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Assimilation of snow water equivalent from AMSR2 and IMS satellite data utilizing the local ensemble transform Kalman filter

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Supplementary Information

Table S1 Confusion matrices for the experiment products (e.g., AMSR2, Openloop, JRA55, and the DA) against IMS data. Overall accuracy = (A+D) / (A+B+C+D)

	IMS SNOW	IMS NO SNOW
EXPERIMENT SNOW	A	B
EXPERIMENT NO SNOW	C	D

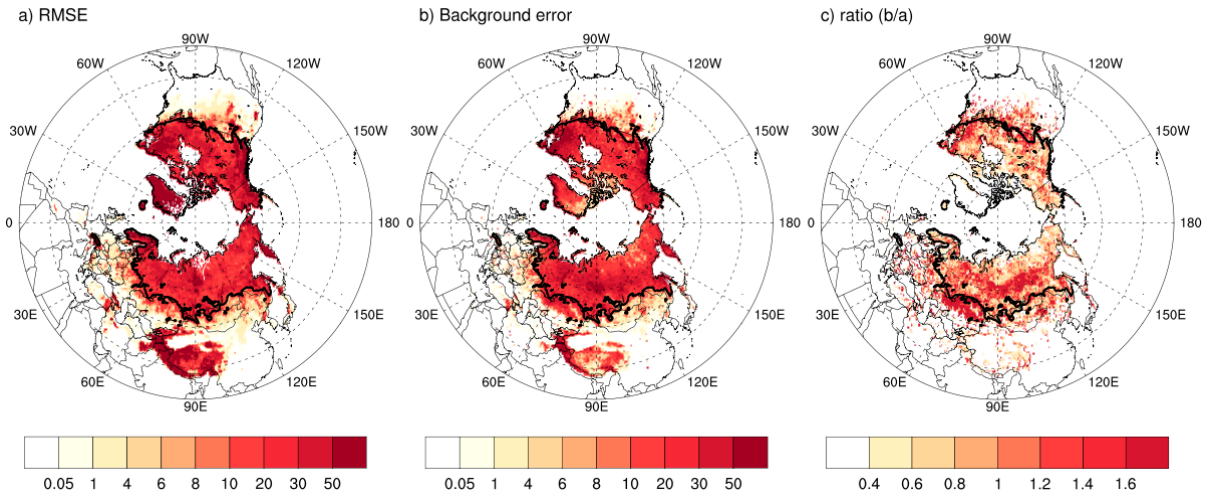

Fig. S1 Spatial distribution of root mean square error (RMSE, unit: kg/m^2 or mm) with CMC, model ensemble spread, and ratio. The black line represents the boundary of the transition region, defined as the climatological-mean SWE of less than 16mm.

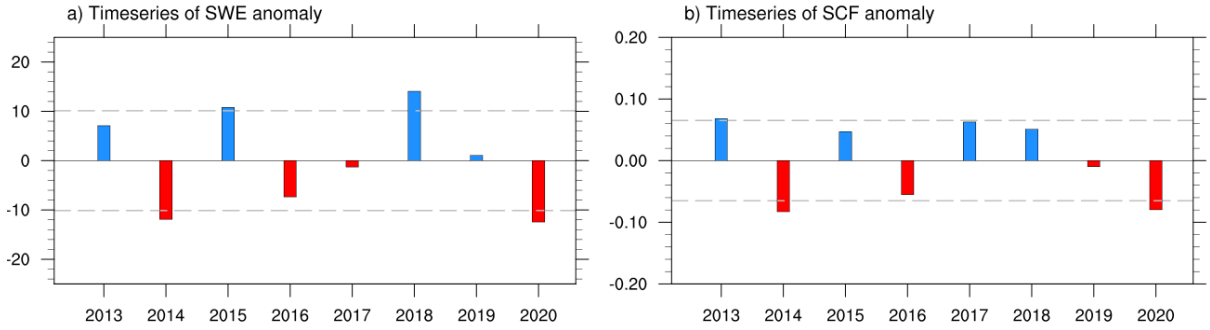

Fig. S2 Time series of the area-averaged SWE (unit: kg/m^2 or mm) and SCF anomaly of CMC and IMS, respectively, in Eurasian bounded by 48–65 ºN and 55–120 ºE, as shown by the red box in Figure 10. The dotted lines represent the one standard deviations of each variable.

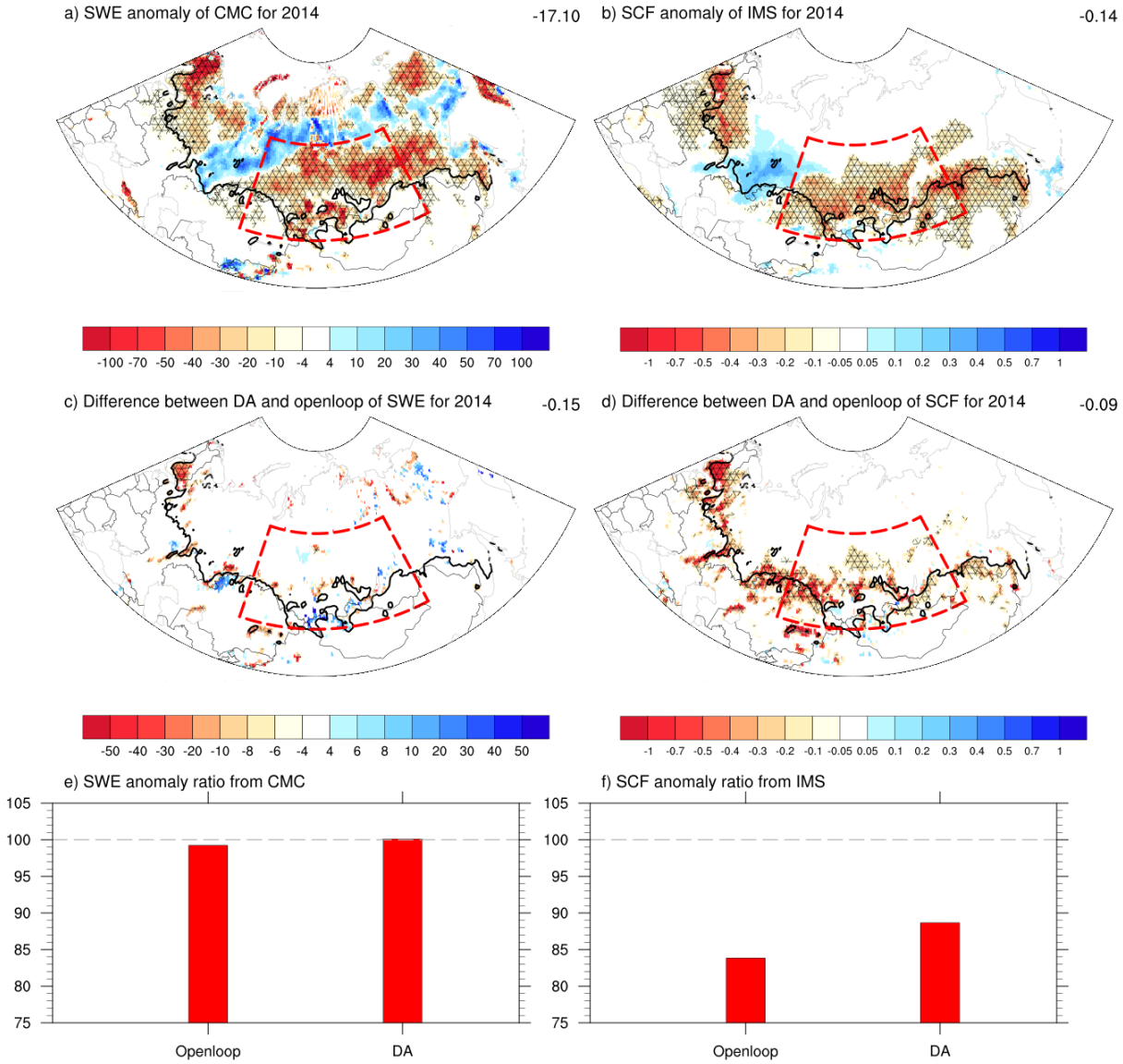

Fig. S3 Anomalies of a) SWE (unit: kg/m^2 or mm) from CMC and b) SCF from IMS as well as the difference (c, d) of variables between DA and Openloop in April 2014. Bar chart (e, f) indicates the ratio of DA and Openloop to verification data such as CMC and IMS in the red box (48–65ºN and 70–120 ºE), which is the region associated with extreme high-temperature events, focused on this study. Negative values (areas) in red shades are indicated with hatching.

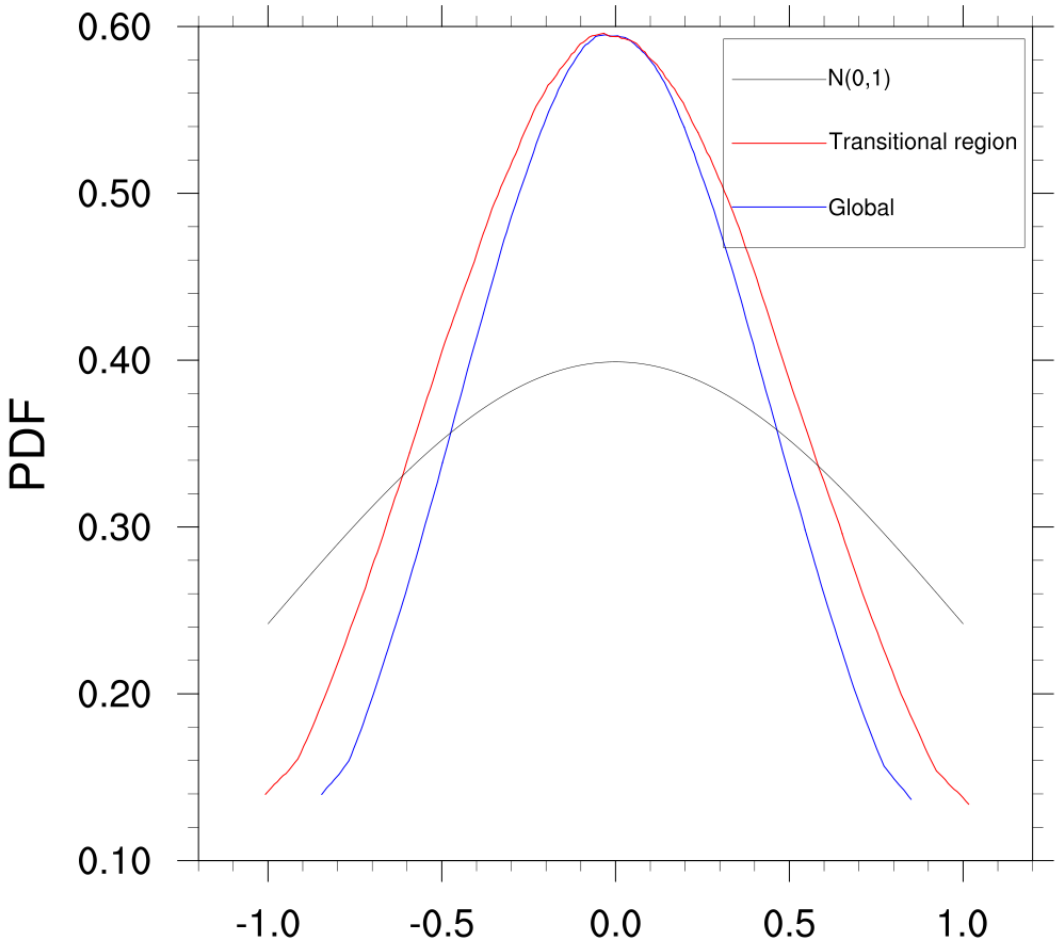

Fig. S4 Probability density function (PDF) of the standardized SWE ensemble perturbation, with the ensemble mean removed from each ensemble member, at each grid point. The PDF is averaged globally (blue line) and for the transition region (red line) for April from 2013 to 2020. The black line represents the standardized Gaussian function N(0,1).