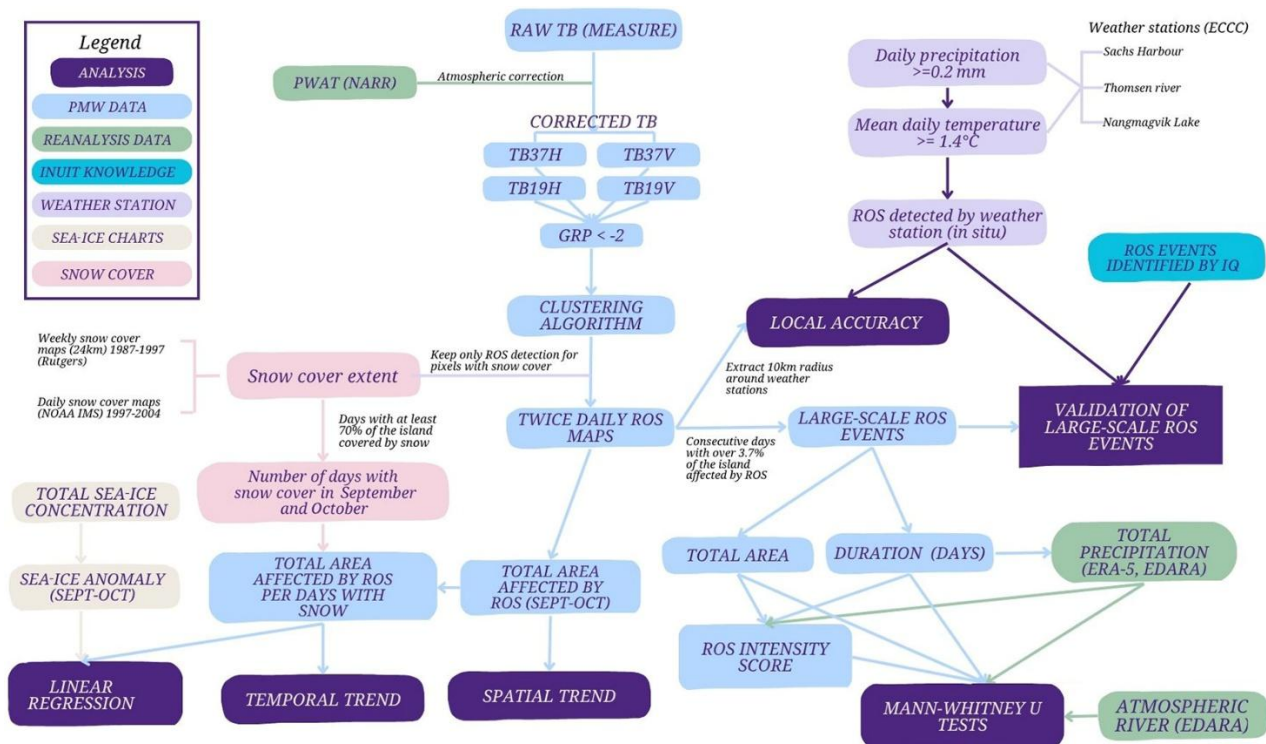


Supplementary material for: Langlois J.-A., Langlois A., Dolant C., Sachs Harbour Hunters & Trappers Committee, Resolute Bay Hunters & Trappers Association, Iviq Hunters & Trappers Association, Taloyoak Umarulirigut Association & Johnson C.A. 2026. Drivers, detection and impacts of rain-on-snow events on Banks Island, Canadian Arctic Archipelago: insights from remote sensing and Inuit Knowledge. *Polar Research* 45. Correspondence: Josée-Anne Langlois, Applied Geomatics Department, Sherbrooke University, 2500 Bd de l'Université, J1K 2R1 Sherbrooke, QC, Canada. E-mail: josee-anne.langlois@usherbrooke.ca.



Supplementary Fig. S1. Methodological framework for ROS detection and drivers' analysis.

Supplementary Table S1. Description of workshops and interviews when IQ of ROS was shared.

Date	Description	Facilitators and local partners	No. of participants	Reference
Oct. 2022	Workshop on Peary caribou and observed environmental changes using participatory mapping and individual semi-directed interviews with the community of Ikaahuk (Sachs Harbour), NWT	Facilitated by Cheryl Johnson, Isabelle Duclos, Jillian Wettlaufer & Susie Memeogana; in partnership with the Sachs Harbour Hunters & Trappers Committee and The Peary Caribou Project	2	Ikaahuk (Sachs Harbour) Peary Caribou Project workshop 2022
Apr. 2023	Workshop on observed environmental changes and ROS conditions using participatory mapping and semi-directed interviews with the communities of Iqaluktuuttiaq (Cambridge Bay), NU, Ikaahuk (Sachs Harbour), NWT, Taloyoak, NU, Tuktoyaktuk, NWT, and Ulukhaktok, NWT	Facilitated by Josée-Anne Langlois, Léna Bureau & Cheryl Johnson; in partnership with the Ekaluktutiak Hunters & Trappers Association, Sachs Harbour Hunters & Trappers Committee, Tuktokaytuk Hunters & Trappers Committee, Olokhaktomiut Hunters & Trappers Committee, Taloyoak Umaruliririgut Association and The Peary Caribou Project	5	Iqaluktuuttiaq (Cambridge Bay) Peary Caribou Project workshop 2023
Oct. 2023	Workshop on muskox and Peary caribou using participatory mapping, proportional piling, fuzzy cognitive mapping, and semi-directed interviews with the community of Ikaahuk (Sachs Harbour), NWT	Facilitated by Léna Bureau, Cheryl Johnson, Susie Memogana & Alex Pantis; in partnership with the Sachs Harbour Hunters & Trappers Committee and The Peary Caribou Project	6	Ikaahuk (Sachs Harbour) Peary Caribou Project workshop 2023
Jan. 2024	Workshop on Peary caribou habitat and snow conditions using participatory mapping, fuzzy cognitive mapping, and semi-directed interviews with the community of Qausuittuq (Resolute Bay), NU	Facilitated by Cheryl Johnson, Estéban Hamel Jomphe, Josée-Anne Langlois & Alexandre Roy; in partnership with the Resolute Bay Hunters & Trappers Association and The Peary Caribou Project	5	Qausuittuq (Resolute Bay) Peary Caribou Project interviews 2024

Date	Description	Facilitators and local partners	No. of participants	Reference
Mar. 2024	Workshop on Peary caribou habitat and snow conditions using participatory mapping, fuzzy cognitive mapping and individual semi-directed interviews with the community of Ajuittuq (Grise Fiord), NU	Facilitated by Cheryl Johnson, Estéban Hamel Jomphe, & Josée-Anne Langlois; in partnership with the Iviq Hunters & Trappers Association and The Peary Caribou Project	4	Ajuittuq (Grise Fiord) Peary Caribou Project interviews 2024

Supplementary Table S2. Details about sources of data used in this paper.

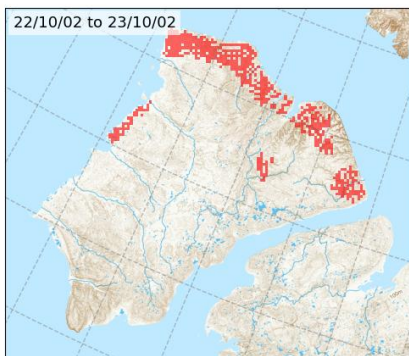
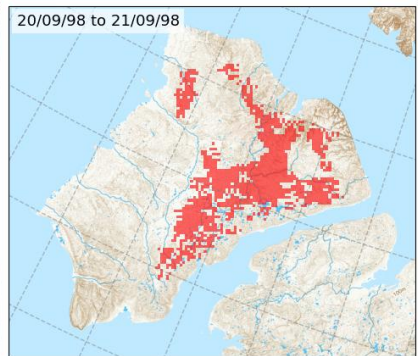
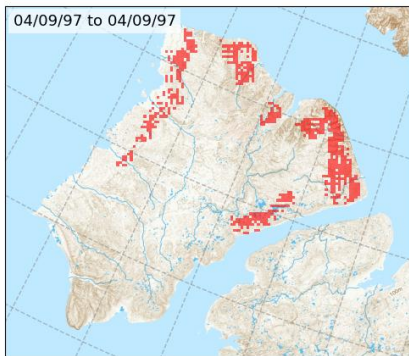
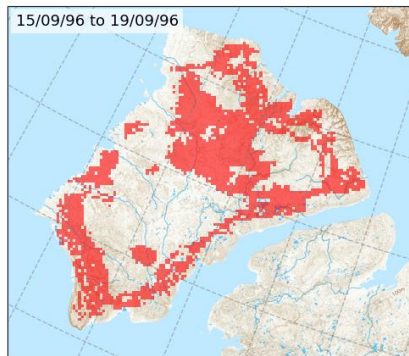
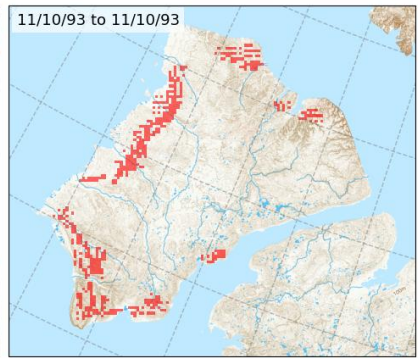
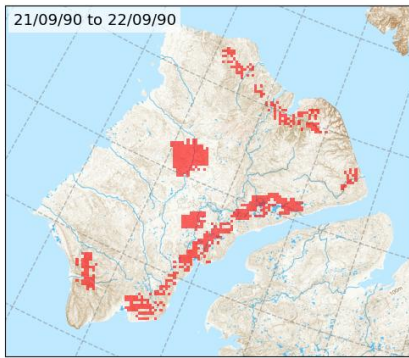
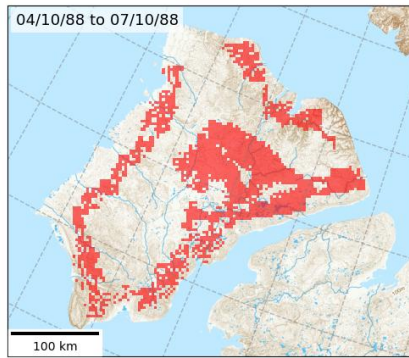
Product	Variable(s)	Reference	Link to data repository
MEaSURES Calibrated Enhanced-Resolution Passive Microwave Daily	Brightness temperature (TB) 19 and 37 GHZ in vertical and horizontal polarization	Brodzik M.J., Long D.G., Hardman M.A., Paget A. & Armstrong R. MEaSURES Calibrated Enhanced-Resolution Passive Microwave Daily EASE-Grid 2.0 Brightness Temperature ESDR, Version 1, NASA National Snow and Ice Data Center Distributed Active Archive Center, Boulder, Colorado, USA, 2016.	https://nsidc.org/data/nsidc-0630/versions/1
North American Regional Reanalysis	Precipitable water variable (PWAT)	Mesinger F., DiMego G., Kalnay E., Mitchell K., Shafran P.C., Ebisuzaki W., Jović D., Woollen J., Rogers E., Berbery E.H., Ek M.B., Fan Y., Grumbine R., Higgins W., Li H., Lin Y., Manikin G., Parrish D. & Shi W. North American Regional Reanalysis, <i>Bulletin of the American Meteorological Society</i> 87, 343–360, 2006.	https://psl.noaa.gov/data/gridded/data.narr.html
Rutgers Northern Hemisphere 24km Weekly Snow Cover Extent	Snow cover (1987-1997)	Robinson D.A. & Estilow T.W. Rutgers Northern Hemisphere 24 km Weekly Snow Cover Extent, September 1980 Onward, Version 1(1), https://doi.org/10.7265/zzbm-2w05 , 2021.	https://nsidc.org/data/g10035/versions/1

Product	Variable(s)	Reference	Link to data repository
Interactive Multisensor Snow and Ice Mapping System (IMS)	Snow cover (1997-2004)	U.S. National Ice Center: IMS Daily Northern Hemisphere Snow and Ice Analysis at 1 km, 4 km, and 24 km Resolutions, Version 1, https://doi.org/10.7265/N52R3PMC , 2008.	https://nsidc.org/data/g02156/versions/1
ECCC weather stations	Daily mean temperature and daily precipitation	Environment and Climate Change Canada historical weather stations Sachs Harbour_A (53328, 1794, 53326) Sachs Harbour Climate (10076), Nangmagvik Lake (27118), Thomsen River (10598)	https://climate.weather.gc.ca/historical_data/search_historic_data_e.html
ERA5-based Dataset for Atmospheric River Analysis (EDARA)	Atmospheric rivers (tARget-v3 and mtARget-v3), total precipitation for 6-hour	Mo R. An ERA5-based Dataset for Atmospheric River Analysis (EDARA): Multi-decade numerical and graphical catalogues, https://doi.org/10.20383/103.0935 , 2024.	https://www.frd-rdfr.ca/repo/dataset/b1798e59-b38e-4a83-ab88-12d0a8aca28f
Weekly sea-ice charts from the Canadian Ice Service	Total sea-ice concentration	Government of Canada. Canadian Ice Service Weekly regional ice charts, 2021.	https://iceweb1.cis.ec.gc.ca/Archive/page1.xhtml?lang=en
Arctic Oscillation (AO), North Atlantic Oscillation (NAO) and Pacific / North American Pattern	Monthly mean AO, NAO and PNA indexes	Climate Prediction Center, National Weather Service, NOAA	https://www.cpc.ncep.noaa.gov/products/precip/CWlink/daily_ao_index/teleconnections.shtml

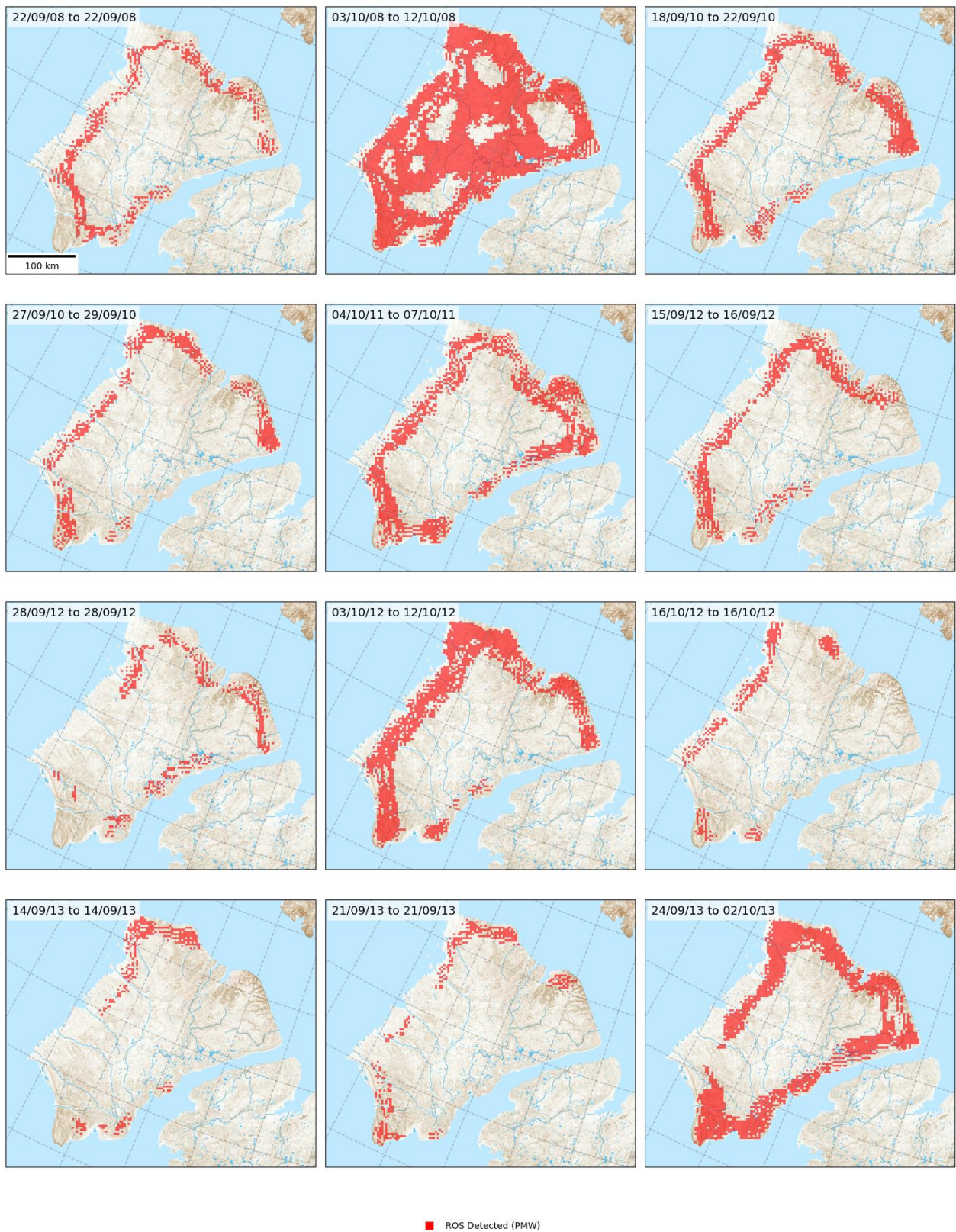
Supplementary Table S3. Characteristics of large-scale ROS events detected using PMW algorithm.

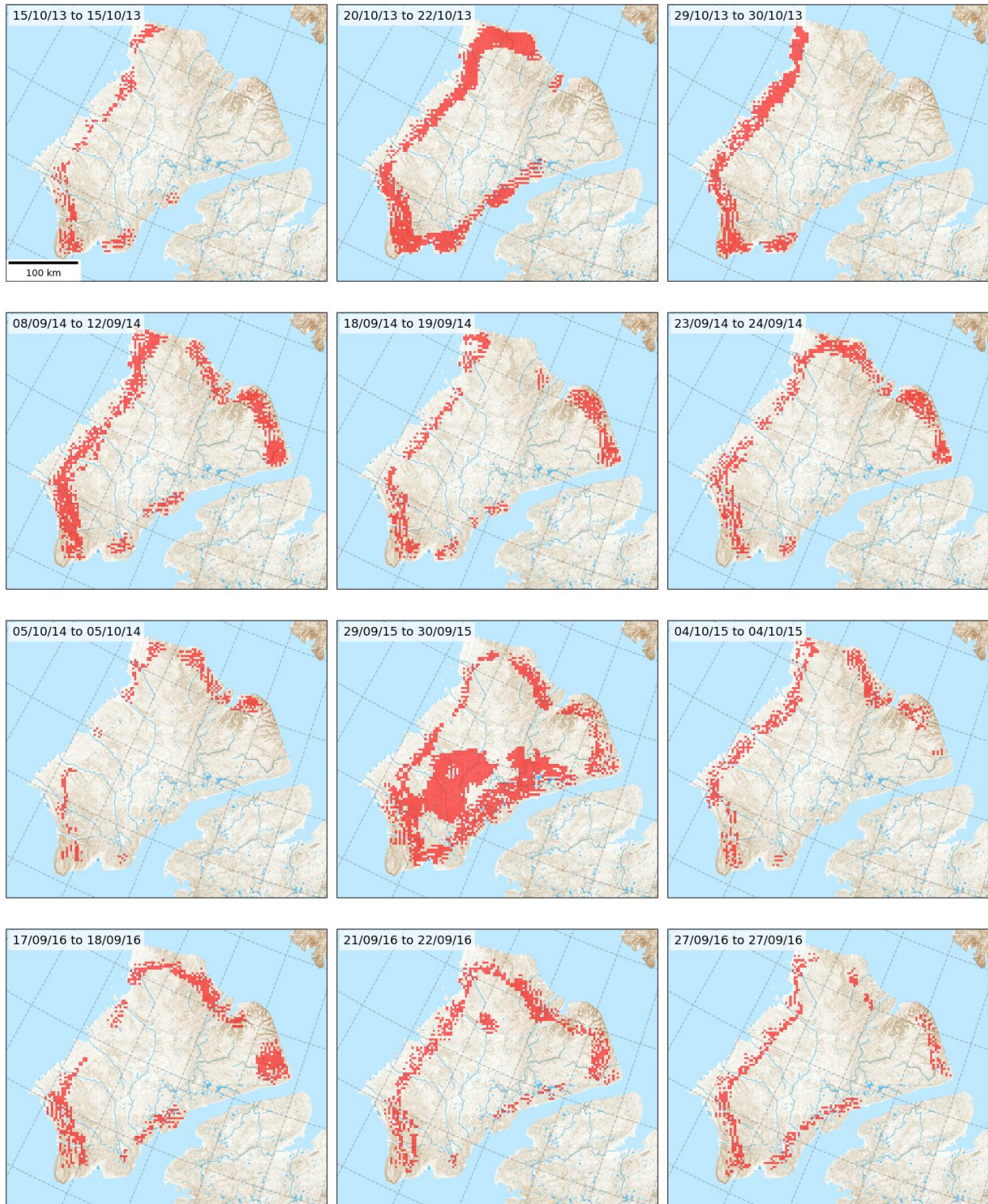
Start date of event	No. of days of the event	Total area affected by event (1000 km ²)	Total precip. (mm) ERA5	Intensity score	Events detected in Sachs Harbour	Events detected in Thomsen	Events detected in Nangmagvik
2008-10-03	10	47.7	30.1	1.00	False	Missing data	Missing data
2023-10-09	10	44.6	25.2	0.92	True	True	False
2022-10-04	9	16.6	17.4	0.59	True	True	True
1996-09-15	5	27.1	23.0	0.58	True	Missing data	True
2023-09-05	8	29.1	8.8	0.55	True	True	True
2012-10-03	10	18.3	9.4	0.55	True	Missing data	Missing data
2020-09-23	8	26.2	5.5	0.49	True	False	False
2013-09-24	9	22.2	4.1	0.49	True	Missing data	Missing data
1988-10-04	4	21.7	9.1	0.35	True	Missing data	Missing data
2003-10-02	4	27.4	2.5	0.32	True	Missing data	Missing data
2010-09-18	5	11.0	2.4	0.23	True	False	False
2021-09-26	4	12.7	3.9	0.23	True	True	Missing data
2014-09-08	5	11.8	0.7	0.22	True	Missing data	Missing data
2011-10-04	4	16.0	1.3	0.22	True	Missing data	Missing data
2015-09-29	2	22.5	1.0	0.19	True	Missing data	Missing data
2013-10-20	3	12.8	4.0	0.19	True	Missing data	Missing data
2003-10-09	3	7.6	6.1	0.18	False	Missing data	Missing data
2020-10-04	4	8.7	0.7	0.16	True	False	False
2006-10-12	2	7.6	6.9	0.15	True	False	Missing data
2010-09-27	3	7.2	3.6	0.15	False	False	False
2021-10-23	3	8.4	0.4	0.12	False	False	Missing data
1998-09-20	2	13.1	0.1	0.11	True	True	True
1990-09-21	2	6.9	4.4	0.11	True	Missing data	Missing data
2012-09-15	2	8.4	1.0	0.09	True	Missing data	False
2016-09-21	2	8.5	0.7	0.09	True	Missing data	Missing data
2016-09-17	2	8.0	1.3	0.09	True	Missing data	Missing data
2013-10-29	2	7.4	1.8	0.09	False	Missing data	Missing data
2014-09-23	2	7.7	0.5	0.08	Missing data	Missing data	Missing data
2002-10-22	2	6.0	0.7	0.07	True	False	False
2021-10-02	2	7.5	0.1	0.07	False	False	Missing data
2014-09-18	2	6.5	0.1	0.06	Missing data	Missing data	Missing data
2019-09-08	2	6.4	0.0	0.06	False	True	Missing data
2008-09-22	1	7.3	0.3	0.04	False	False	False

Start date of event	No. of days of the event	Total area affected by event (1000 km ²)	Total precip. (mm) ERA5	Intensity score	Events detected in Sachs Harbour	Events detected in Thomsen	Events detected in Nangmagvik
2017-09-14	1	7.7	0.0	0.04	False	Missing data	Missing data
1993-10-11	1	5.5	1.4	0.03	True	Missing data	Missing data
1997-09-04	1	6.7	0.6	0.03	True	True	True
2022-09-30	1	6.4	0.0	0.03	False	False	Missing data
2020-09-20	1	4.8	1.3	0.03	True	True	False
2023-10-06	1	4.9	0.1	0.02	False	False	False
2023-10-02	1	5.6	0.0	0.02	True	Missing data	False
2023-09-26	1	5.8	0.1	0.02	False	False	False
2021-10-28	1	5.0	0.1	0.02	True	Missing data	Missing data
2003-09-20	1	5.9	0.1	0.02	True	True	False
2012-09-28	1	4.9	0.1	0.02	True	Missing data	True
2016-09-27	1	5.6	0.0	0.02	True	Missing data	Missing data
2015-10-04	1	5.6	0.3	0.02	False	Missing data	Missing data
2013-10-15	1	3.5	0.1	0.01	True	Missing data	Missing data
2022-09-17	1	3.8	0.3	0.01	True	False	False
1999-09-18	1	4.4	0.0	0.01	False	False	False
2022-10-18	1	4.1	0.5	0.01	False	False	False
2012-10-16	1	3.6	0.1	0.01	False	Missing data	Missing data
2013-09-21	1	3.9	0.0	0.01	True	Missing data	Missing data
2023-10-23	1	4.2	0.1	0.01	False	False	False
2021-10-10	1	3.0	0.1	0.00	False	False	Missing data
2021-10-14	1	3.1	0.3	0.00	False	Missing data	Missing data
2018-09-06	1	3.1	0.0	0.00	Missing data	Missing data	Missing data
2017-09-29	1	3.4	0.0	0.00	True	Missing data	Missing data
2013-09-14	1	3.4	0.1	0.00	True	Missing data	Missing data
2014-10-05	1	3.4	0.0	0.00	Missing data	Missing data	Missing data

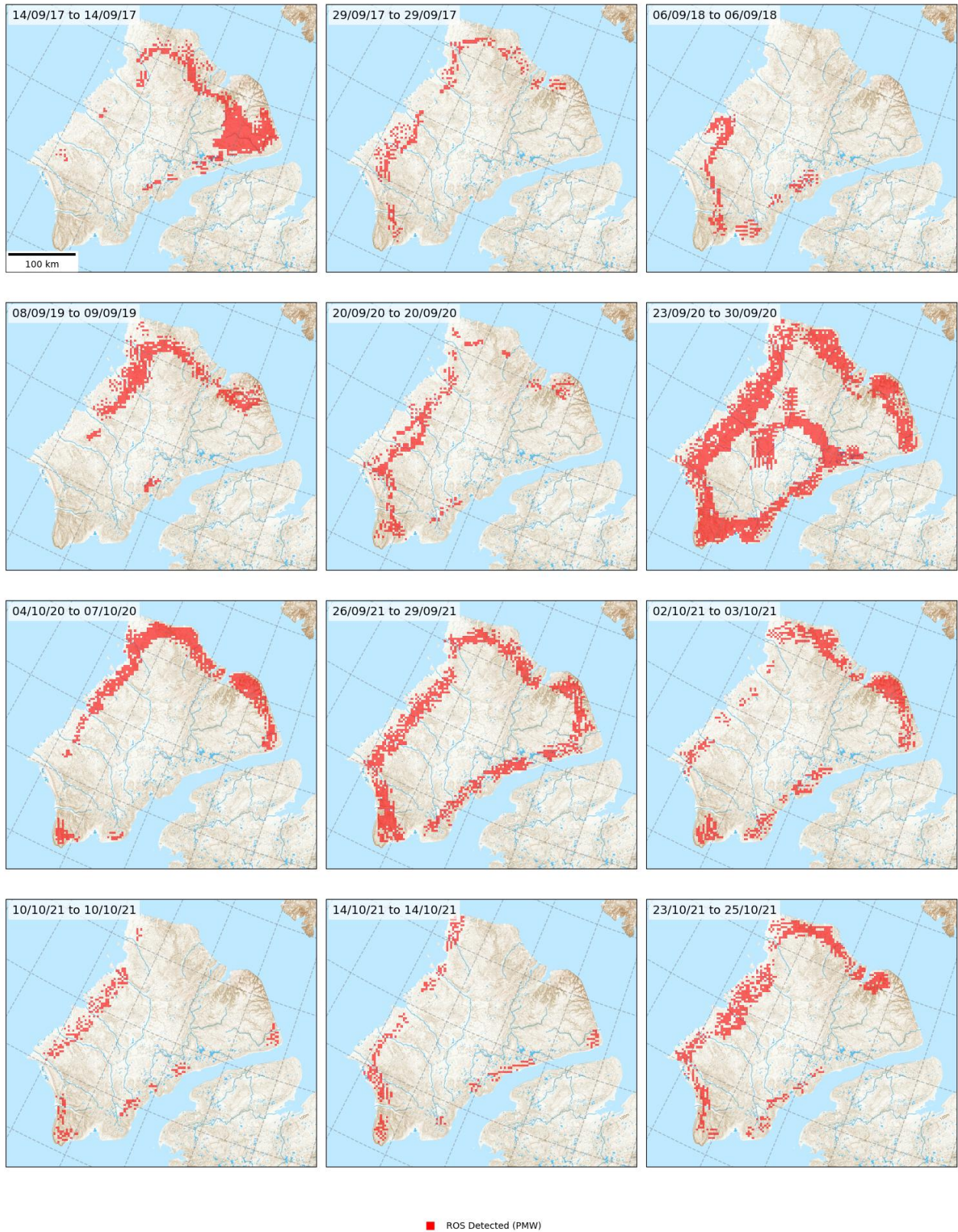


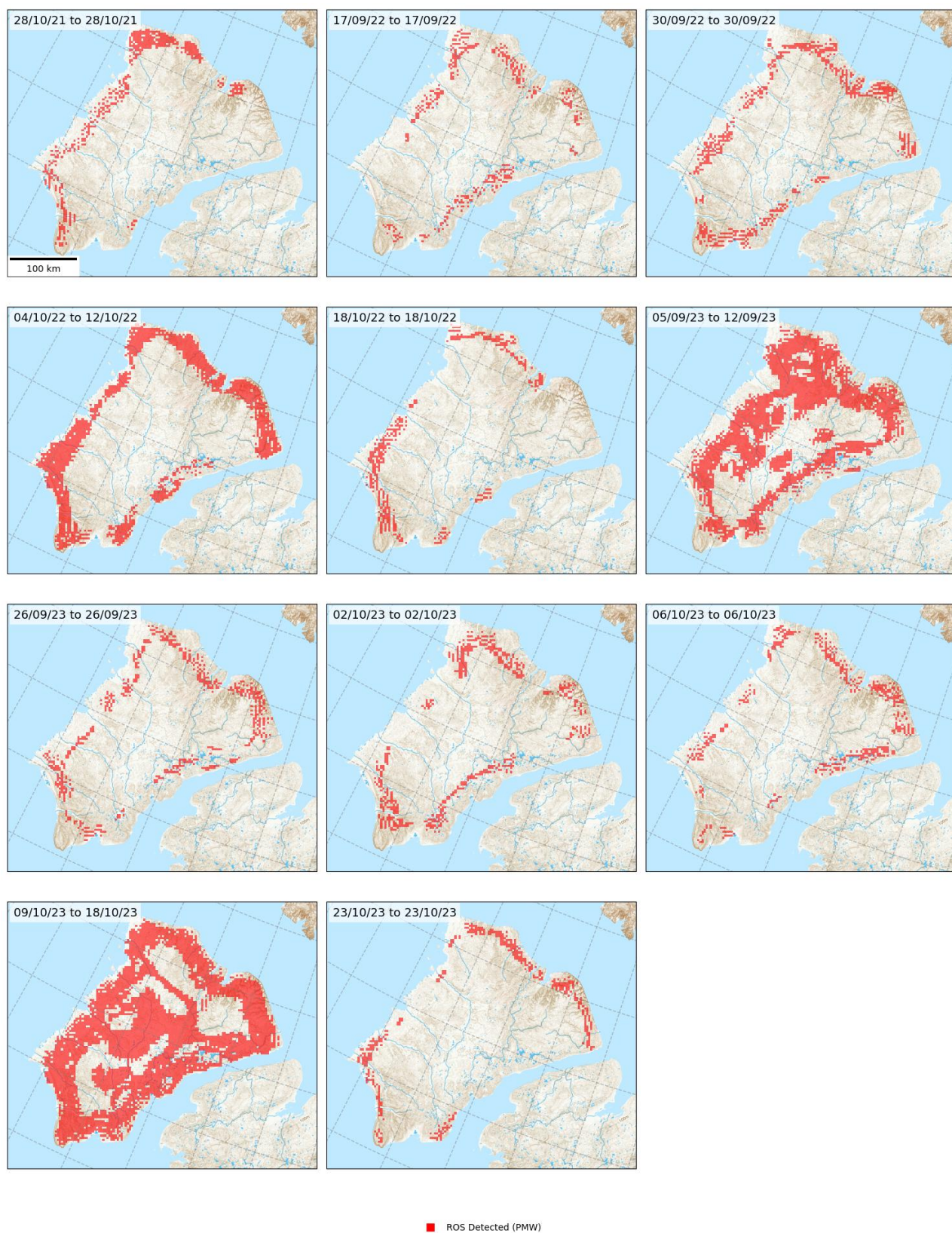
■ ROS Detected (PMW)





■ ROS Detected (PMW)





Supplementary Fig. S2. Maps of large-scale ROS events detected using PMW images.