

Permanently ice-free in 7 years?

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Since my informal 'citizen scientist' contribution to SIPN's June report this year, PIOMAS Arctic sea ice volume data for the first half of 2017 have been published. This means an outlook can now be made from June 30 onward. I've also realised that a limit for 'virtually ice-free' must be used for the full year ice-free, not least because a warming Arctic will see a lot more calving of ice from glaciers, so that an absolute zero will not be likely in many decades still, if not centuries. The consensus limit for virtually ice-free area/extent is 1 million km², and for simplicity, I will set the corresponding volume limit to 1 thousand km³. That leaves some space for ice-bergs going south.

June 30, 2017 had an annual average volume (AAV, or 365-day rolling average) of 12 704 km³.

	June 30 AAV	Total AAV Drop	AAV Drop / Yr	Years To Ice-Free
2006	17 465	4 761	433	27
2007	16 598	3 894	389	30
2008	15 925	3 221	358	33
2009	16 514	3 810	476	25
2010	15 417	2 713	388	30
2011	13 846	1 142	190	61
2012	13 857	1 153	231	51
2013	13 545	841	210	56
2014	14 536	1 832	611	19
2015	15 856	3 152	1 576	7
2016	14 478	1 774	1 774	7

Table shows the annual average volume per June 30 for a given year, the total decrease from that level to June 30, 2017, then this drop divided by the number of years from 2017, and finally the time it would take at that annual drop rate to get to an all-year virtual ice-free state.

Please note that where my June report contribution had only one row with a single-digit number of years till ice-free — the drop from December 31st, 2015 to same day 2016, with a decrease large enough to go all-year ice-free in 8 years — table now has two rows that both indicate we could go ice-free all-year in just 7 years from June 30, 2017. The lower numbers are partly due to the introduction of a set limit for what experts call 'virtually ice-free' (see above), and partly because we've had 6 more months of rapid ice volume losses in the Arctic. In terms of annual average volume, we have in fact lost 6.5% only since New Year's Eve (which is of course distinct and different from the loss of *daily* volume over the same half year, which is seasonal and at 7.0%).

Conclusion: We may be headed for the all-year virtual ice-free state in as little as a decade from now, with linear projections based on the latest 365 and 730 days of Arctic sea ice volume indicating we could lose it all in even less than a decade. Granted, natural variability will likely cause future predictions using these methods to go slightly above a decade, but due to the rapid changes seen in the Arctic and the potential for tipping points in the cryospheric systems, the most recent rows of this table shouldn't be dismissed as completely impossible. Time will tell, but we could even see faster than linear collapse of the last chunks of Arctic sea ice.