

Northern Hemisphere Continental Snow Cover Extent: 2022 Update

David A. Robinson

Rutgers University, Piscataway, New Jersey, USA

Annual snow cover extent (SCE) over Northern Hemisphere (NH) lands averaged 24.9 million sq. km. in 2022. This is 0.04 million sq. km. less than the 1991-2020 mean and 0.23 million sq. km. below the full period of record (1967-2022) mean (Table 1). This ranks 2022 as having the 24th least extensive cover on record. Monthly SCE in 2022 ranged from 47.3 million sq. km. in January to 2.4 million sq. km. in August.

The first four months of 2022 saw NH SCE rank in the middle tercile of the 56-year record. This fell off to the lower tercile in May and then to the 3rd least extensive June cover. When snowfall resumed in September the SCE over Eurasia (EUR) quickly climbed to 6th most extensive, while North America (NA) SCE began slowly. NH October SCE was in the middle tercile before both continents experienced above normal November SCE, NA ranking 3rd most extensive and EUR 11th. However, the pace of seasonally advancing SCE slowed considerably across EUR in December, ranking 10th least extensive, while NA continued to see above normal SCE, ranking 13th most extensive.

Compared to normal values, monthly SCE over the contiguous United States varied considerably in 2022. Rankings were in the middle tercile in January, the lowest in February and achieved a rank of 7th least extensive in March. Melt slowed considerably in April, with the 19th most extensive cover occurring, followed by a middle tercile ranking in May. End-of-year US SCE was above normal, ranking 11th, 6th, and 14th most extensive in October, November, and December, respectively.

SCE is calculated at the Rutgers Global Snow Lab (GSL) from daily SCE maps produced by meteorologists at the US National Ice Center, who rely primarily on visible satellite imagery to construct the maps (Estilow et al. 2015). Maps depicting daily, weekly, and monthly conditions, anomalies, and climatologies may be viewed at the GSL website (<https://snowcover.org>).

Reference

Estilow, T. W., A.H. Young, and D.A. Robinson (2015) A long-term Northern Hemisphere snow cover extent data record for climate studies and monitoring. *Earth Syst. Sci. Data*, 7, 137–142, doi:10.5194/essd-7-137-2015.

Figures

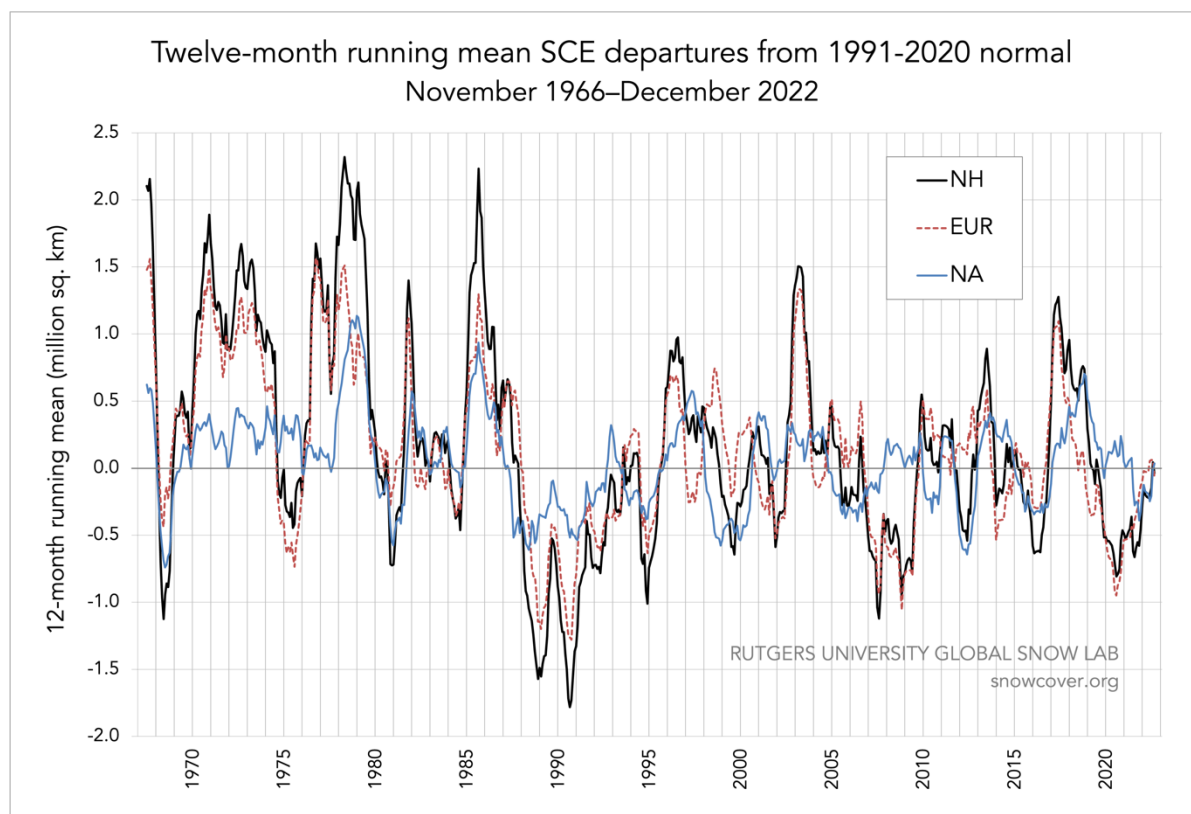


Figure 1. Twelve-month running anomalies of monthly SCE over NH lands as a whole and EUR and NA separately plotted on the 7th month using values from November 1966 to December 2022. Anomalies are calculated from NOAA snow maps. Mean NH SCE is 25.1 million sq. km. for the full period of record. Monthly means for the period of record are used for 9 missing months during 1968, 1969, and 1971 to create a continuous series of running means. Missing months fall between June and October.

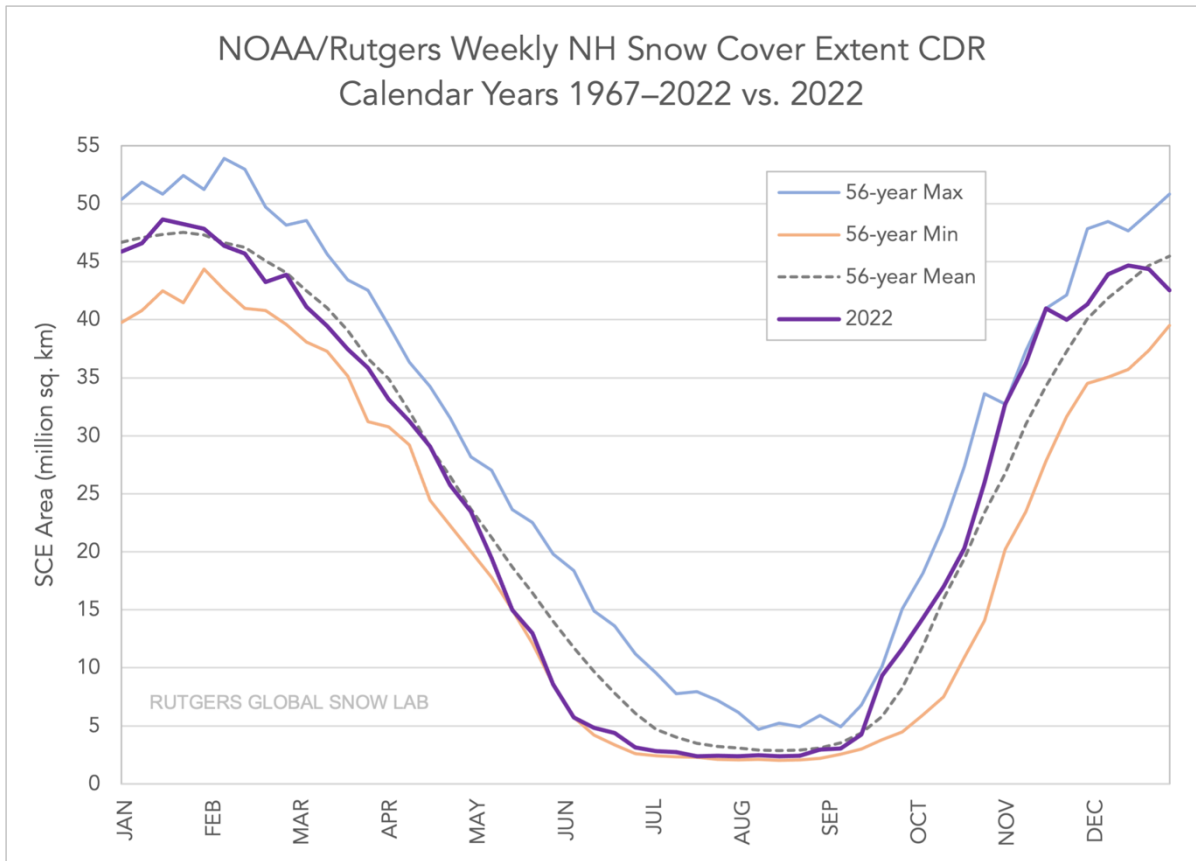


Figure 2. Weekly NH SCE for 2022 (purple) plotted with the mean (grey dashed line), maximum (blue), and minimum (orange) SCE for each week. Mean weekly SCE and extremes are calculated using the 56-year record from January 1967–December 2022. Weekly data granules represent SCE for each 7-day period ending on Monday.

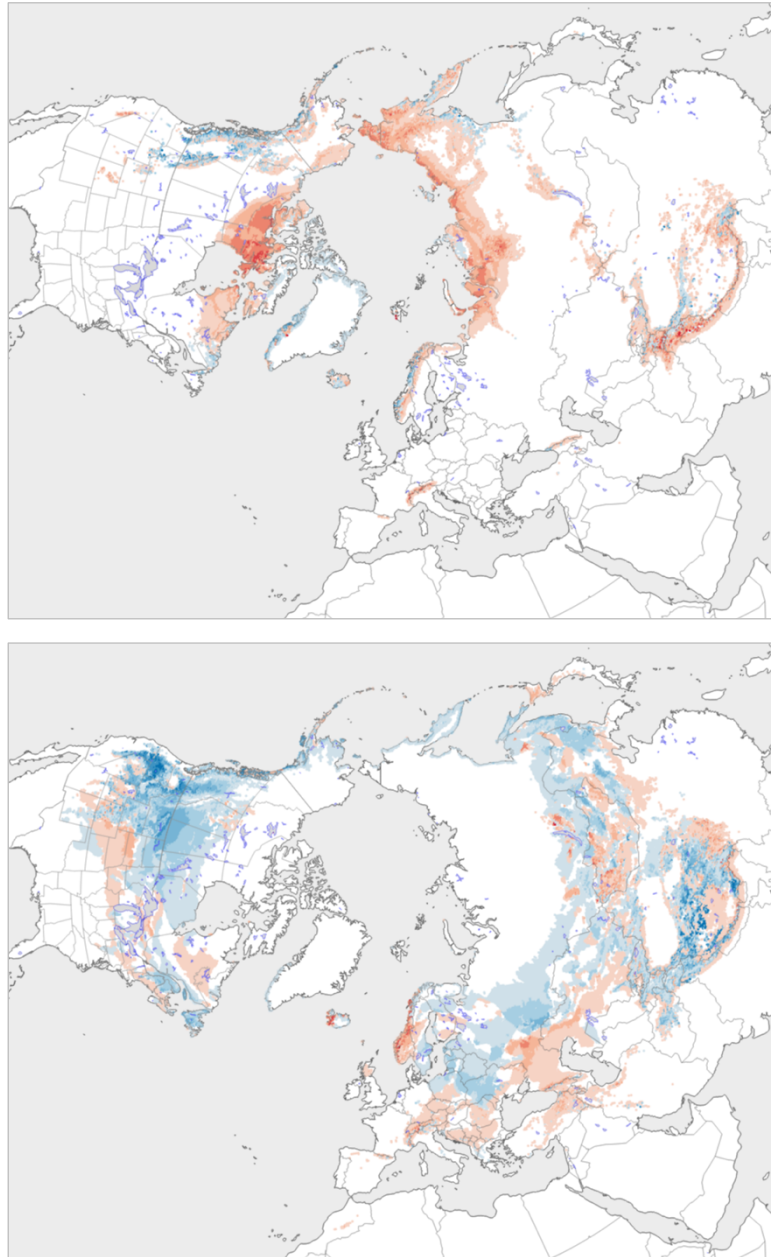


Figure 3. Monthly SCE departure maps showing June (top) and November (bottom). June exhibited the lowest SCE anomaly (-3.91 million sq. km.) during 2022, while November was the highest above normal (+3.79 million sq. km.). Mean monthly SCE calculated using the 30-year span from 1991-2020. Negative departures indicate less SCE than normal (red) with positive departures (blue) showing areas of SCE above the 30-year mean.

Table

	Yrs.	NH Mean	Std. Dev.	2022	2022 NH rank	2022 Eurasia rank	2022 NA rank
Jan	56	47.1	1.5	47.3	26	24	32
Feb	56	46.0	1.8	45.8	27	22	37
Mar	56	40.4	1.8	40.0	31	33	32
Apr	56	30.5	1.7	30.9	23	32	13
May	56	19.1	2.0	18.0	40	44	23
Jun	55	9.3	2.5	5.5	53	54	51
Jul	53	3.9	1.2	2.7	45	51	43
Aug	54	3.0	0.7	2.4	43	45	38
Sep	54	5.4	0.9	5.9	14	6	45
Oct	55	18.6	2.6	18.7	25	22	34
Nov	57	34.3	2.1	37.7	4	11	3
Dec	57	43.7	1.8	43.6	37	48	13
Ann	53	25.1	0.8	24.9	33	34	30

Table. Monthly and annual climatological information on NH, EUR, and NA SCE between November 1966 and December 2022. Included are the numbers of years with data used in the calculations, NH means, standard deviations, 2022 values, and rankings. Areas are in millions of square kilometers. 1968, 1969, and 1971 have 1, 5, and 3 missing months respectively, thus are not included in the annual (Ann) calculations. NA includes Greenland. Ranks are from most (1) to least extensive.

Dataset used

Robinson, D.A., Estilow, T.W., and NOAA CDR Program, 2012: NOAA Climate Data Record (CDR) of Northern Hemisphere (NH) Snow Cover Extent (SCE), Version 1. NOAA National Centers for Environmental Information. doi:10.7289/V5N014G9.

<https://snowcover.org>

Acknowledgement

This work is funded in part by NOAA's Climate Data Record (CDR) Program at the National Centers for Environmental Information.

Summary bullet points

- Annual snow cover extent (SCE) over NH lands averaged 24.9 million square kilometers in 2022. This is 0.04 million sq. km less than the 1991-2020 average and ranks as the 33rd most extensive cover on record during the satellite era.
- SCE continues a general trend of early spring melt, particularly at higher latitudes, while fall and early winter SCE continues a recent decadal run of above normal conditions.