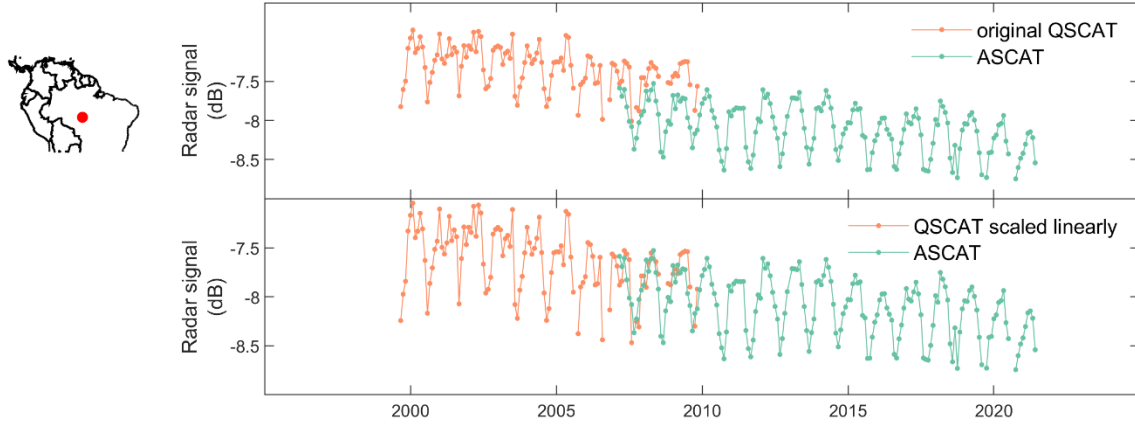
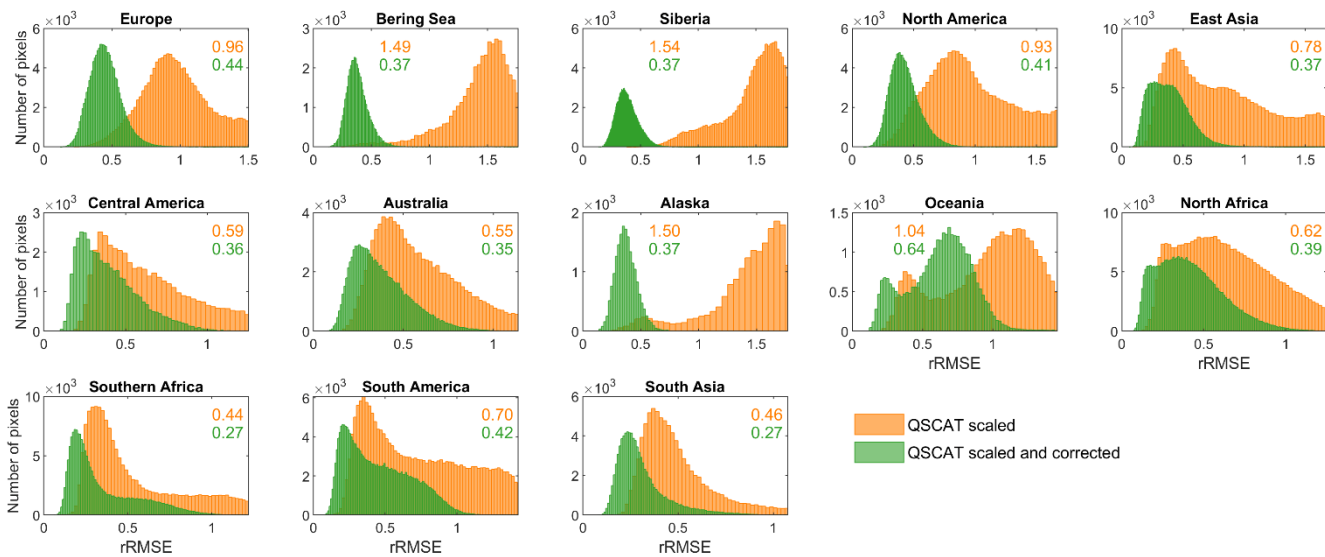


# Supplementary materials



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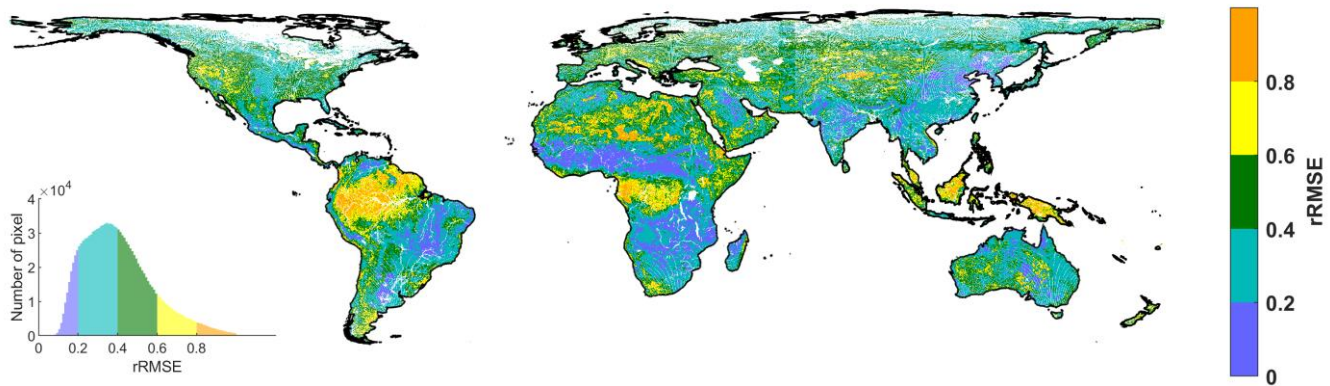
**Figure S1. QSCAT scaled by the linear regression correction method.** The same pixel shown in Fig. 3a in the main text is used here as an example. This figure shows that, unlike the CDF method, the linear regression correction is not affected by the decreasing trend in QSCAT signal.



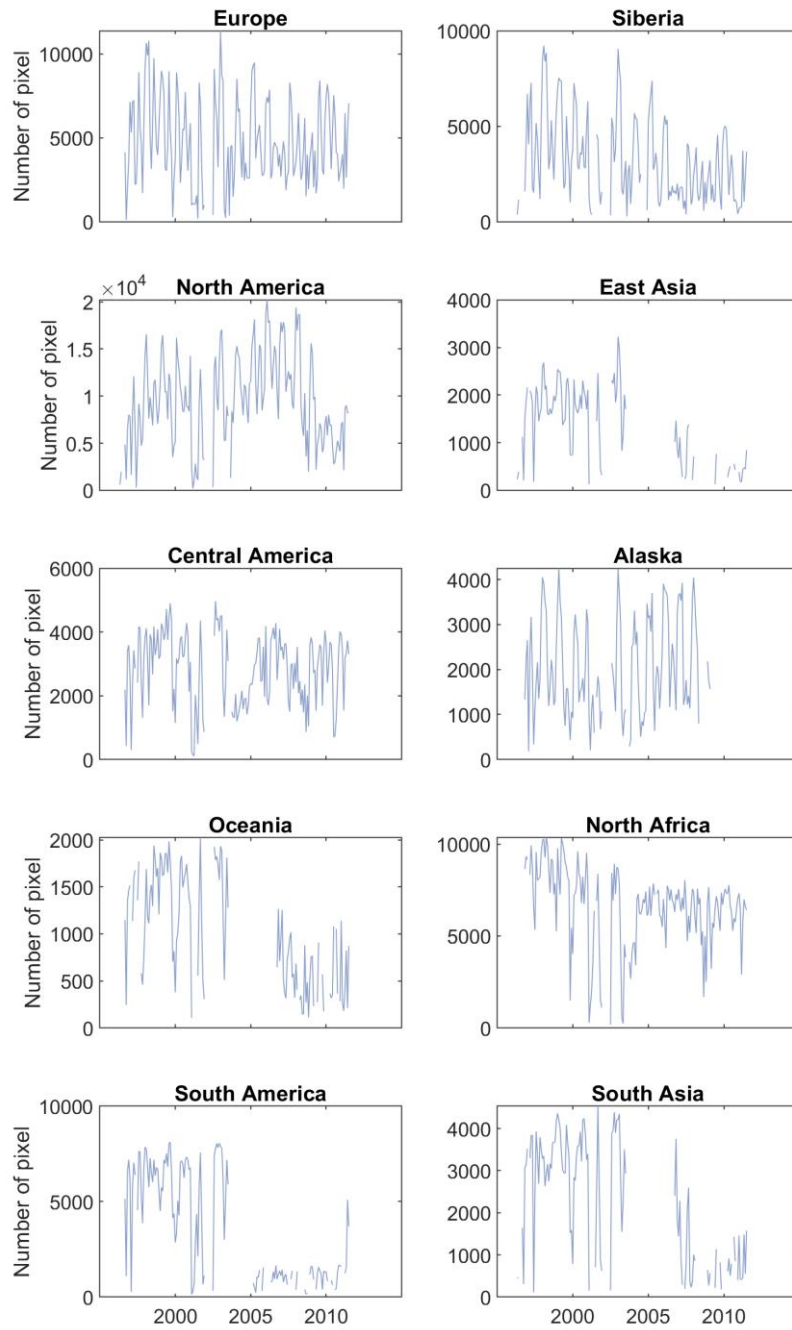
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**Figure S2. rRMSE-based quality assessment of the CScat data set at the pixel level.** Each panel shows the result of one region. Inside each panel, the rRMSE values between the C-band and the scaled Ku-band signals in the overlapping years (1999-2001 and 2007-2009) were calculated for all the pixels in this region and colored in orange. As a comparison, the rRMSE values between the C-band and the corrected Ku-band signals in the overlapping years were also calculated and colored in green. The medians of the rRMSE values are labelled inside each panel.

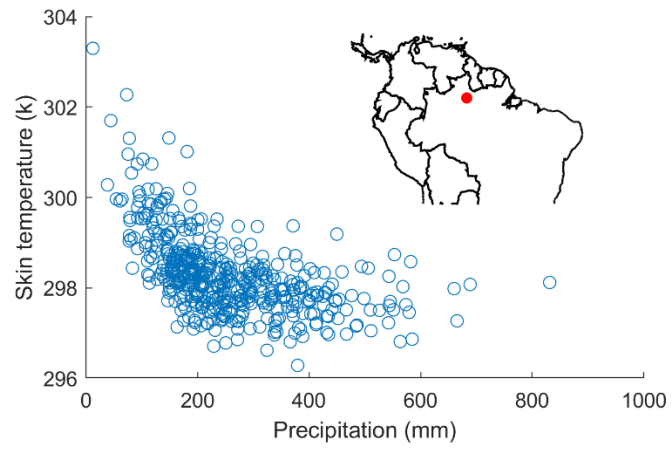
15



**Figure S3. Spatial pattern and histogram of the rRMSE values between the C-band and the final corrected Ku-band signals in the overlapping years (1999-2001 and 2007-2009).**



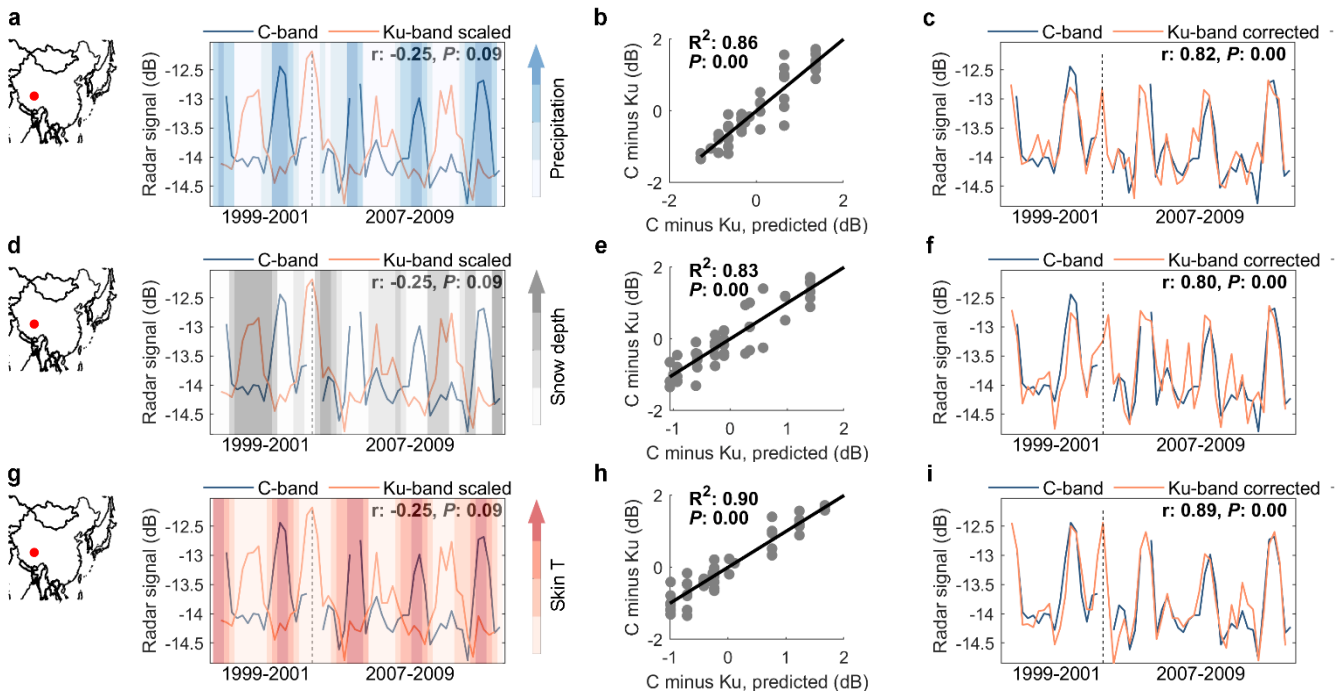
**Figure S4. Regional time series of the pixel numbers of the ESA ERS-2 data.**



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**Figure S5. Relationship between monthly precipitation and skin temperature in one pixel of Amazonia.** The location of the pixel is denoted by the red dot in the map shown in the upper-right corner.

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**Figure S6. Corrections of the Ku-band signal in one pixel of the Tibetan Plateau.** (a-c) illustrate the correction procedure using rainfall as the predictor of the signal differences. (d-f) and (g-i) illustrate the corrections for the same pixel but using snow depth and skin temperature, respectively, as predictors of the signal differences. Notation are the same as those described in the legend of Fig. 4 in the main text.

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