

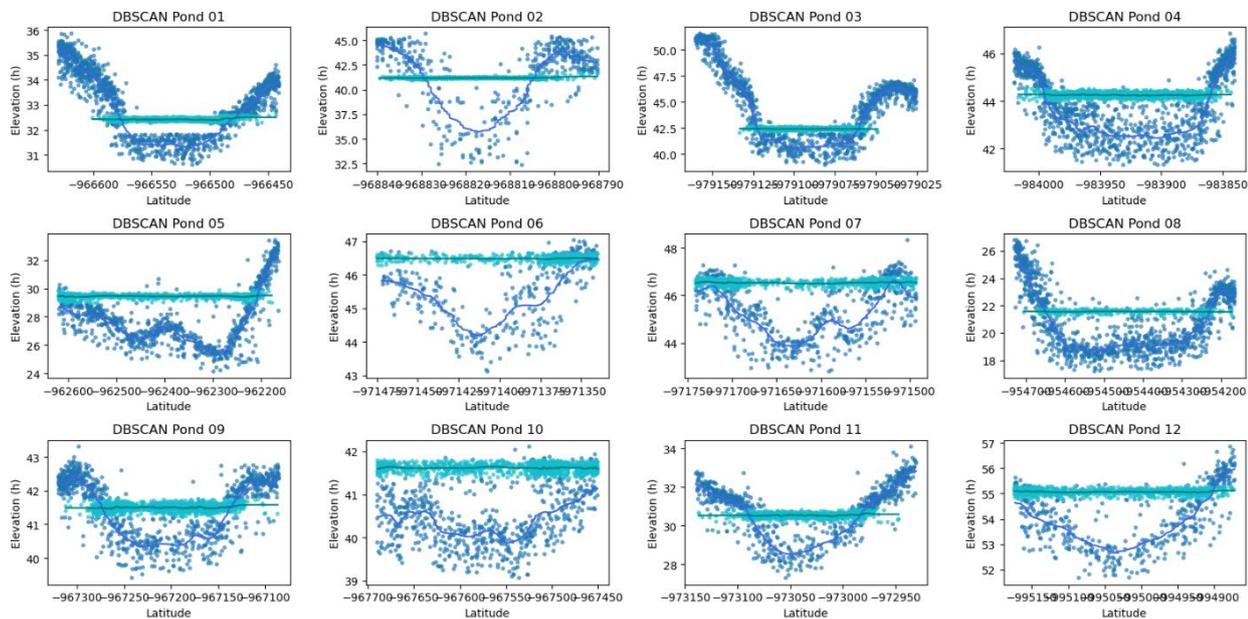
## Supplementary Information

**Table S1: Data acquisition information for WorldView-2/3, ArcticDEM, Sentinel-2, and ICESat-2.**

Product	Acquisition Date/Time	Scene/Track ID	Figure?
WorldView-2 multispectral imagery	2013-06-27 21:08:34 UTC	10300100234AF200	Fig. 8
	2013-08-21 20:40:09 UTC	103001002665B800	Fig. 8
	2014-06-20 23:00:36 UTC	10300100335D2400	Fig. 8
	2014-06-30 20:13:28 UTC	10300100340AF800	
	2014-07-06 18:11:47 UTC	1030010033713E00	
	2014-08-12 23:46:11 UTC	10300100357B5000	Fig. 2, Fig. 8
	2014-08-18 18:27:38 UTC	10300100363CD400	
	2014-09-01 18:10:24 UTC	103001003682A000	Fig. 8
	2015-07-10 17:46:21 UTC	10300100460A0300	Fig. 8
	2016-06-26 21:29:22 UTC	1030010057BE9900	
	2016-07-07 21:21:52 UTC	103001005ABAB700	
	2016-07-13 17:42:23 UTC	103001005992DB00	
	2017-09-22 19:34:54 UTC	103001006F21B500	Fig. 8
	2018-07-24 19:21:43 UTC	10300100820A2600	Fig. 1, Fig. 8
	2020-08-17 17:51:55 UTC	10300100AC47AC00	Fig. 2
2023-06-27 06:58:54 UTC	10300100E88FE300	Fig. 2	
WorldView-3 multispectral imagery	2016-06-15 23:54:40 UTC	104001001E762500	Fig. 8
	2016-08-15 22:05:00 UTC	1040010021BD7F00	
	2016-09-09 18:57:43 UTC	10400100212AA300	Fig. 8
	2017-06-13 23:19:28 UTC	104001002D7A1B00	Fig. 8
	2017-06-30 19:41:23 UTC	104001002F2F0D00	
	2018-08-31 21:41:19 UTC	10400100426FFE00	Fig. 8
ArcticDEM strip	2014-06-20 23:00:35	1030010033A2D400	
	2014-06-20 23:01:38	10300100335D2400	
	2014-06-30 20:12:30	10300100340AF800	
	2016-06-30 20:13:33	10300100332FD900	
	2014-07-06 18:11:43	1030010033713E00	
	2014-07-06 18:12:52	103001003376F100	
	2014-08-12 23:44:55	10300100357B5000	
	2014-08-12 23:46:07	10300100369C2A00	
	2014-08-18 18:26:25	10300100352C8300	
	2014-08-18 18:27:34	10300100363CD400	
	2016-06-15 23:53:43	104001001D93A200	
	2016-06-15 23:54:40	104001001E762500	
	2016-06-26 02:27:57	1030010057D24400	
	2016-06-26 02:29:20	1030010057BE9900	
	2016-07-07 21:21:57	1030010059D3AD00	
	2016-07-07 21:23:32	103001005ABAB700	
	2016-07-13 17:42:29	103001005AA16700	
	2016-07-13 17:43:51	103001005992DB00	
	2016-08-15 22:04:53	10400100208A3100	
	2016-08-15 22:05:59	1040010021BD7F00	
	2020-08-17 17:51:55	10300100AB61F200	
	2020-08-17 17:53:11	10300100AC47AC00	
	2023-06-27 18:58:54	10300100E8637D00	
	2023-06-27 19:00:17	10300100E88FE300	
	2018-07-25 19:59:01	T21XVK	Fig. 1

Sentinel-2 L1C multispectral imagery	2023-06-27 20:08:59	T21XVK	Fig. 2
ICESat-2 ATL03	2020-08-17 00:14:09 UTC	08040804	
	2023-06-29 08:43:30 UTC	01402004	

**Figure S1: Final ICESat-2 clustering and corresponding bathymetry profiles for all ponds.**



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Figure S2: Water depth (m) calculated using Eq. 5 for all ponds. Imagery copyright Vantor 2025.

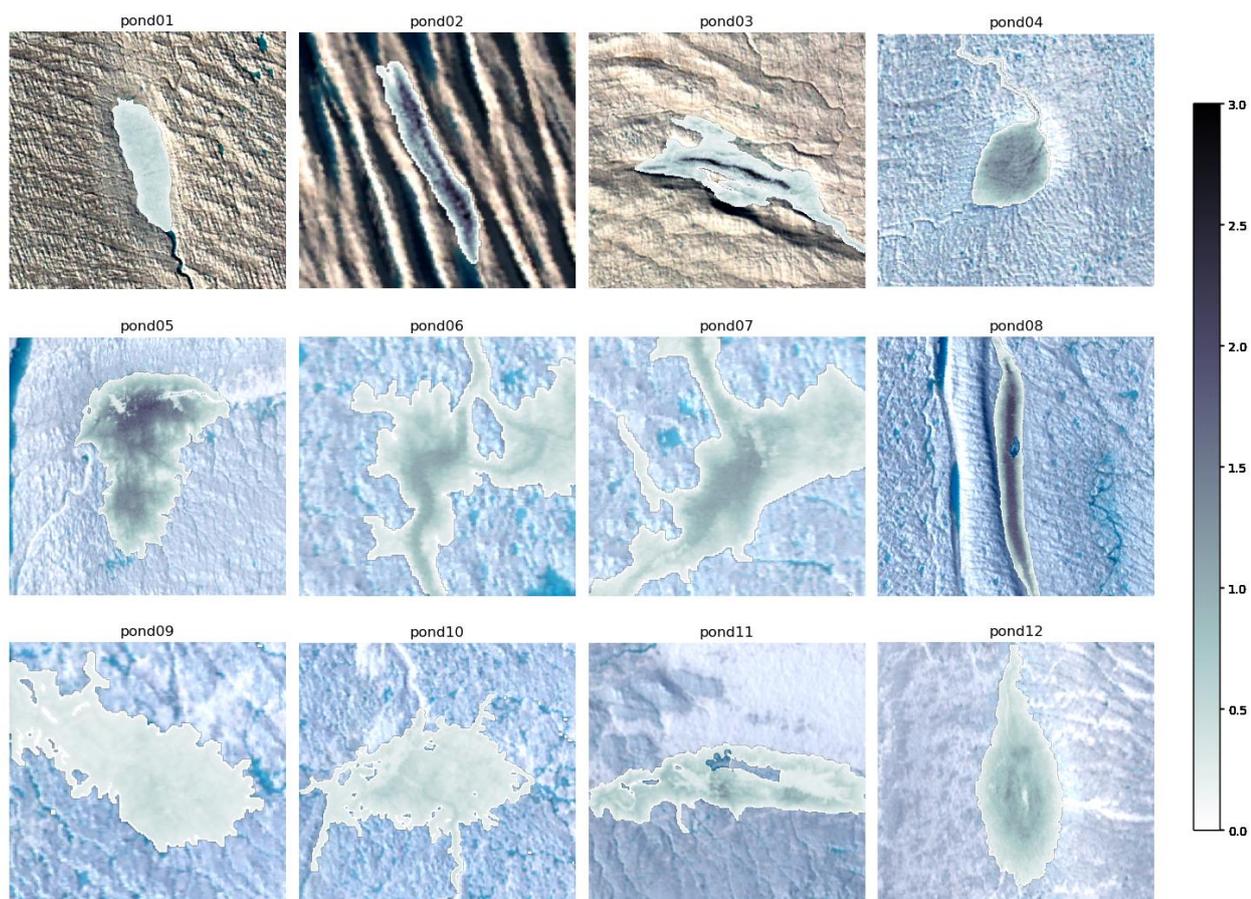
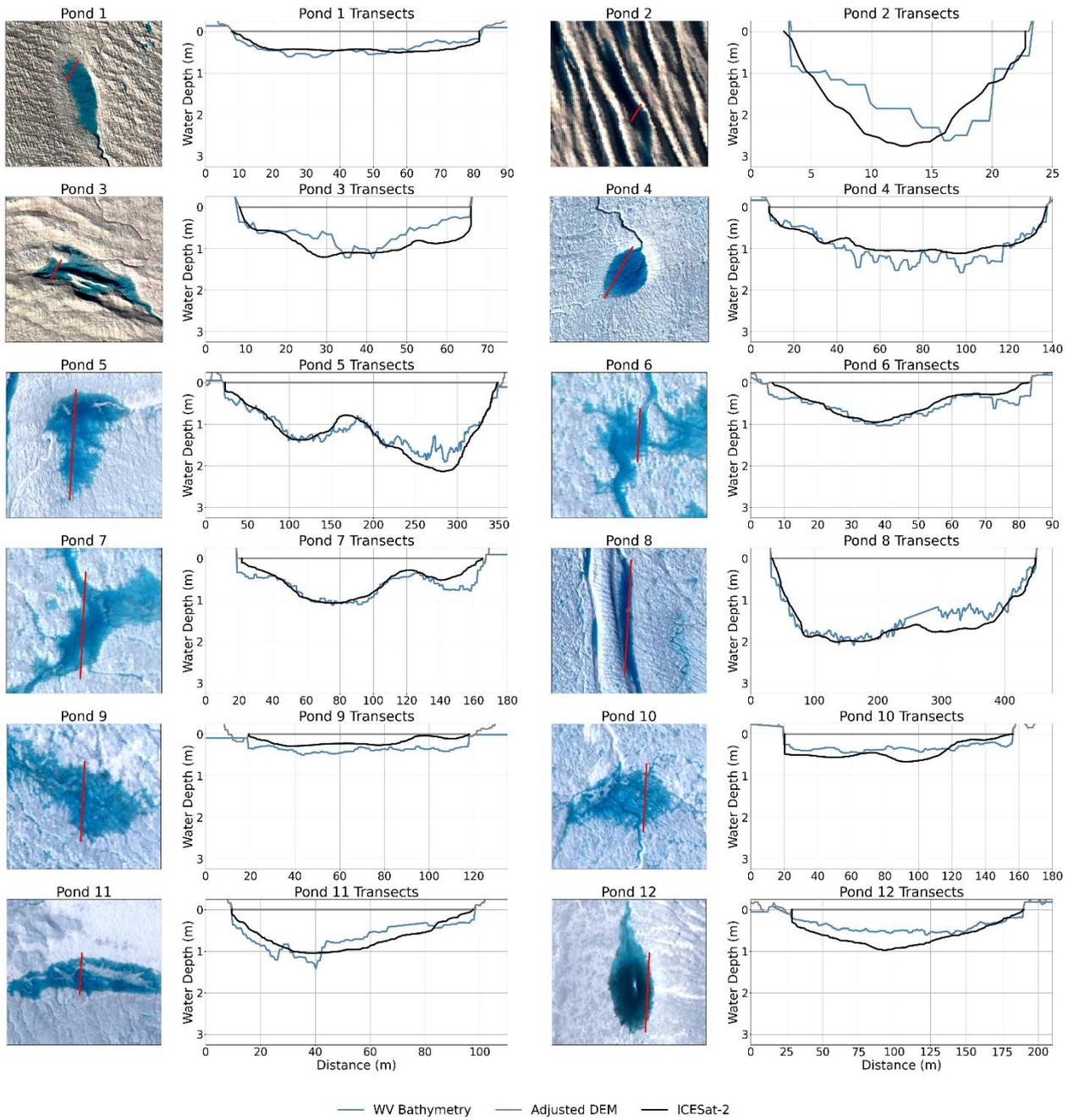
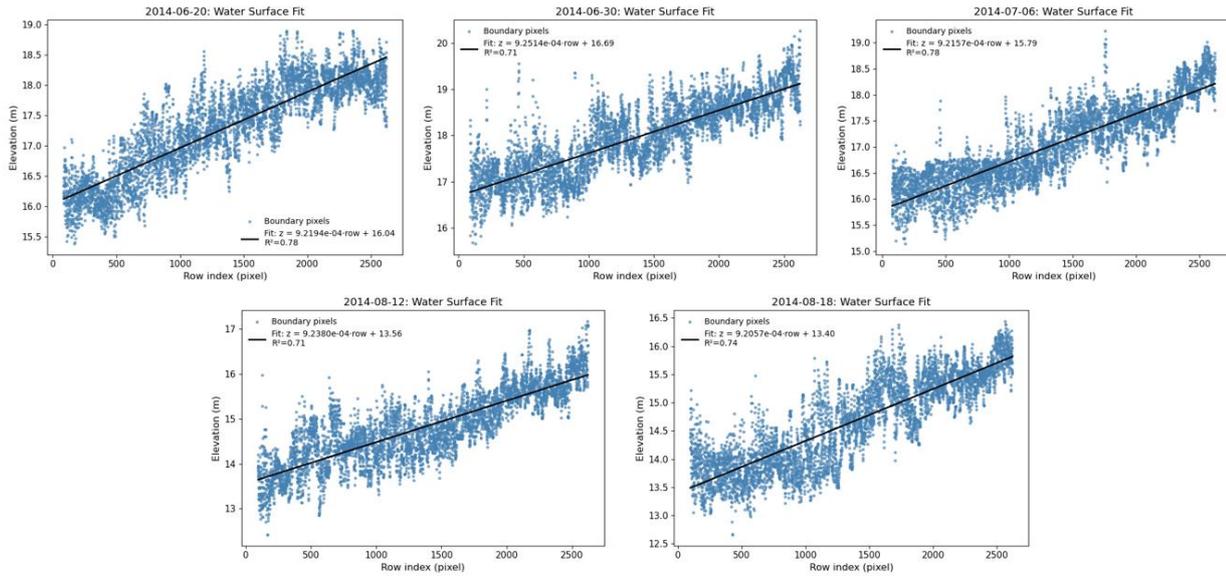


Figure S3: Final ICESat-2 bathymetry compared to predicted bathymetry using Eq. 5. Imagery copyright Vantor 2025.

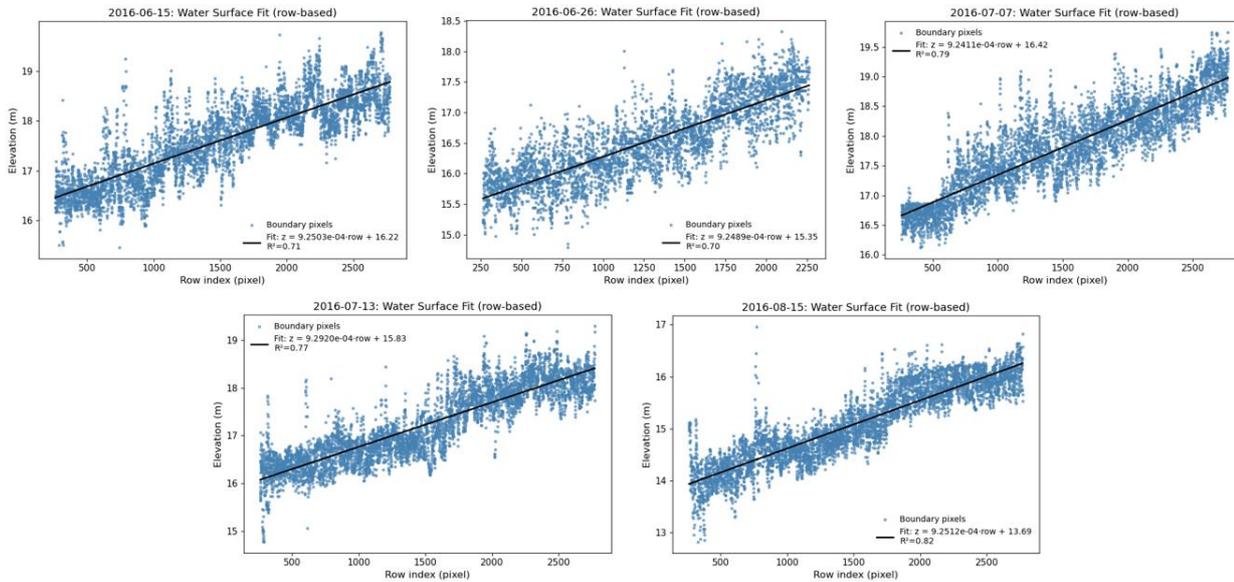


**Figure S4: 2014 river surface elevation gradient best fit lines.**

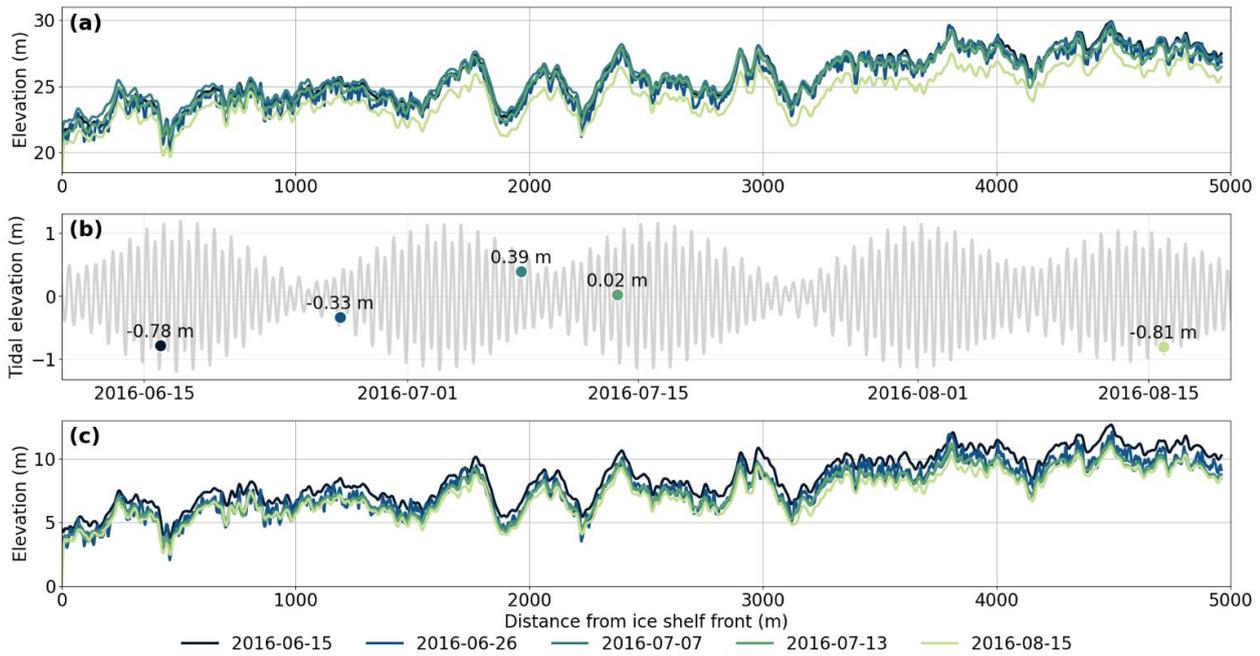


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**Figure S5: 2016 river surface elevation gradient best fit lines.**

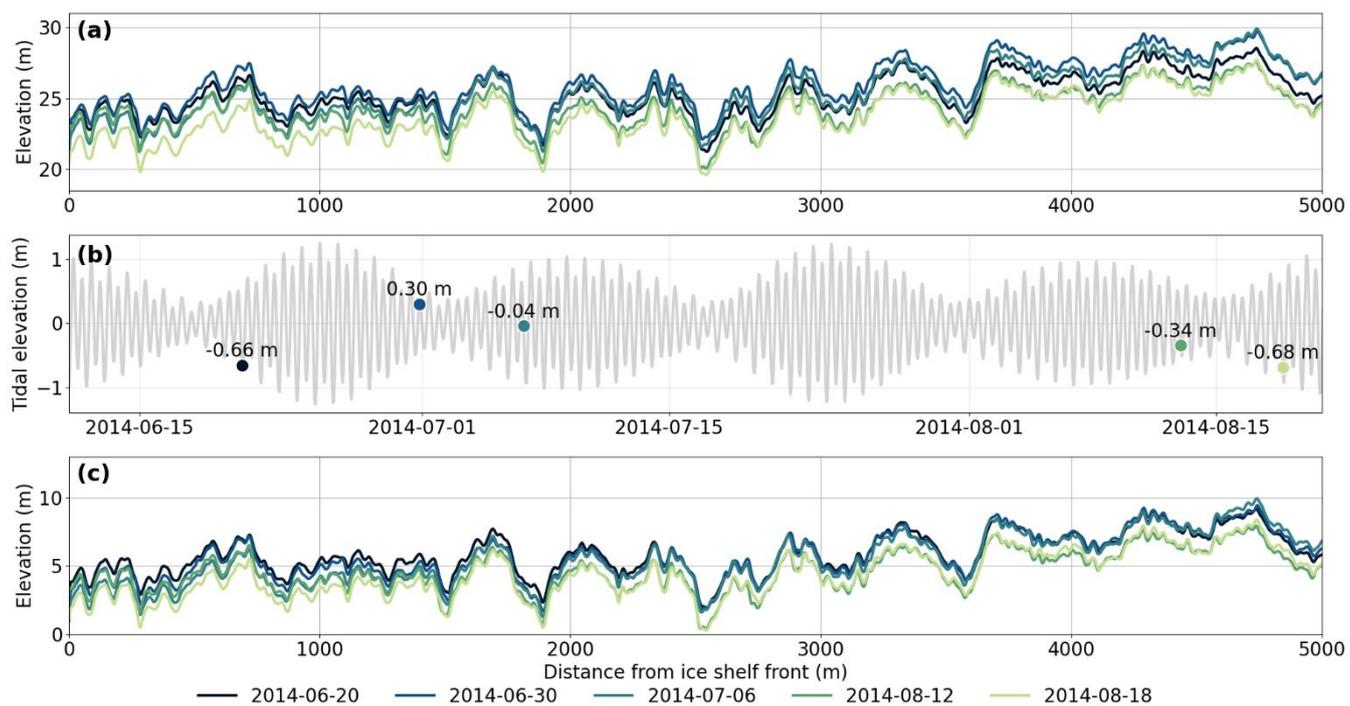


20 **Figure S6: Example of tidal correction applied to five DEM dates during the 2016 melt season. Subplots show (a) DEM surface elevation profiles prior to tidal correction, (b) tidal elevation from Gr1kmTM with points for the corresponding DEM acquisition dates and times labelled with the calculated displacement, and (c) tide corrected DEM surface elevation profiles. The equivalent figure for 2014 is Fig. S7.**



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Figure S7: Same as Fig. S6 for the 2014 melt season.



30 **Figure S8: Ocean and ice surface elevation profiles for the 2014 melt season. Elevation values over the ocean surface can be highly variable due to the presence of sea ice, clouds, and processing artifacts (imagery copyright Vantor 2014).**

