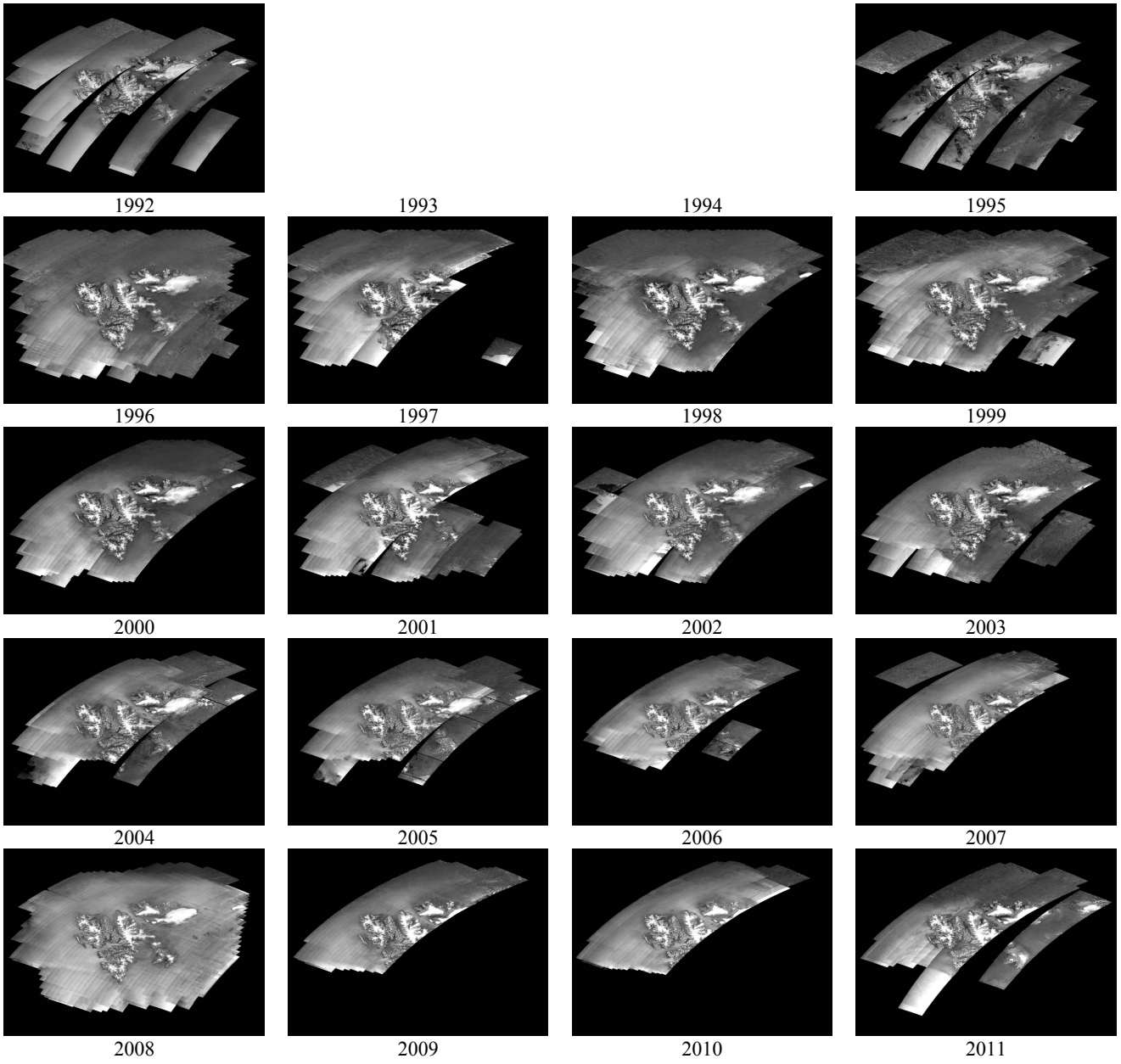

Figure S1. Mosaics of the ERS-1/2 average backscatter intensity from November to April of every year between 1992 and 2011 for the descending orbits. Note that years in the legend refer to the start of the winter, i.e., 1996 means e.g. November 1995 to April 1996.

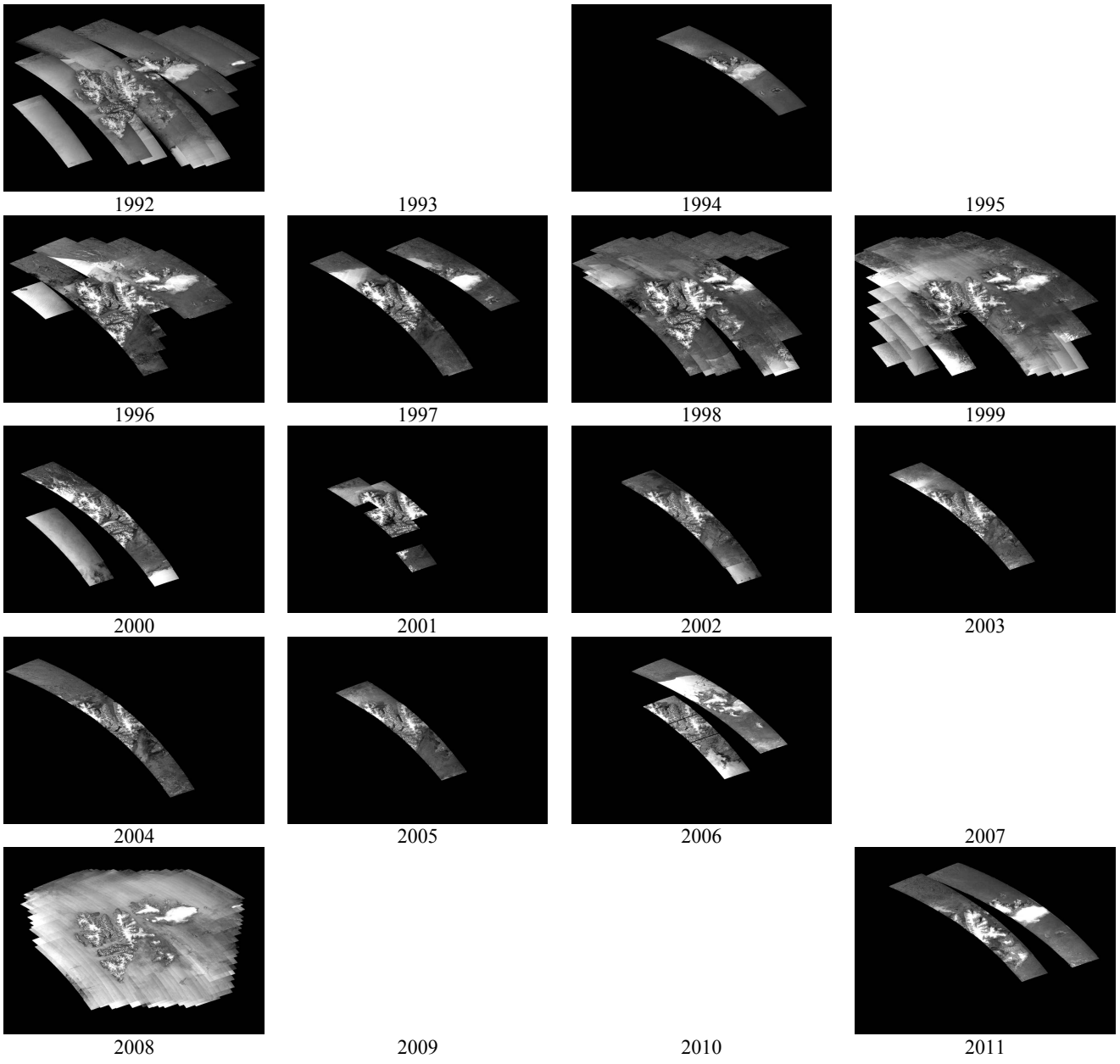

Figure S2. Mosaics of the ERS-1/2 average backscatter intensity from November to April of every year between 1992 and 2011 for the ascending orbits. Note that years in the legend refer to the start of the winter, i.e., 1996 means e.g. November 1995 to April 1996.

Figure S3. Mosaics of the JERS-1 SAR backscatter intensity for the months November to April of every year between 1992 and 1998. Note that the year refer to the end of the winter, i.e., 1993 means e.g. the winter season November 1992 to April 1993. Outlines from the Randolph Glacier Inventory 7.0 (RGI 7.0 Consortium, 2023) are shown in black.

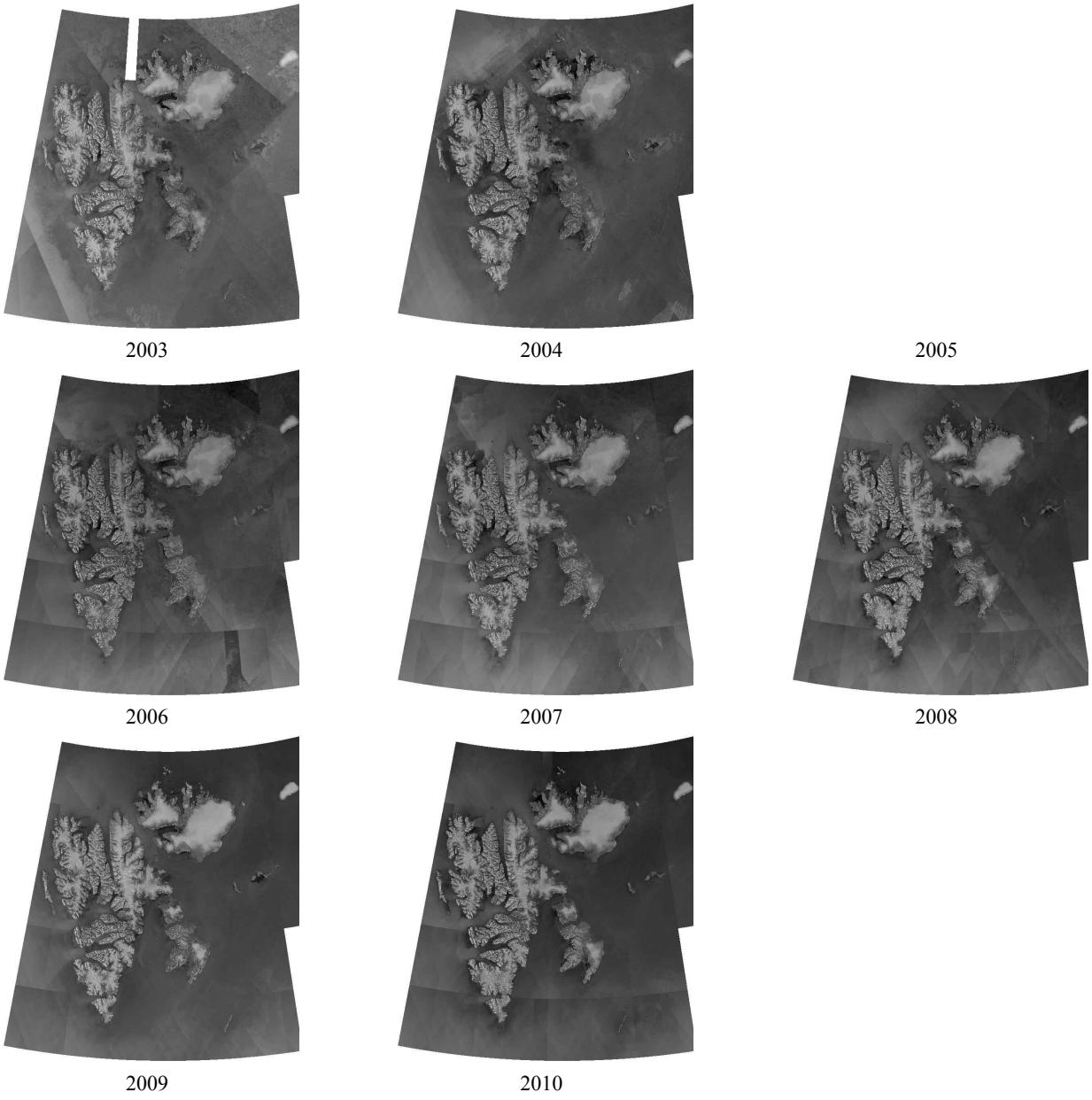

Figure S4. Mosaics of the ENVISAT ASAR backscatter intensity from January to March of every year between 2003 and 2010. Note that there are no acquisitions in the period from January to March 2005.

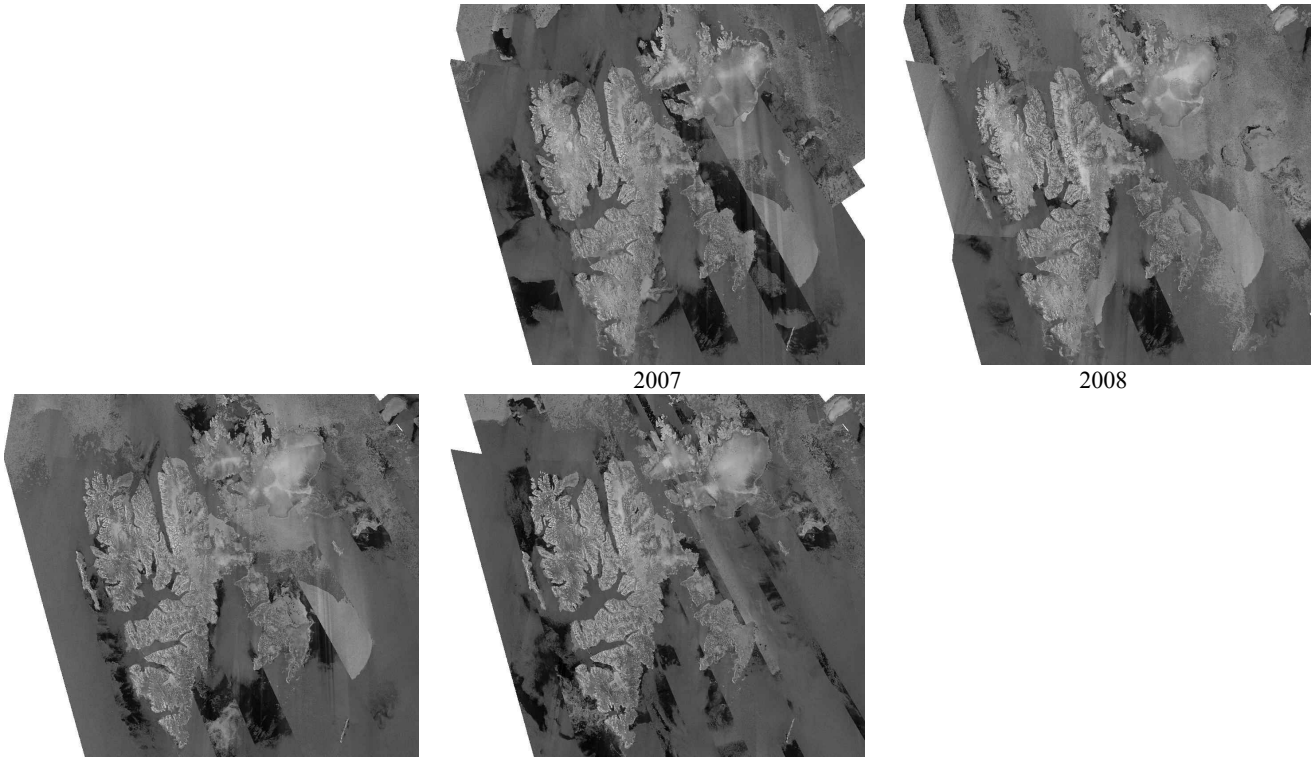

Figure S5. Mosaics of the yearly ALOS PALSAR backscatter intensity between 2007 and 2010.

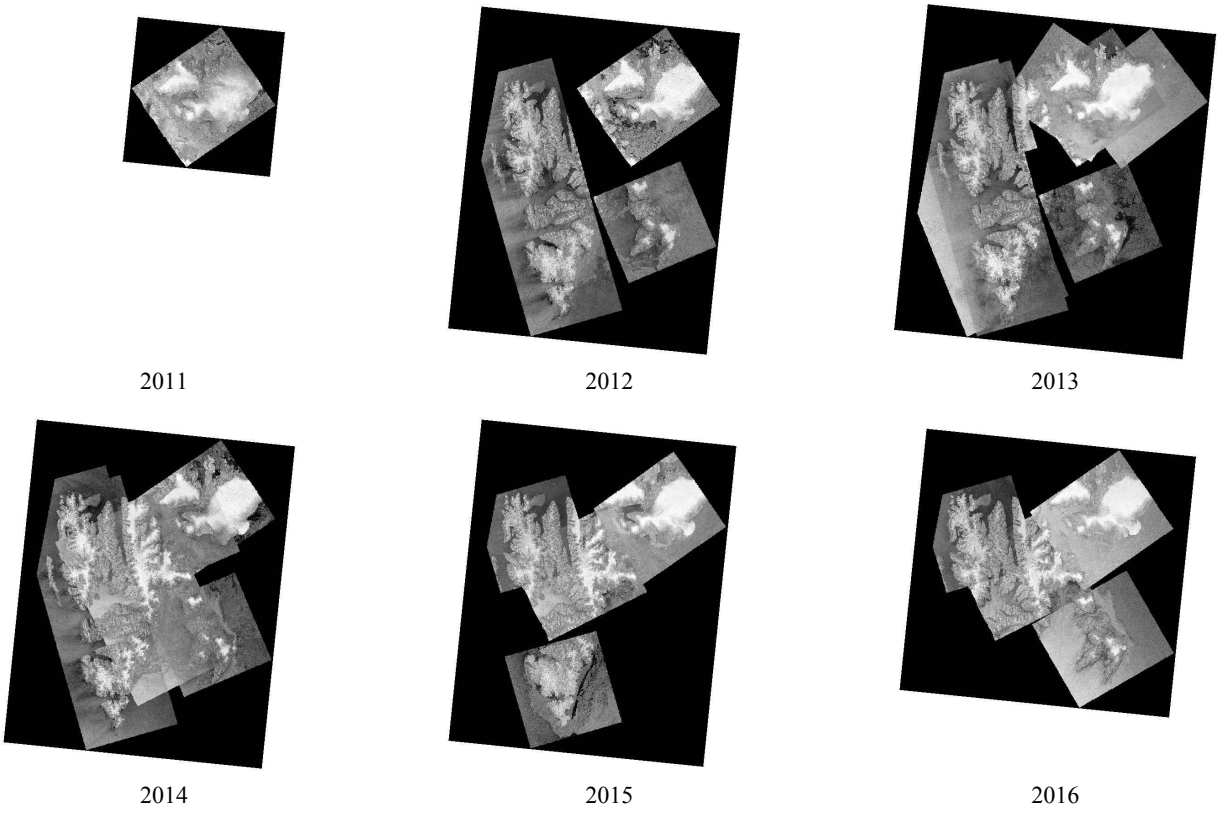

Figure S6. Mosaics of the RADARSAT-2 average backscatter intensity from October to April of every year between 2011 and 2016. Note that years in the legend refer to the end of the winter, i.e., 2016 means e.g. October 2015 to April 2016.

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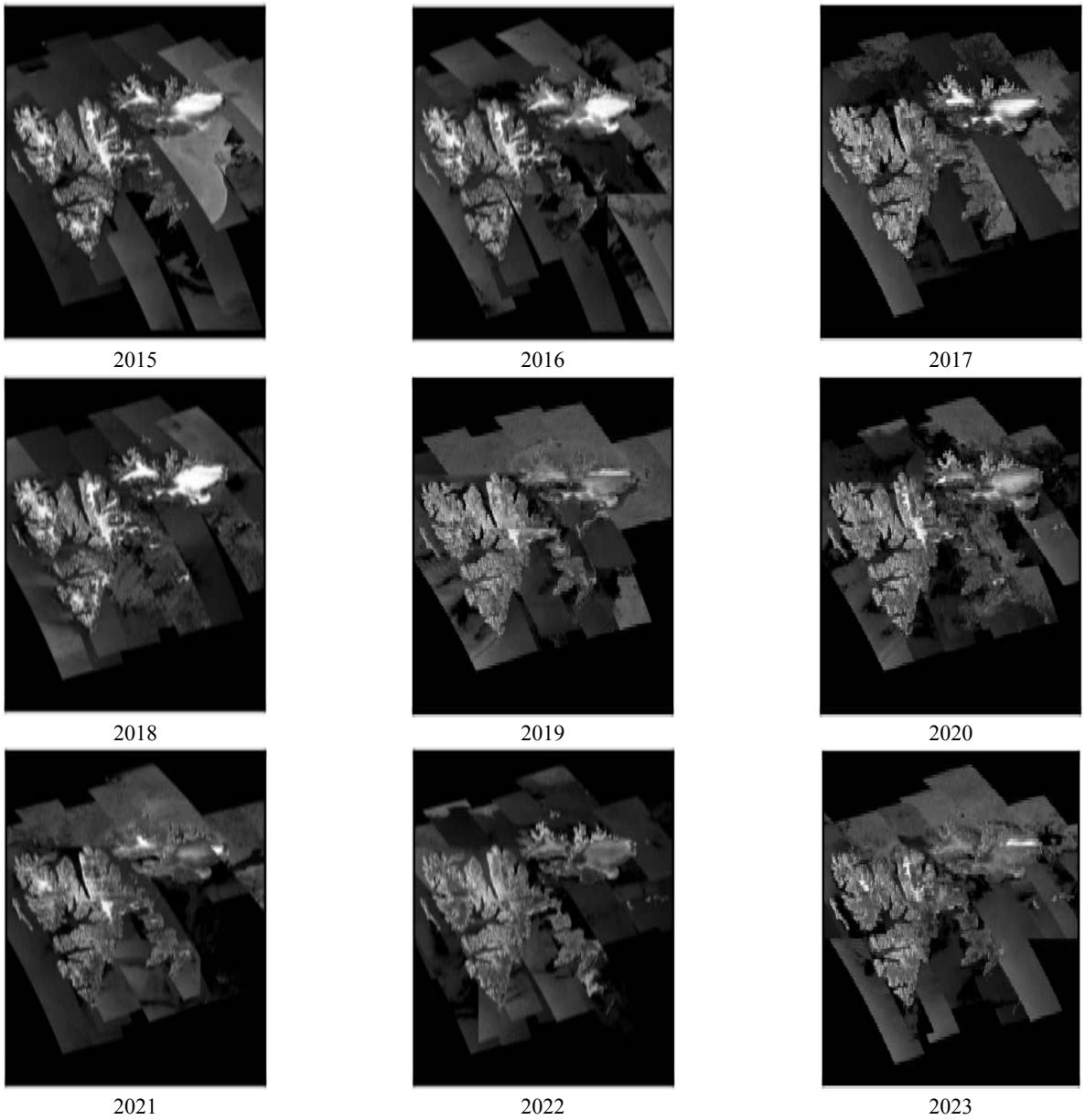
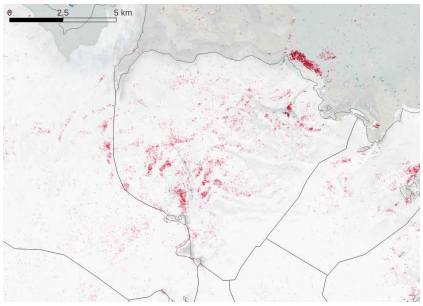
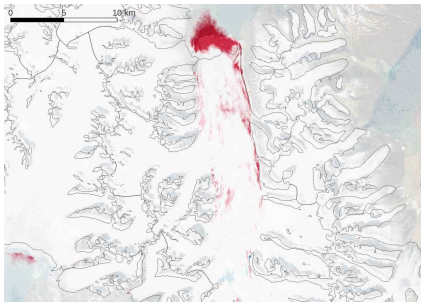


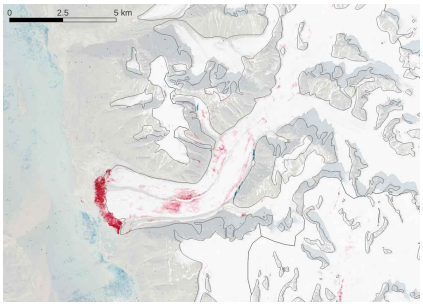
Figure S7. Mosaics of the yearly ALOS-2 PALSAR-2 backscatter intensity between 2015 and 2023.



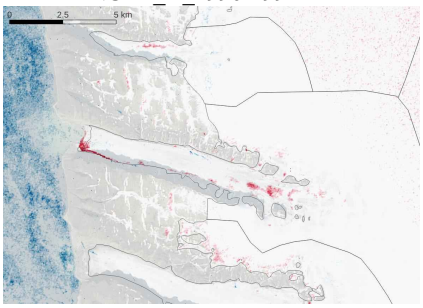
NULL_D_1996-1992



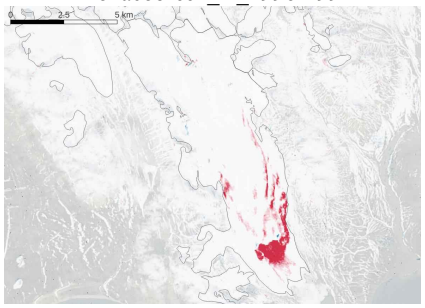
Monacobreen_D_1996-1992



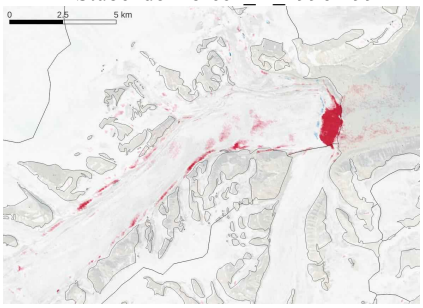
Stubendorffbreen_D_1996-1992



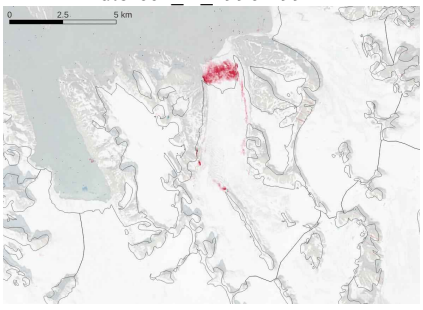
Midtbreen_A_1996-1992



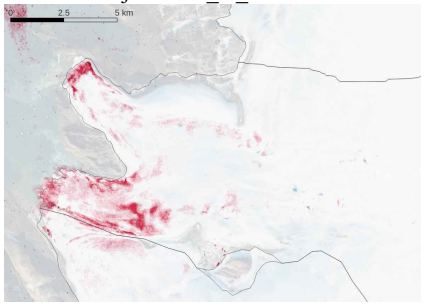
Fridtjovbreen_D_1996-1992



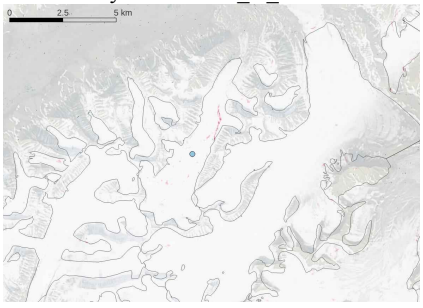
Chydeniusbreen_D_2002-1999



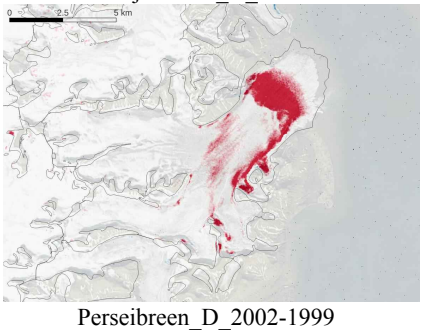
Mendelejevbreen_D_1999-1998



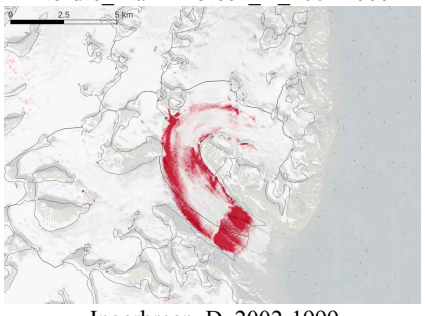
Nordre_Franklinbreen_D_2002-1999



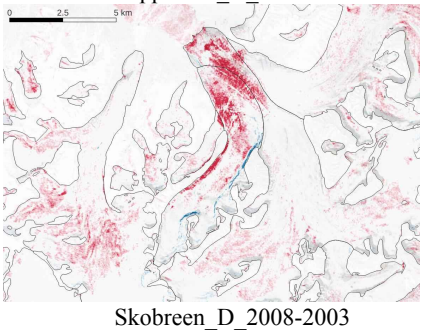
Kroppbreen_D_2002-1999



Perseibreen_D_2002-1999



Ingerbreen_D_2002-1999



Skobreen_D_2008-2003

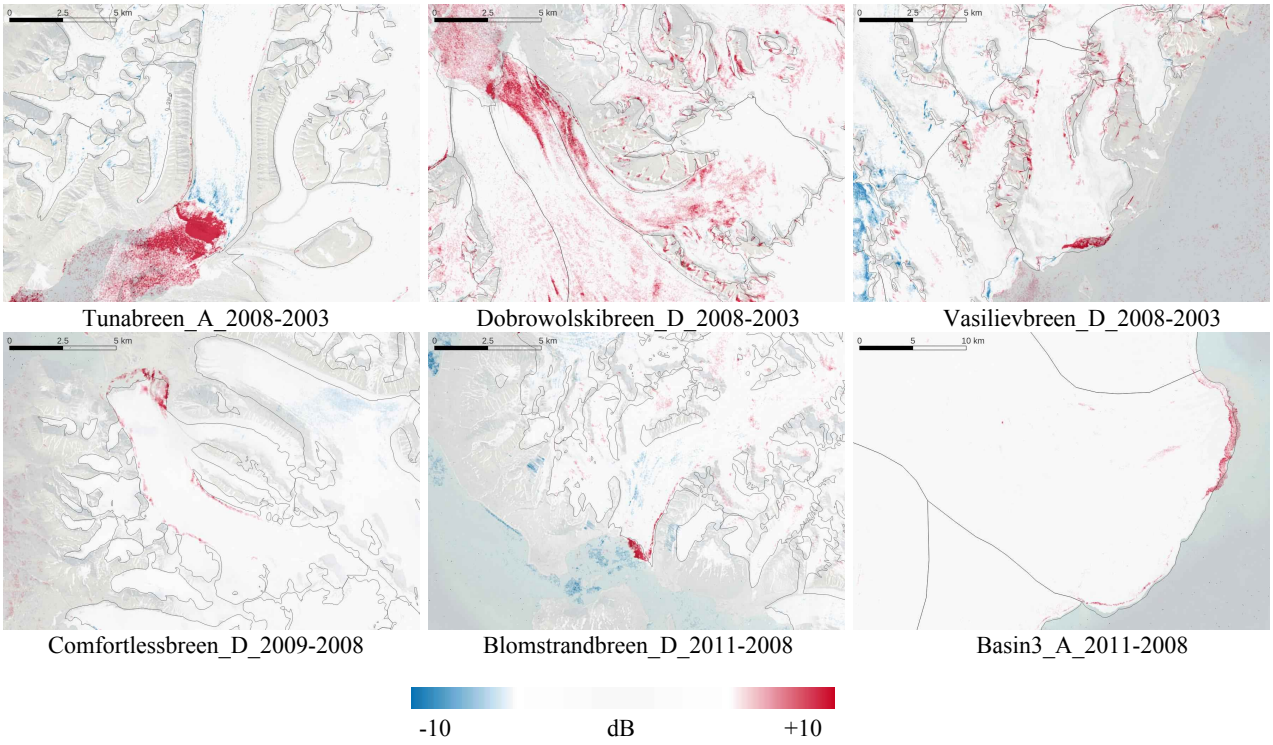


Figure S8. ERS-1/2 backscattering intensity change images for the surge-type events mapped over Svalbard over the period 1992-2011. The name of the glacier, the orbit direction (A: ascending, D: descending) and the dates of the winter mosaics are indicated below each image. Note that years in the legend refer to the end of the winter, i.e., 1996 means e.g. November 1995 to April 1996.

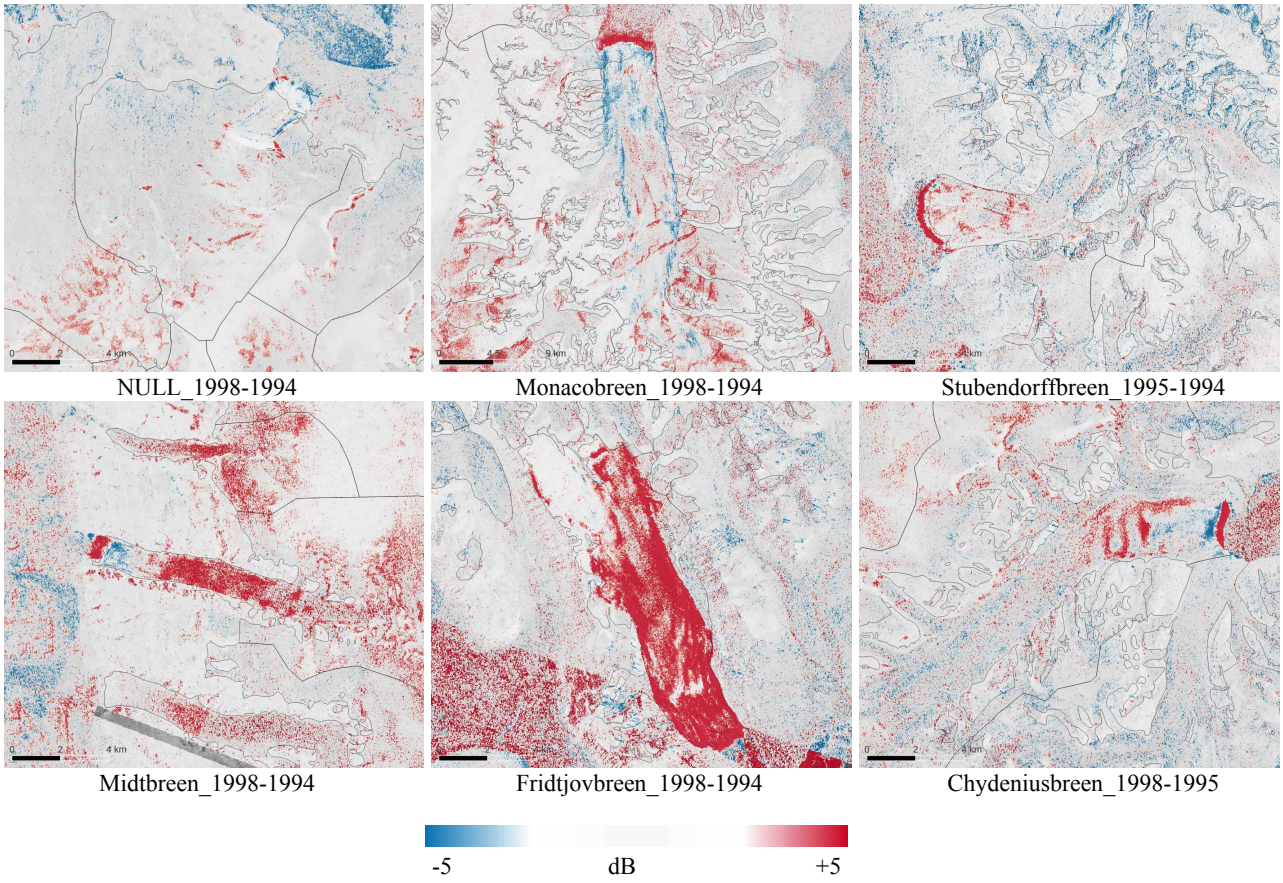
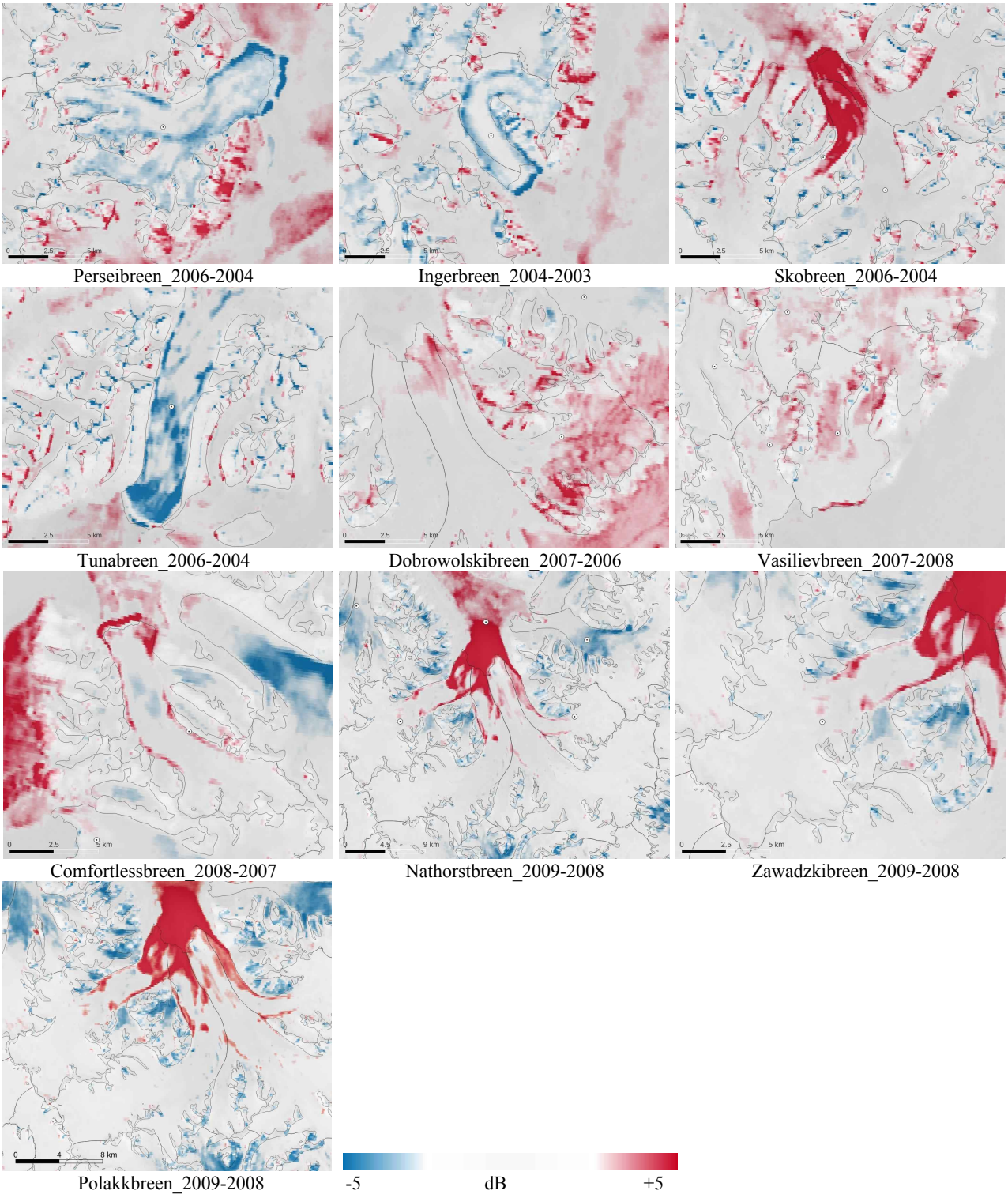


Figure S9. JERS-1 backscattering intensity change images for the surge-type events mapped over Svalbard over the period 1993-1998. The name of the glacier and the dates of the winter mosaics are indicated below each image. Note that years in the legend refer to the end of the winter, i.e., 1995 means e.g. the winter season 1994 to 1995.

Figure S10. ENVISAT ASAR backscattering intensity change images for the surge-type events mapped over Svalbard over the period 2003-2010. The name of the glacier and the dates of the winter mosaics are indicated below each image.


Perseibreen_2006-2004
Ingerbreen_2004-2003
Skobreen_2006-2004
Tunabreen_2006-2004
Dobrowolskibreen_2007-2006
Vasilievbreen_2007-2008
Comfortlessbreen_2008-2007
Nathorstbreen_2009-2008
Zawadzkibreen_2009-2008
Polakkbreen_2009-2008
-5
dB
+5

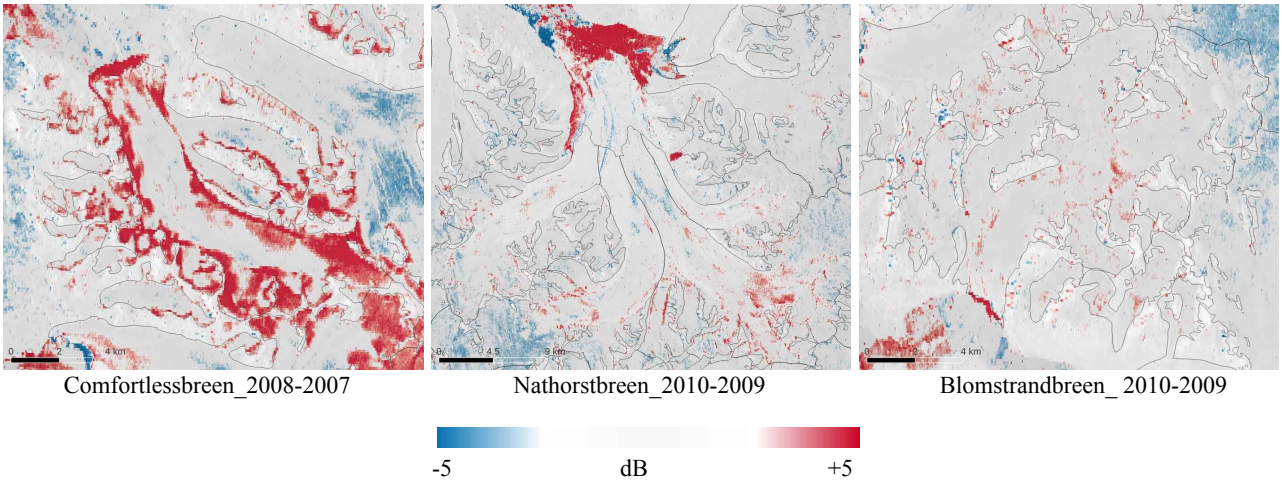


Figure S11. ALOS PALSAR backscattering intensity change images for the surge-type events mapped over Svalbard over the period 2007-2010. The name of the glacier and the dates of the yearly mosaics are indicated below each image. The Nathorstbreen glacier system also includes Zawadzkibreen and Polakkbreen.

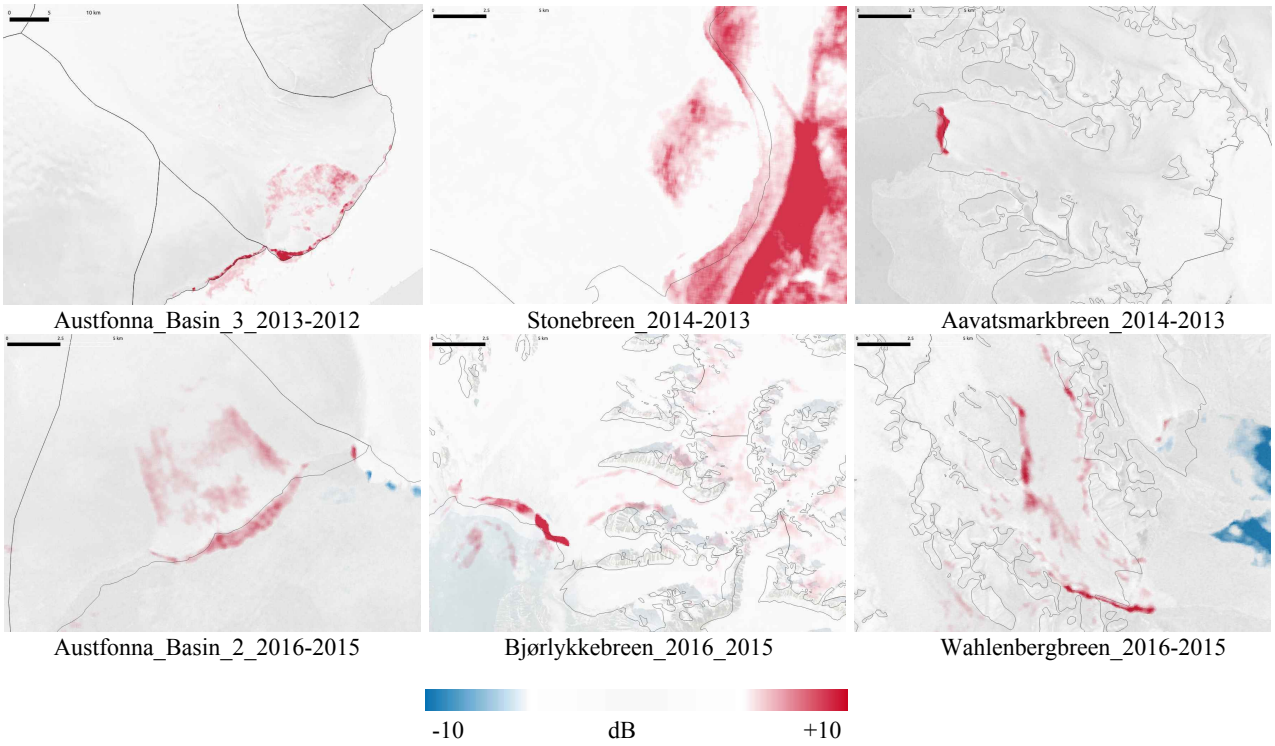


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Figure S12. Radarsat-2 backscattering intensity change images for the surge-type events mapped over Svalbard over the period 2012-2015. The name of the glacier and the dates of the winter mosaics are indicated below each image. Note that years in the
790 **legend refer to the end of the winter, i.e., 2016 means e.g. October 2015 to April 2016.**

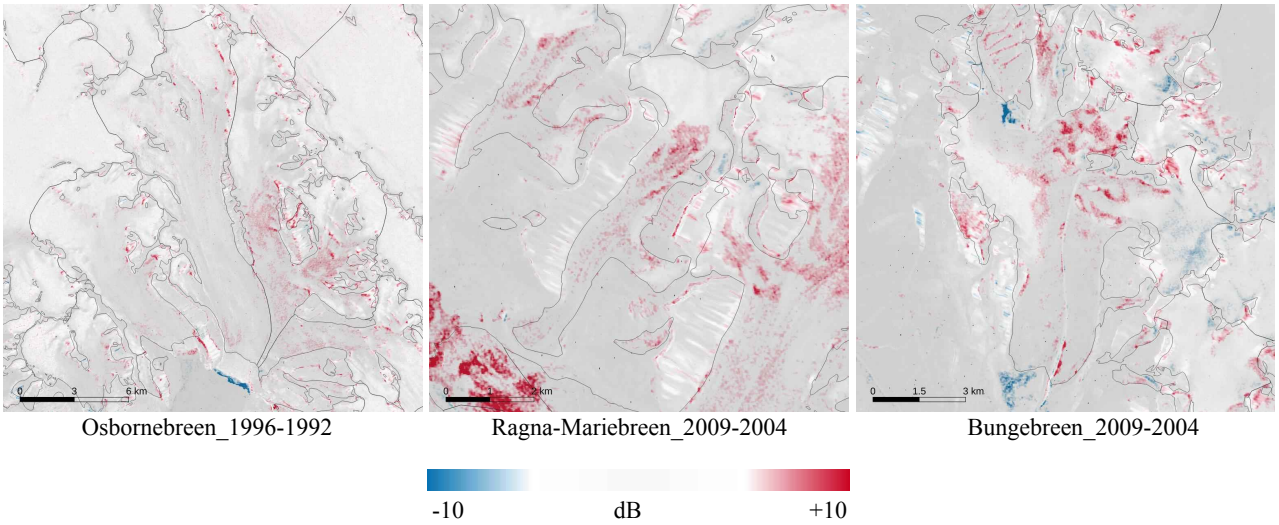

Figure S13. ERS-1/2 backscattering intensity change images for glaciers over Svalbard indicated as surge type or with strong evidence for surging in the earlier catalogues of the 1990s and 2000s, but with no clear indication of an increase or decrease in backscattering. The name of the glacier and the dates of the winter mosaics are indicated below each image. Note that years in the legend refer to the end of the winter, i.e., 1995 means e.g. the winter season 1994 to 1995.

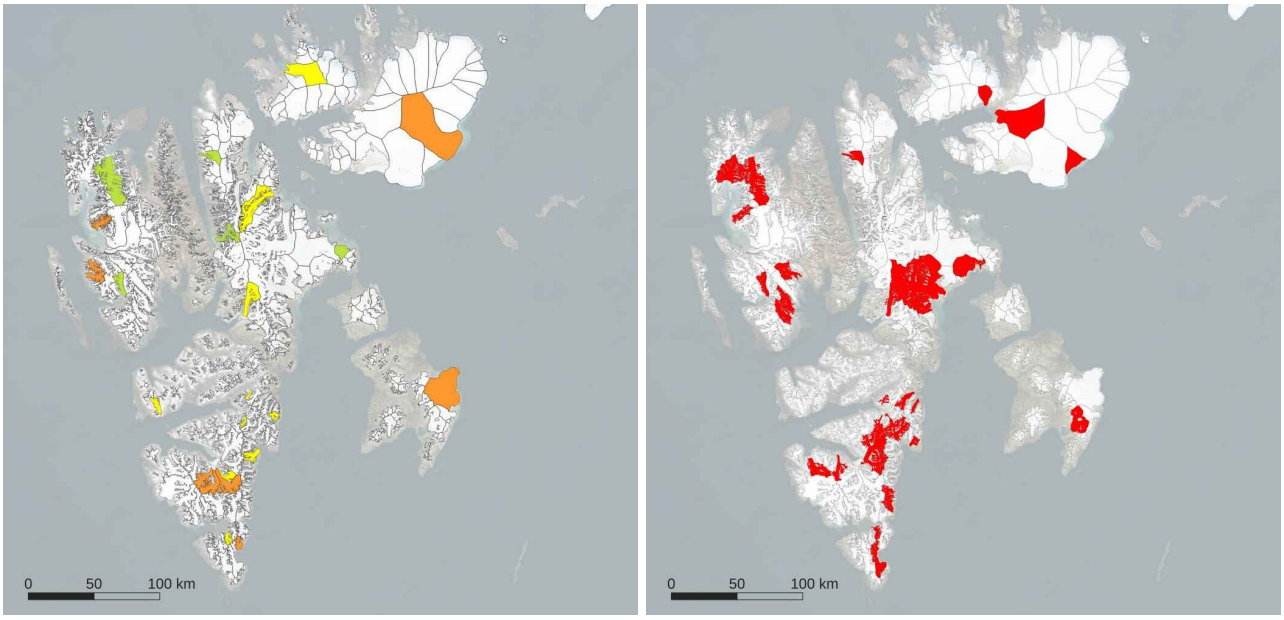

Figure S14. Surge events interpreted over Svalbard in the period 1992-2025 using ERS-1/2 SAR, JERS-1 SAR, ENVISAT ASAR, ALOS PALSAR, Radarsat-2 and Sentinel-1 data listed by start date. Left: green is before 1994, yellow is 1995-2005 and orange is 2005-2014. Right: red is 2015-2025.