Supplementary to "On the Statistical Relationship between Sea Ice Freeboard and C-Band Microwave Backscatter – A Study with Sentinel-1 and Operation IceBridge"

March 6, 2025
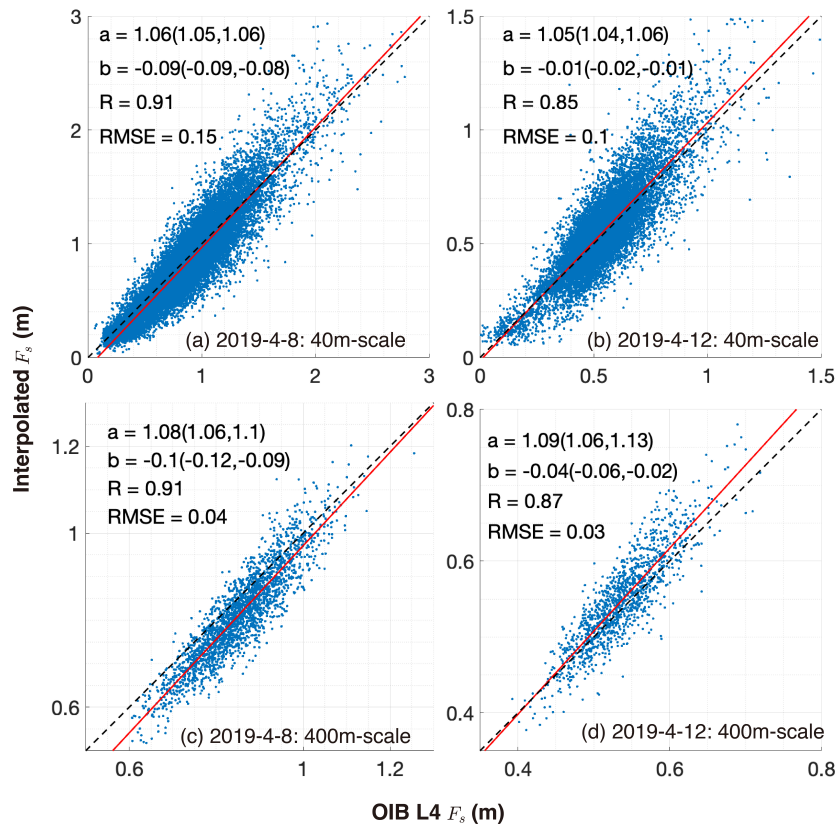
Figure S1: Consistency of the interpolated F_s and the Operation IceBridge (OIB) standard Level 4 product. The $40m$ coarsened F_s based on the $1m$-scale F_s map is compared with the standard OIB product (top row) for both days: April 8th (left column) and April 12th (right column). The along-track 10-footprint mean F_s comparison for both days is shown in the second row.
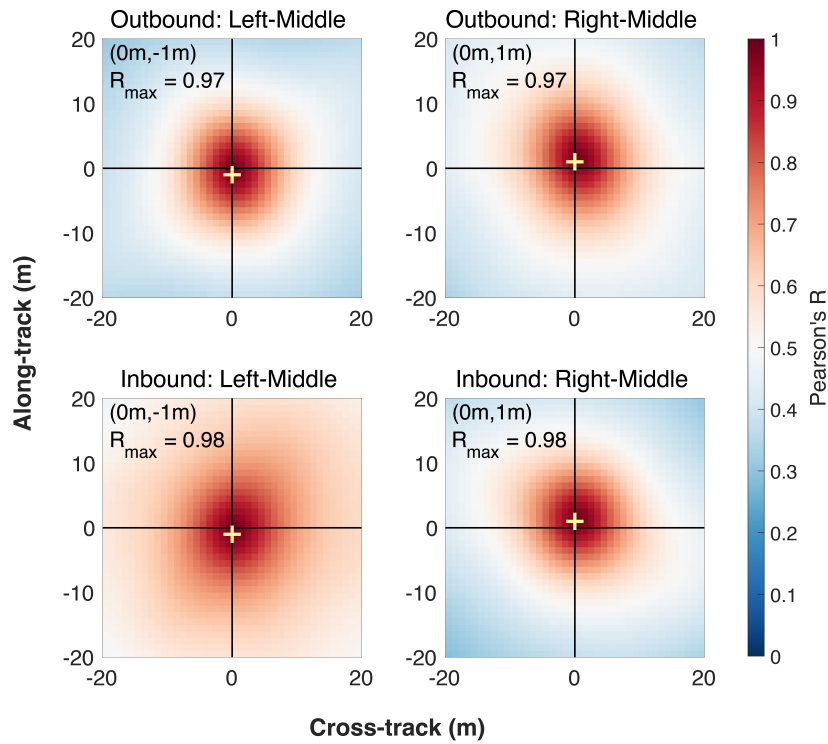
Figure S2: Correlation maps of F_s ($1m$-scale) between different OIB passes for the outbound (top row) and the inbound (bottom row) sample segment on April 8th, 2019 (see also Fig. 2).
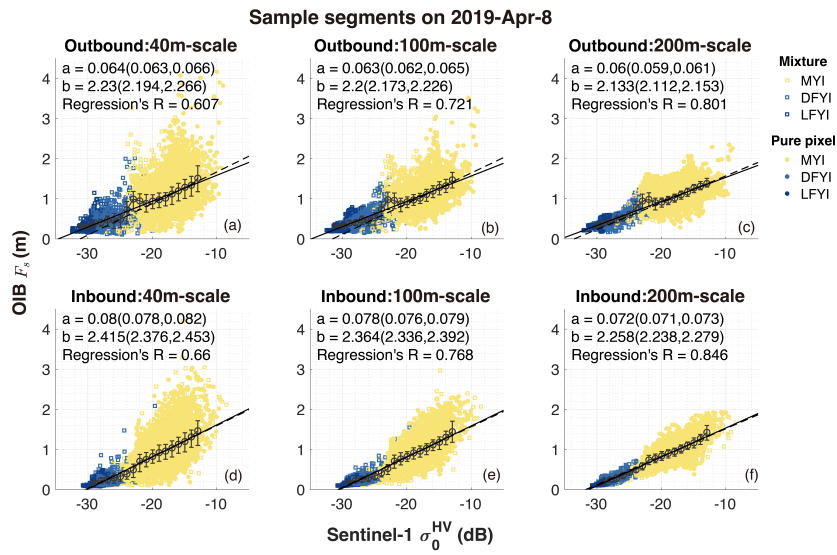
Figure S3: Scattered plot of the relationship between F_s and the Sentinel-1 C-band backscatter (σ_0) in the H-V polarization channel for the sample segment on April 8th, 2019. Same as in Fig. 2, three spatial scales of F_s are adopted for matching to the $40m$-resolution σ_0 product: $40m$ (left column), $100m$ (middle column) and $200m$ (right column).
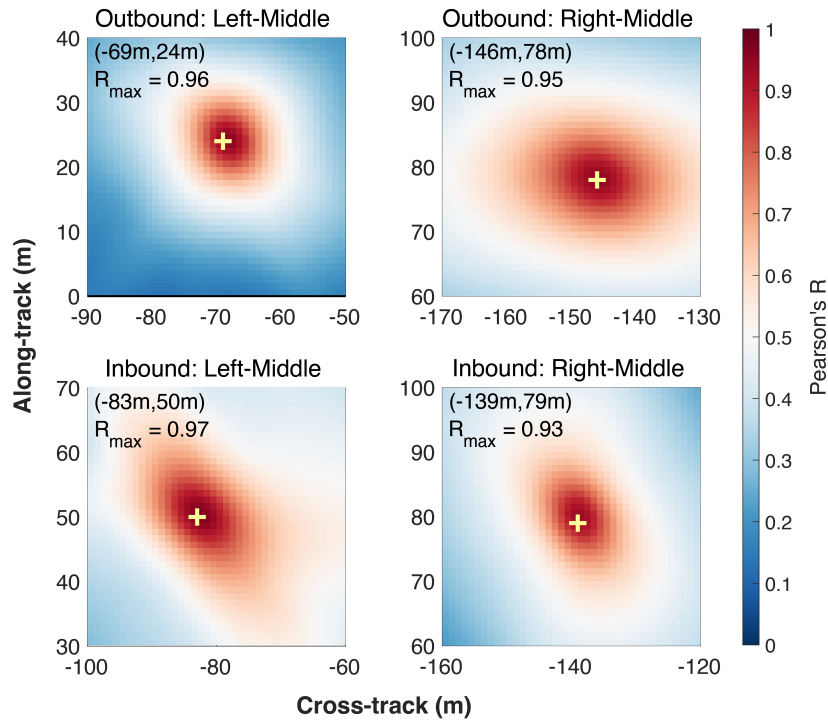
Figure S4: Same as Fig. S2, but for the sample segment on April 12th, 2019 (see also Fig. 3).
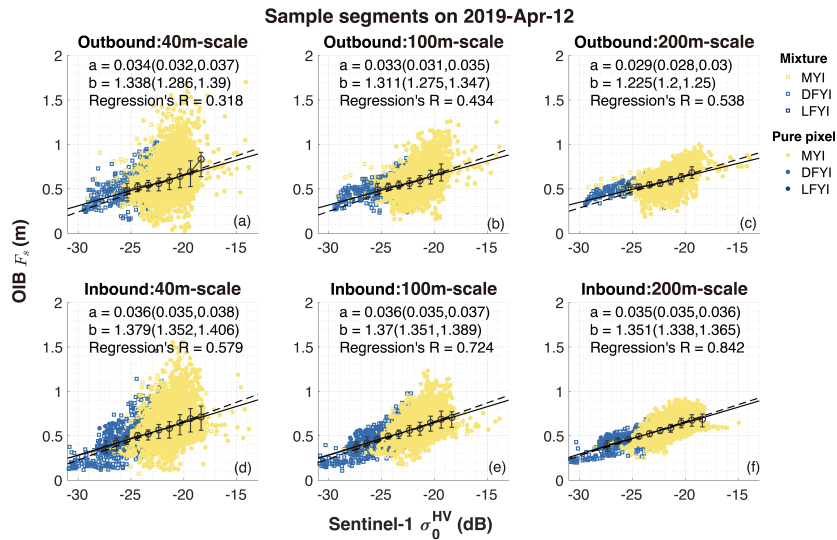
Figure S5: Same as Fig. S3, but for the sample segment on April 12th, 2019.
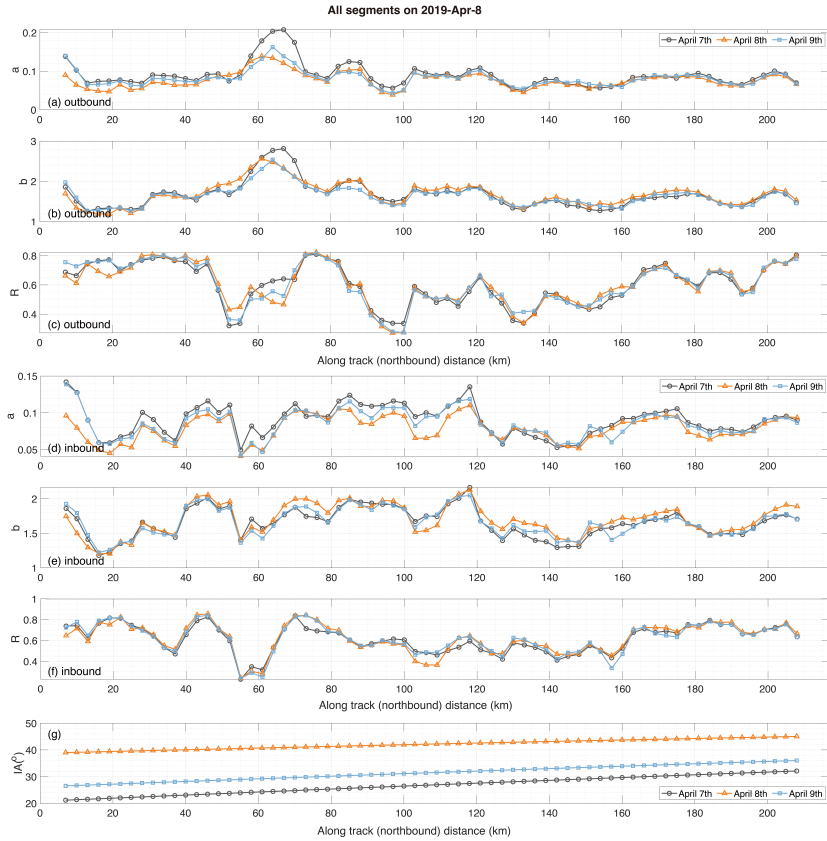
Figure S6: The linear regression($\overline{F_s} = a \cdot \sigma_0 + b$) are established using the $200m$-scale OIB F_s and $40m$-scale σ_0 for all segments on April 8th(panels a-f). The σ_0 data were derived from three Sentinel-1 images acquired on April 7th, 8th, and 9th. The corresponding IA variations along the whole OIB track on April 8th are shown in panel g.
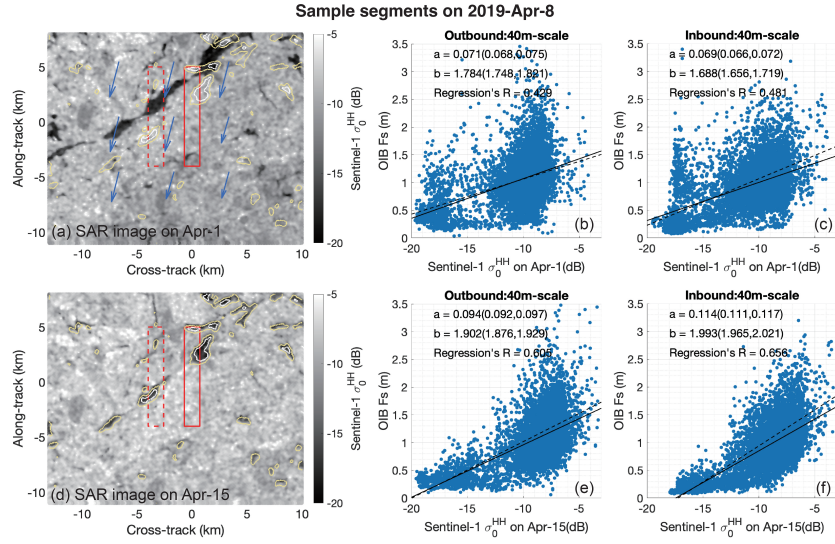
Figure S7: Collocation between the F_s map for the sample segment on April 8th and the Sentinel-1 maps (σ_0^{HH}) from April 1st (top row) and April 12th (second row).
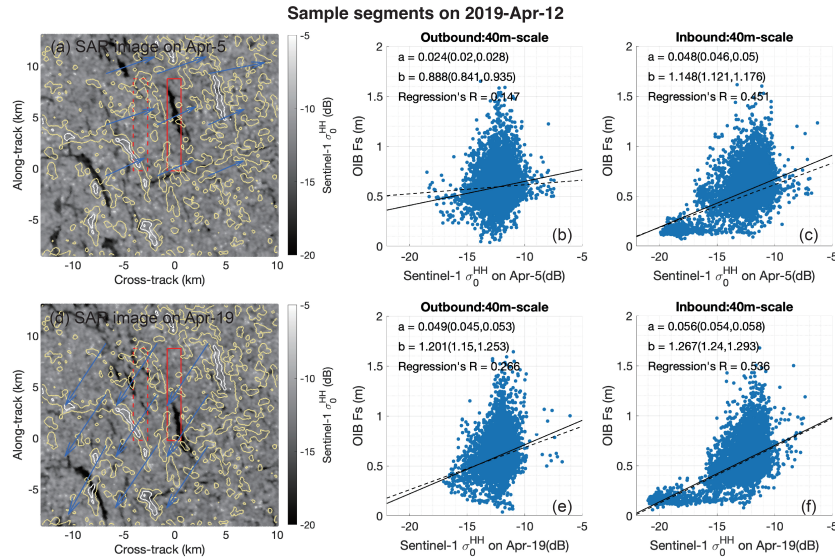
Figure S8: Collocation between the F_s map for the sample segment on April 12th and the Sentinel-1 maps (σ_0^{HH}) from April 5th (top row) and April 19th (second row).
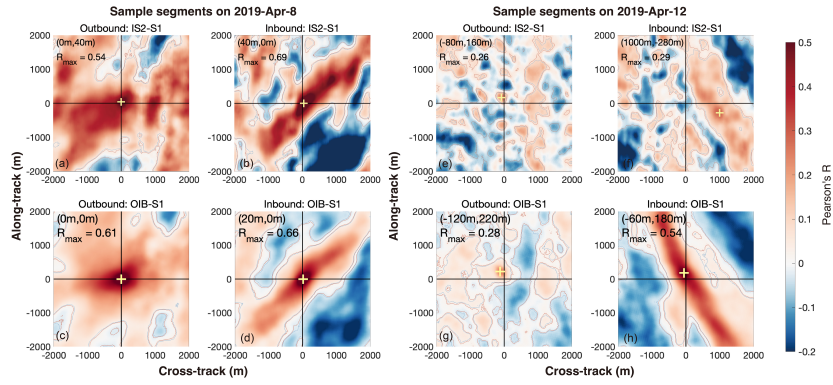
Figure S9: Correlation maps of F_s on IS2 strong and weak beam segments and Sentinel-1 backscatter (HH channel) for the sample segment on April 8th (left panels) and 12th (right panels). The correlation maps in Fig. 2 and 3 are also shown in the lower row for comparison.