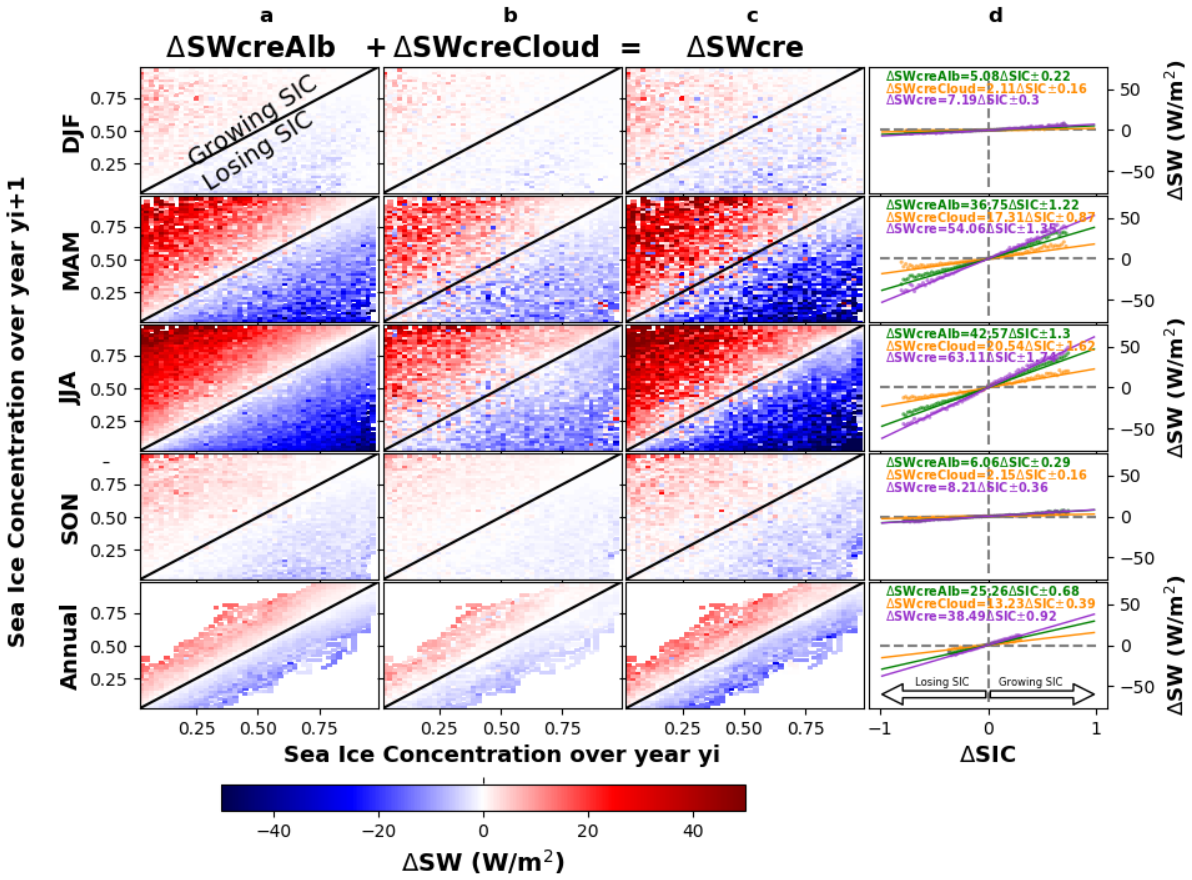
59 **Figure S5** Annual changes in SW, LW and NET as function of SIC. Annual changes in SW (top),
60 LW (middle) and NET (bottom) of radiative down (a), up (b), sfc=down-up (c) and cre (d) over
61 Arctic sea as function of SIC change between two consecutive years y_{i+1} and y_i from 2001-2016
62 time period. The top triangles in (c top) refers to the increase (growing) in SIC while the blue color
63 means a reduction (cooling) in SWsfc. Whereas, the top triangles in (d) refers to the increase in
64 SIC while the red color means an increase (decreasing the cooling role of clouds) in SWcre. Each
65 dot in column (e) represent the average of one parallel to the diagonal in (c) or (d).
66



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68 **Figure S6** Seasonal and annual changes in SWcreAlb, SWcreCloud and SWcre over Arctic sea as
69 function of SIC change between two consecutive years y_{i+1} and y_i from 2001-2016 time period.
70 All the analysis are based on observations from satellites data.