

Northern Hemisphere Continental Snow Cover Extent: 2021 Update

David A. Robinson

Rutgers University, Piscataway, New Jersey, USA

Annual snow cover extent (SCE) over Northern Hemisphere (NH) lands averaged 24.3 million sq. km in 2021. This is 0.6 million sq. km less than the 1991-2020 mean and 0.8 million sq. km below the full period of record mean (Table 1). This ranks 2021 as having the 7th least extensive cover on record. Monthly SCE in 2021 ranged from 46.8 million sq. km in January to 2.5 million sq. km in August.

The year began with NH SCE ranking in the middle tercile of the 55-year record. This despite NA SCE ranking 4th most extensive in February. North America (NA) quickly lost SCE in March, falling to 47th least extensive, while Eurasia (EUR) remained low. These conditions persisted throughout spring, with May having the third lowest SCE on record and June ninth lowest.

NA picked up some early fall snow and a ranking of 13th most extensive September cover. This ranking fell to 46th least extensive in October, when EUR and the NH ranked in the middle tercile. NH November and December SCE fell near the boundary of the highest and middle tercile, mainly due to above average SCE in EUR where November ranked 9th and December 13th. SCE over the contiguous United States was 5th most extensive in February, average in January, and below average in every other month.

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. Maps depicting daily, weekly, and monthly conditions, anomalies, and climatologies may be viewed at the GSL website (<https://snowcover.org>).

References

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](https://doi.org/10.5194/essd-7-137-2015).

Figures

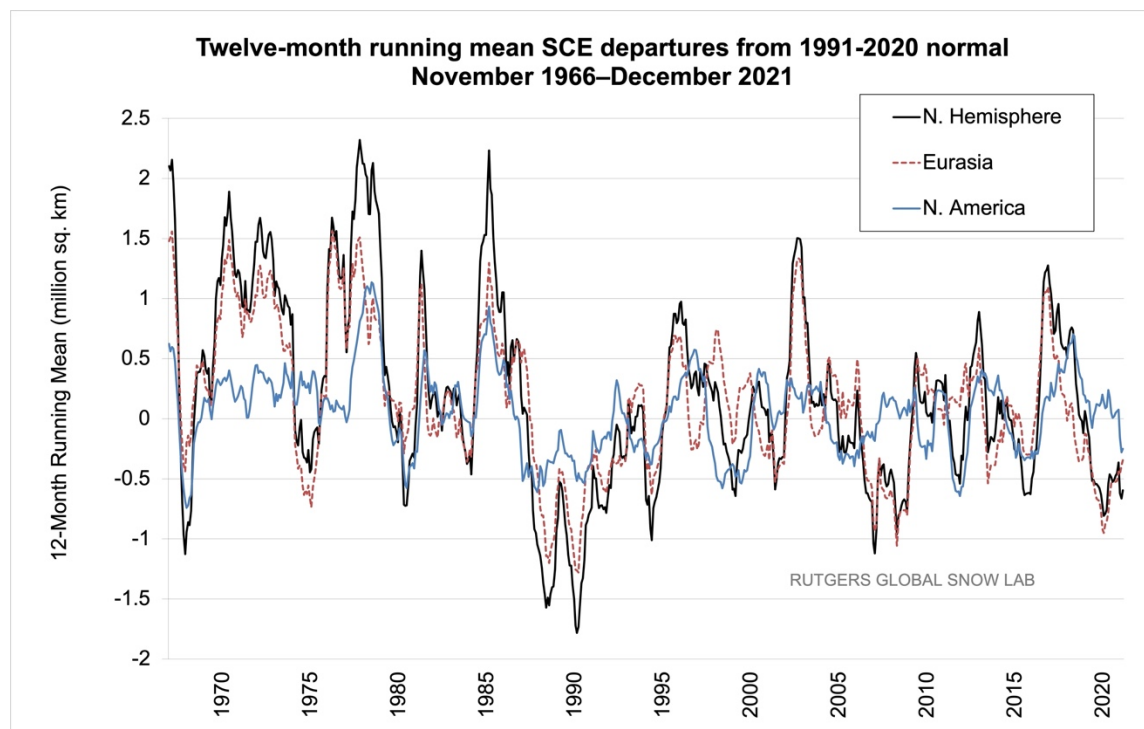


Figure 1. Twelve-month running anomalies of monthly SCE over NH lands as a whole and EUR and NA separately plotted on the 7th month using values from November 1966 to December 2021. Anomalies are calculated from NOAA snow maps. Mean NH SCE is 25.1 million sq. km for the full period of record. Monthly means for the period of record are used for 9 missing months during 1968, 1969, and 1971 in order to create a continuous series of running means. Missing months fall between June and October.

Tables

	Yrs	NH Mean	Std. Dev.	2021	2021 NH rank	2021 Eurasia rank	2021 NA rank
Jan	55	47.1	1.5	46.8	32	36	28
Feb	55	46.0	1.8	46.1	22	42	4
Mar	55	40.4	1.9	38.6	44	42	47
Apr	55	30.5	1.7	28.8	45	40	46
May	55	19.1	2.0	16.2	53	51	45
Jun	54	9.4	2.5	6.2	46	52	42
Jul	52	3.9	1.2	2.8	43	44	39
Aug	53	3.0	0.7	2.5	40	42	30
Sep	53	5.4	0.9	5.6	22	30	13
Oct	54	18.6	2.7	18.1	28	22	46
Nov	56	34.3	2.1	35.4	18	9	44
Dec	56	43.7	1.8	44.5	17	13	26
Ann	52	25.1	0.8	24.3	46	44	41

Table 1. Monthly and annual climatological information on NH, EUR, and NA SCE between November 1966 and December 2021. Included are the numbers of years with data used in the calculations, NH means, standard deviations, 2021 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.

Datasets used and their URLs

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://doi.org/10.7289/V5N014G9).

<https://snowcover.org>

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Summary bullet points

- Annual snow cover extent (SCE) over NH lands averaged 24.3 million square kilometers in 2021. This is 0.6 million sq. km less than the 1991-2020 average and ranks as the 7th least 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.