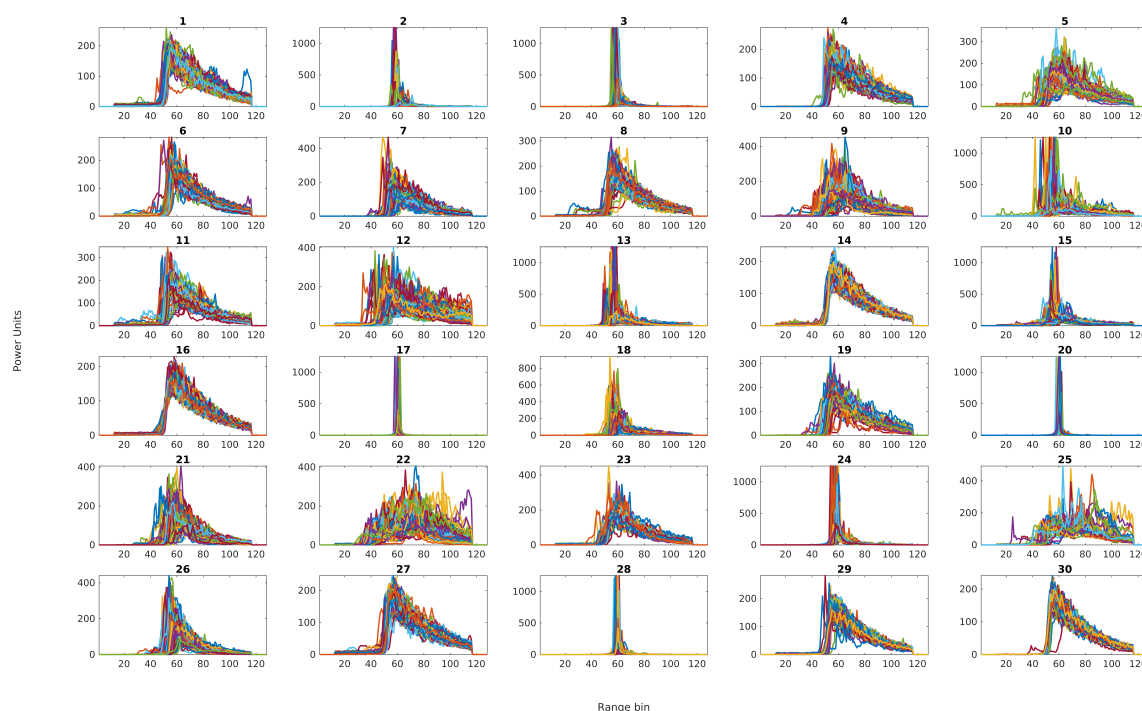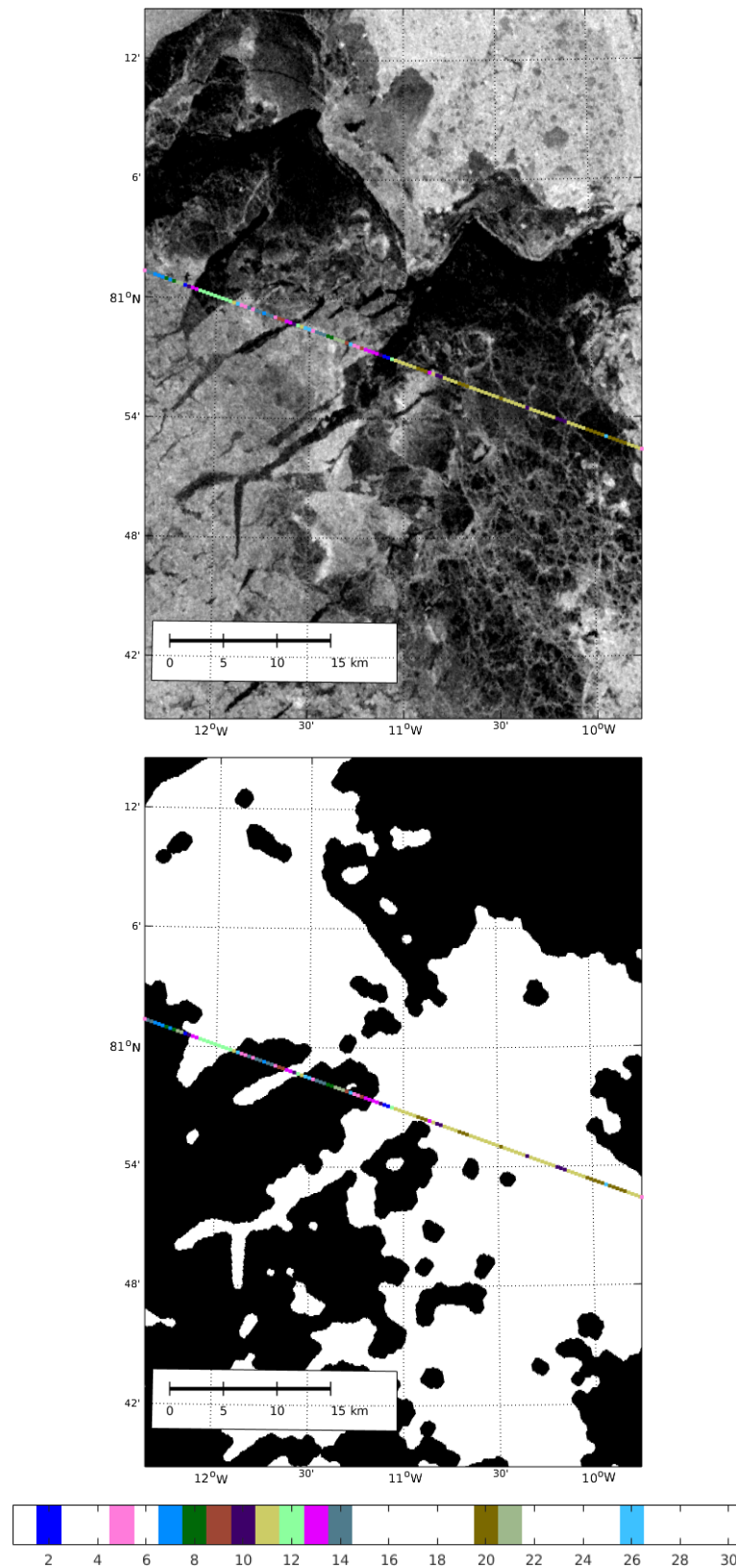# Supplementary Materials: Monitoring the Arctic seas: How satellite altimetry can be used to detect open water in sea-ice regions
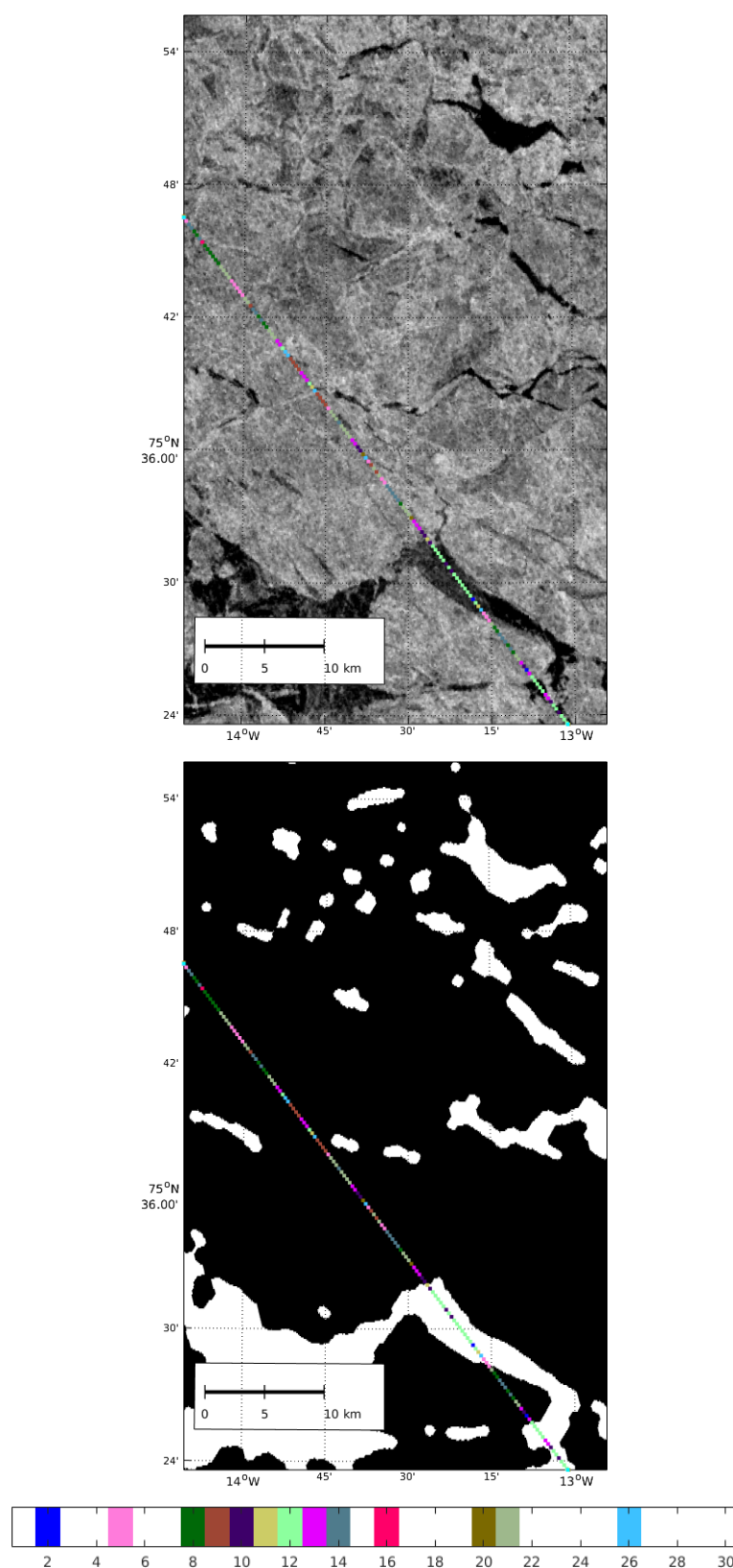
Felix L. Müller*, Denise Dettmering, Wolfgang Bosch, and Florian Seitz
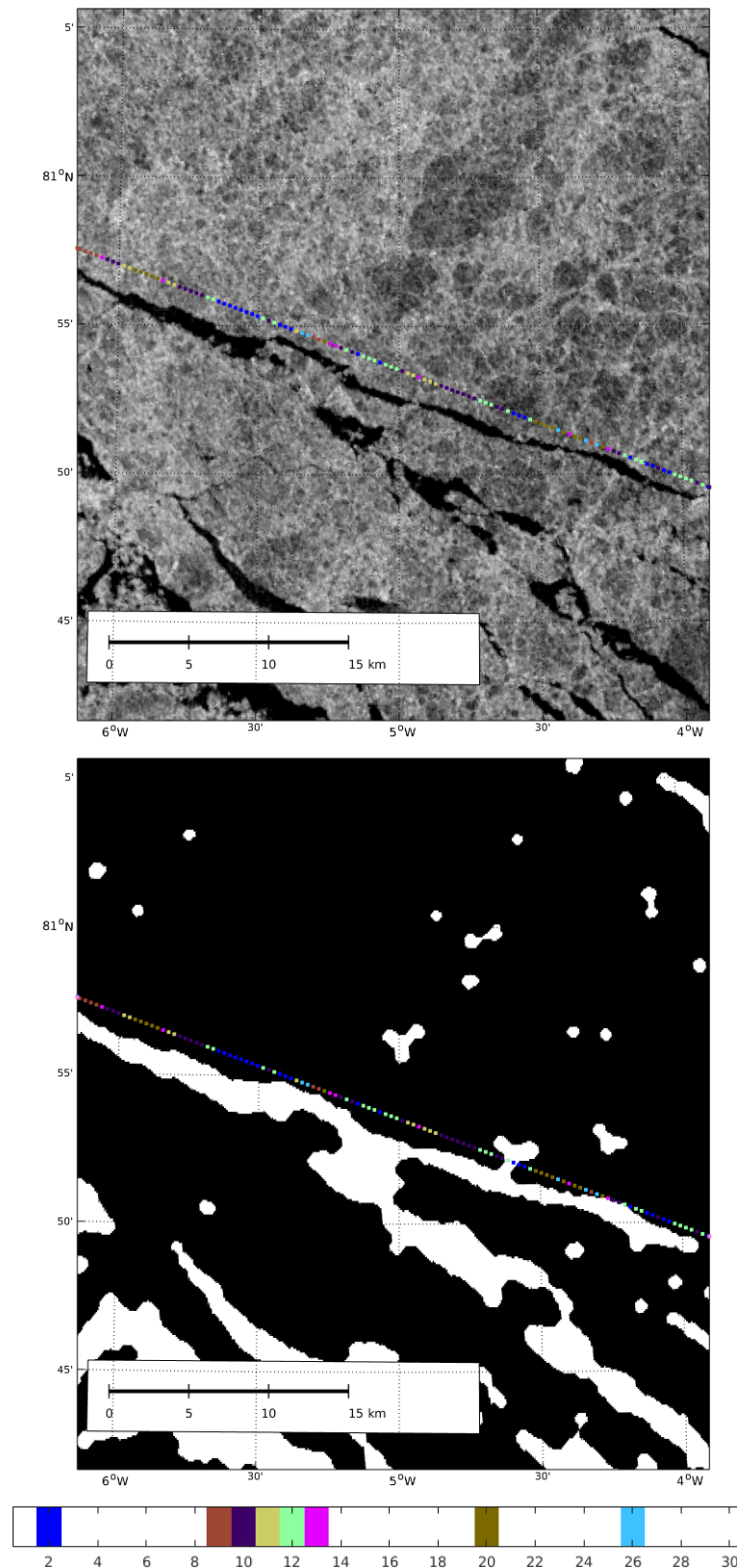

Figure S1. SARAL waveform clusters (K=30) after K-medoids clustering showing segmented waveforms (every twenty fifth per cluster).

Figure S2. Unassigned classification results for Envisat open water detection in comparison with the ALOS image before (top) and after (bottom) SAR processing. Cluster numbers are indicated by different colors. Clusters displayed in white are not included in the track. Clusters 1, 3, 6, 18, 22, 23, 25, 27-29 represent ocean, 2, 10-12, 20, 26 lead/polynya and 5, 7-9, 13, 14, 16, 21, 24, 30 ice waveforms. Remaining clusters are set to undefined.
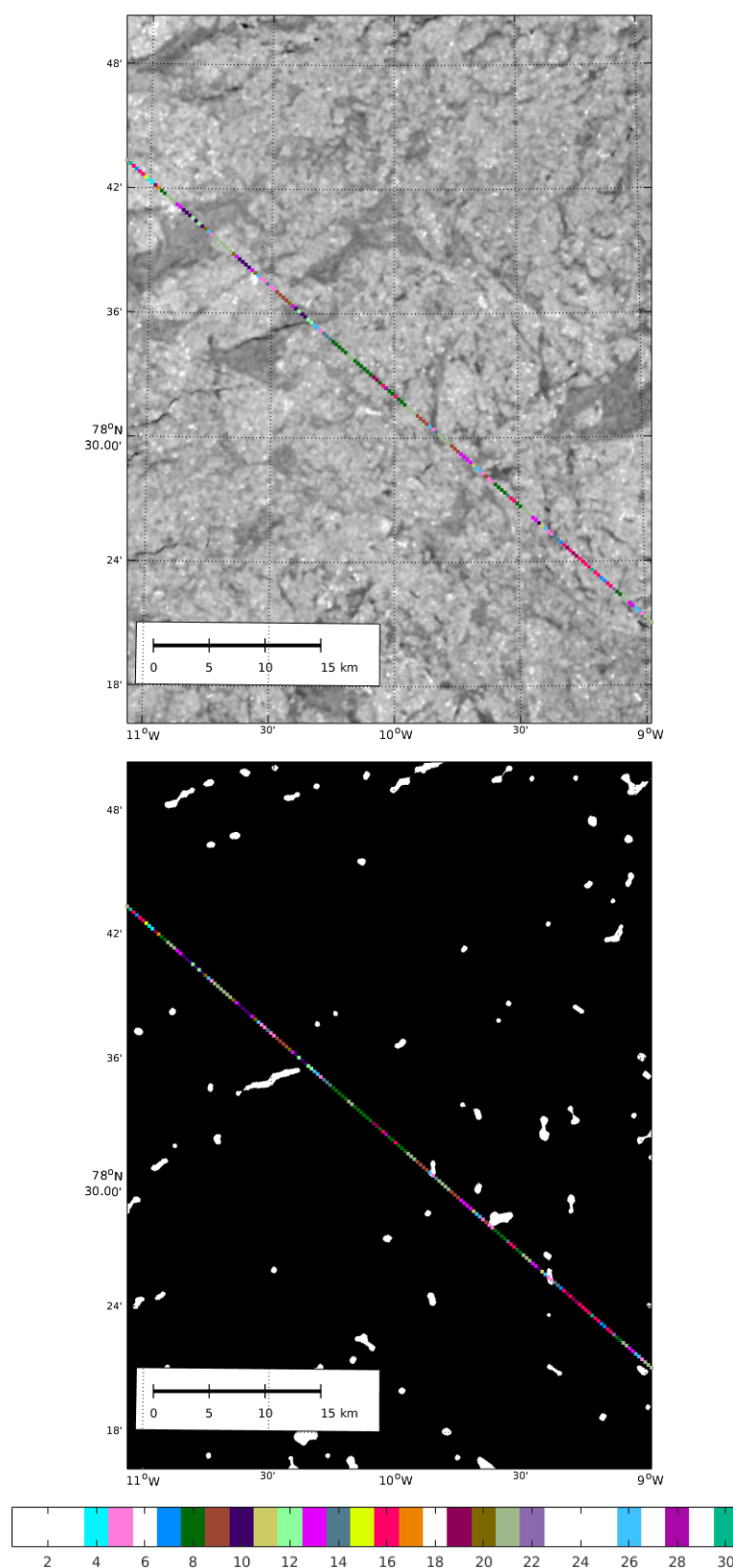
Figure S3. Unassigned classification results for Envisat open water detection in comparison with the ALOS image before (top) and after (bottom) SAR processing. Cluster numbers are indicated by different colors. Clusters displayed in white are not included in the track. Clusters 1, 3, 6, 18, 22, 23, 25, 27-29 represent ocean, 2, 10-12, 20, 26 lead/polynya and 5, 7-9, 13, 14, 16, 21, 24, 30 ice waveforms. Remaining clusters are set to undefined.
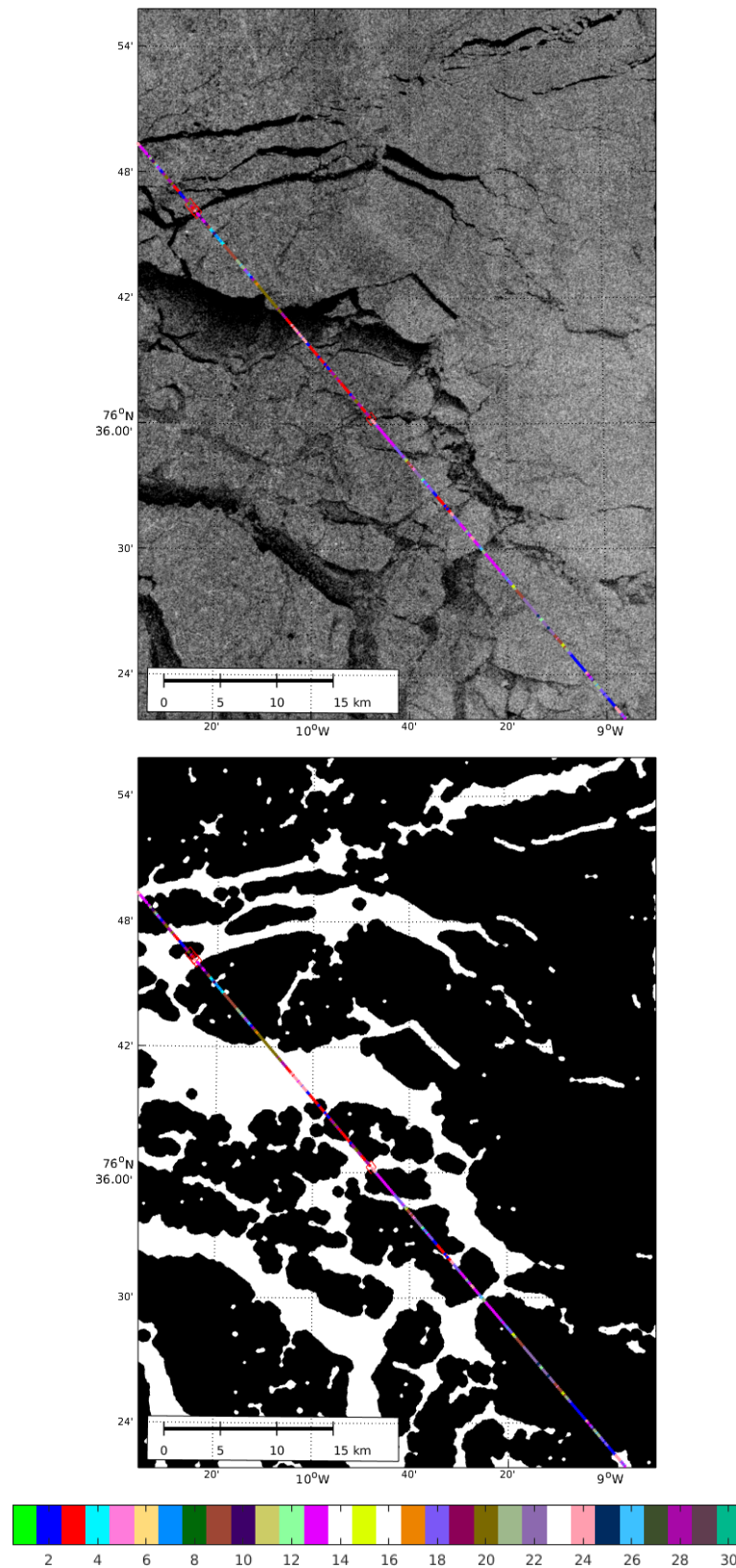
Figure S4. Unassigned classification results for Envisat open water detection in comparison with the ALOS image before (top) and after (bottom) SAR processing. Cluster numbers are indicated by different colors. Clusters displayed in white are not included in the track. Clusters 1, 3, 6, 18, 22, 23, 25, 27-29 represent ocean, 2, 10-12, 20, 26 lead/polynya and 5, 7-9, 13, 14, 16, 21, 24, 30 ice waveforms. Remaining clusters are set to undefined.

Figure S5. Unassigned classification results for Envisat open water detection in comparison with the Radarsat-2 image before (top) and after (bottom) SAR processing. Cluster numbers are indicated by different colors. Clusters displayed in white are not included in the track. Clusters 1, 3, 6, 18, 22, 23, 25, 27-29 represent ocean, 2, 10-12, 20, 26 lead/polynya and 5, 7-9, 13, 14, 16, 21, 24, 30 ice waveforms. Remaining clusters are set to undefined.

Figure S6. Unassigned classification results for SARAL open water detection in comparison with the S-1A image before (top) and after (bottom) SAR processing. Cluster numbers are indicated by different colors. Clusters displayed in white are not included in the track. Clusters 1, 14, 16, 29, 30 represent ocean, 17, 20, 28 lead/polynya and 2, 3, 7, 9, 10, 12, 13, 15, 18, 21, 22, 24, 26 ice waveforms. Remaining clusters are set to undefined. Saturated waveforms are marked by a red diamond shape.