Supplementary Materials

Warming Climate Shortens Ice Durations and Alters Freeze and Breakup Patterns in Swedish Water Bodies

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For a review of previous studies on change in freeze, breakup date and ice duration, the reader is referred to Table S1. The studies represent different parts of the northern hemisphere and over different time periods. In Figure S2, we present the linear best fit of change per decade in ice duration, freeze and breakup date during 1913-2014 and 1959-2014. The figure shows a more substantial shift in the latter time period and more in the southern latitudes than the northern. In Figure S3 we present the correlations between ice variables (freeze, breakup and ice duration) and mean temperature for different time periods.

Table S1. Change in freeze date, breakup date, and ice duration (in days per decade, unless otherwise specified) for inland lakes and rivers, for multiple locations and time periods.

		Study Period		Change in		
Reference	**Location (Number and Type of Water Bodies)**	**Initial Year**	**Final Year**	**Freeze Date**	**Breakup Date**	**Ice duration**
Magnuson et al. (2000)	Northern Hemisphere (39 lakes)	1846	1995	0.58	-0.65	
Benson et al. (2012)	Northern Hemisphere (9 lakes freeze, 17 breakup)	1855	2005	1.1	-0.89	
Takács (2011)	Danube river (1 river)	1875	2004	0.56 to 1.12	-0.56 to -0.96	-0.56 to -2
Latifovic and Pouliot (2007)	Canada (20 lakes)	1950	2004	1.2	-1.8	-3
Jensen et al. (2007)	Great Lakes region (65 lakes and rivers)	1975	2004	3.3	-2.1	-5.3
Latifovic and Pouliot (2007)	Canada (6 lakes in northern Canada)	1985	2004	7.6	-9.9	-17.5
Hodgkins (2013)	US, New England (up to 28 lakes)	1908	2008		-0.4	
	US, New England (up to 28 lakes)	1958	2008		-1.8	
Wang et al. (2012)	Great Lakes region (over all)	1973	2010			-73%
Surdu et al. (2014)	North Slope of Alaska	1950	2011	5.9	-17.7 to 18.6	-24
Patterson and Swindles (2015)	Eastern North America	1836	2013		Earlier	
This study	Sweden (58 lakes)	1914	2014	0.9	-0.9	-1.9
	- North of 60°N			0.8	-0.8	-1.7
	- South of 60°N			1.3	-1.3	-3.2
	Sweden (58 lakes)	1959	2014	2	-2.9	-4.9
	- North of 60°N			1.3	-2.4	-3.6
	- South of 60°N			3.6	-4.1	-7.8

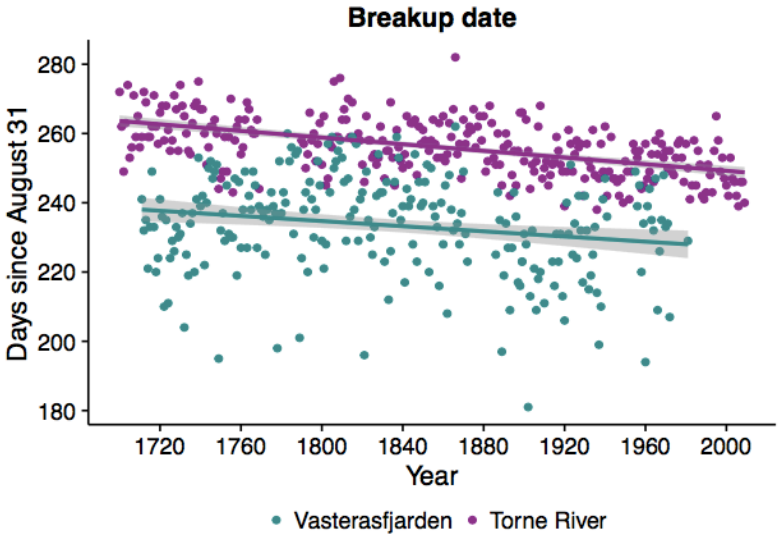

Figure S1. Observed breakup dates form 1700 – 2009 for Torne River and 1711 – 1989 for Västeråsfjärden. The best linear fit and the corresponding confidence levels are shown for both series.

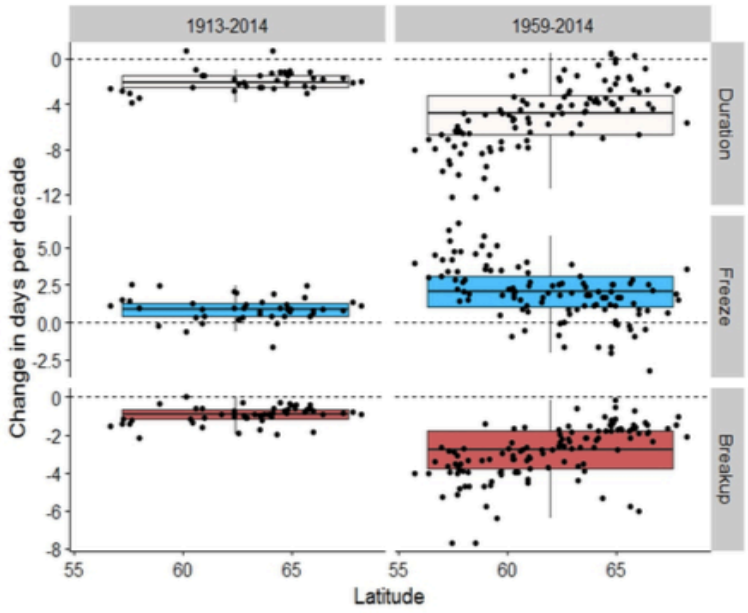

Figure S2. Change per decade in ice duration, freeze and breakup date during1913-2014 and 1959-2014. Decrease in freeze and breakup date represent earlier date, while increase represent a later date. Values for individual lakes are marked in black based on latitude.

Temp mean, months	Ice duration	Freeze date	Breakup date
October-December, OND	-0.44	0.50	-0.11
December-February, DJF	-0.34	0.19	-0.35
March-May, MAM	-0.44	0.07	-0.69
April-June, AMJ	-0.38	0.10	-0.56
November-May, N-M	-0.50	0.26	-0.53
September-August, Annual	-0.54	0.31	-0.53

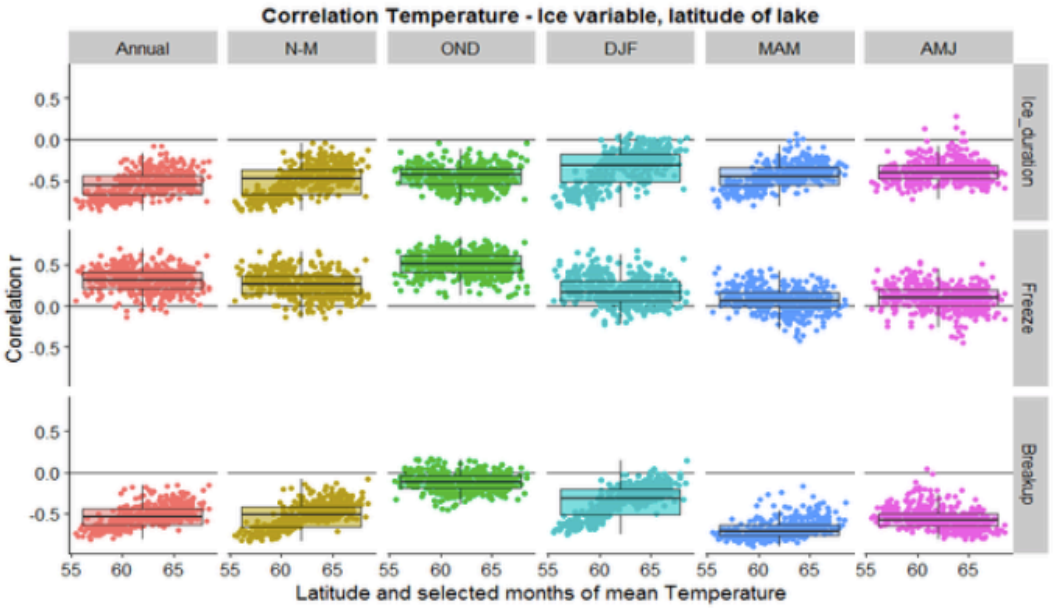

Figure S3. Correlations between ice variables (freeze, breakup and ice duration) *and mean temperature for different time periods. Mean values are tabulated over different times of the year. Correlations during these same time periods are displayed across latitudes in the figure.*