May 2018 – September 2018 Arctic Summer Seasonal Review

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Arctic Summer Highlights

Temperature & Precipitation (summer, JJA)

- Air temperature anomalies for summer 2018 were above average (for the reference period 1961-1990), with the exception of the Canadian Arctic and stations along the coast of Greenland, where anomalies were negative. Summer 2018 was Siberia's warmest summer since 1935
- **Precipitation between June and August 2018 was slightly below average over the Arctic region.** Lower than average precipitation was observed for the whole Arctic region (94,0 %), with the lowest amount observed in the Eastern Siberian (85,0 %) and Chukchi region. Close to normal values, on the other hand, were observed in Atlantic and N European regions

Arctic (NH) Sea Ice (summer, JJAS)

- The summer minimum sea ice extent (4.56 mln km²), reached on 16/09, was the 6th minimum in row since 1979 (2017 8th), with the maximum sea ice extent observed in 1980 (7.61 mln km²)
 - Estimates of the sea ice volume, based on numerical reanalysis (HYCOM-CICE, PIOMAS), show similar 6th minimum in row (5.09 thou km³) and higher ice thicknesses in comparison to 2017, with maximum volume observed in 1979 (16.91 thou km³). A precursor of higher sea ice thicknesses in the Central Arctic could be higher precipitation during pre-melt season (April).
- High variability of ice conditions due to high mobility of sea ice was observed through the whole 2018 summer period. Sea ice extent for the Canadian Arctic was higher than the last decade median, with the North West Passage remaining blocked for ice free navigation. Simultaneously, parts of the Eurasian Arctic (SE Barents, Kara, Eastern Siberian Seas) showed close to 1998-2017 median ice coverage until the middle of July, with further extreme low sea ice extent in the most parts of this region until the end of September
 - Between late August and the end of October 2018, strong westerly winds (positive North Atlantic Oscillation index NAO) continued to preserve positive temperature anomalies over the Eastern and Central Arctic, with the exception of the Canadian archipelago and the Hudson Bay regions, slowing the ice formation process

Terrestrial Arctic Snow (pre-summer, AMJ) (contribution of Snow Watch/GCW)

- Snow accumulation during the 2017/18 winter was above average across both the North American and Eurasian Arctic, consistent with an early start to the snow season in the fall (therefore a longer accumulation period) and above-average winter snowfall.
- Snow cover extent for Eurasia was above average during April, slightly above average for May, and below average by June (relative to the 1981-2010 average). This month-to-month change is consistent with unusually high early spring accumulation combined with rapid late spring snow loss.
- Despite relatively high spring snow accumulation and snow cover extent over the Arctic during the previous two spring seasons, long-term trends remain negative.

May 2018 to Sep 2018 Surface Air Temperature (SAT) anomalies (observations)



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SAT anomalies by regions (observations)

Region	Anomaly	Anomaly	The warmest year	The coldest year
		number in	(anomaly)	(anomaly)
		row		
Atlantic	0,4	13	2003 (1,9)	1965 (-0,7)
N Europe	1,8	4	2013 (2,8)	1969 (-1,6)
West Siberia	1,4	7	2016 (3,6)	1968 (-1,6)
East Siberia	2,4	1	2018 (2,4)	1989 (-1,2)
Chukchi	1,2	8	2007 (2,9)	1949 (-1,3)
Alaska	0,4	14	2004 (2,9)	1945, 1955 (-1,3)
Canadian	0,1	17	2012 (2,3)	1972 (-1,6)

Reference period: 1961-1990



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May – Sep 2018 SAT: anomalies and ranks (reanalysis)







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Precipitation anomalies by regions

Region	Relative	The greatest	The lowest
	anom, %	value	value
Atlantic	101,4	1964 (120,5)	1968 (75,2)
N Europe	98,3	1981 (128,4)	1980 (68,5)
West Siberia	91,0	2002 (122,6)	1946 (72,4)
East Siberia	85,0	1988 (125,2)	1967 (78,4)
Chukchi	80,4	1954 (139,6)	1982 (60,2)
Alaska	90,1	1951 (164,4)	1968 (54,1)
Canada	91,8	2005 (123,5)	1977 (75,0)
60-70°N	93,3	1954 (115%)	1968 (88%)
70-85°N	97,7	1989 (127%)	1998 (84%)
60-85°N	94,0	1954 (117%)	1980 (90%)

Reference period: 1961-1990





May – Sep 2018 Precipitation anomalies and ranks







Arctic (NH) seasonal ice extent – 2018 1979



Minimum ice extent 4,56 mln km² (4.62 in 2017) reached 17 September 2018



Seasonal NH (Arctic Ocean in summer) ice extent variability: 1978 - 2018





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MJJ 2018 Arctic sea ice – conc. and stages of development



Blended AARI/CIS/NIC ice charts; ice edge – nearest pentade, reference period: 1998-2017 her Climate Water

End of summer 2018 Arctic sea ice – conc. and stages of development



Blended AARI/CIS/NIC ice charts; ice edge – nearest pentade, reference period: 1998-2017 ther Climate Water

Arctic Sea Ice Reanalysis – HYCOM-CICE and PIOMAS



Terrestrial snow: snow cover duration



Snow cover duration (SCD in days) departures (difference from 1998-2010 mean) for the 2017-2018 snow year: (a) fall; and (b) spring. The grey circle marks the latitude 60° N. Source: NOAA IMS data record.

Snow accumulation during the 2017/18 winter was above average across both the North American and Eurasian Arctic, consistent with an early start to the snow season in the fall (therefore a longer accumulation period) and above-average winter snowfall.



Terrestrial snow: snow depth anomaly, MAMJ 2018



- Snow cover extent for Eurasia was above average during April, slightly above average for May, and below average by June (relative to the 1981-2010 average).
- This month-to-month change is consistent with unusually high early spring accumulation combined with rapid late spring snow loss.

Snow depth anomaly (% of the 1999-2017 average) in 2018 for (a) March, (b) April, (c) May, and (d) June. Source: CMC snow depth analysis.



Snow Watch/GCW: 2018 Arctic Report Card, L. Mudryk, R. Brown, C. Derksen, K. Luojus, and S. Helfrich.

Current Ice Conditions (22-23 October 2018)



Till the end of October 2018, with exception of Canadian archipelago and Hudson Bay, strong westerly winds (NAO>0) continued to preserve positive temperature anomalies over the Eastern and Central Arctic, slowing the ice formation process



Surface air temperature anomalies (2m) relative to 2004-2013 and mean wind vectors (10 m) for 06.10-24.10.2018 (http://polarportal.dk)



Weather

· Climate
· Water

Thank you! Merci! Takk! Спасибо! Tak! Tack! Kiitos! þakka þér fyrir!

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