

Supporting Information for “Atmospheric form drag coefficients over Arctic sea ice using remotely sensed ice topography data, spring 2009–2015”

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Figures S1–S4, Table S1–S2

Introduction

This supplemental section provides more figures and an additional table to increase the scope of the information included in the main manuscript.

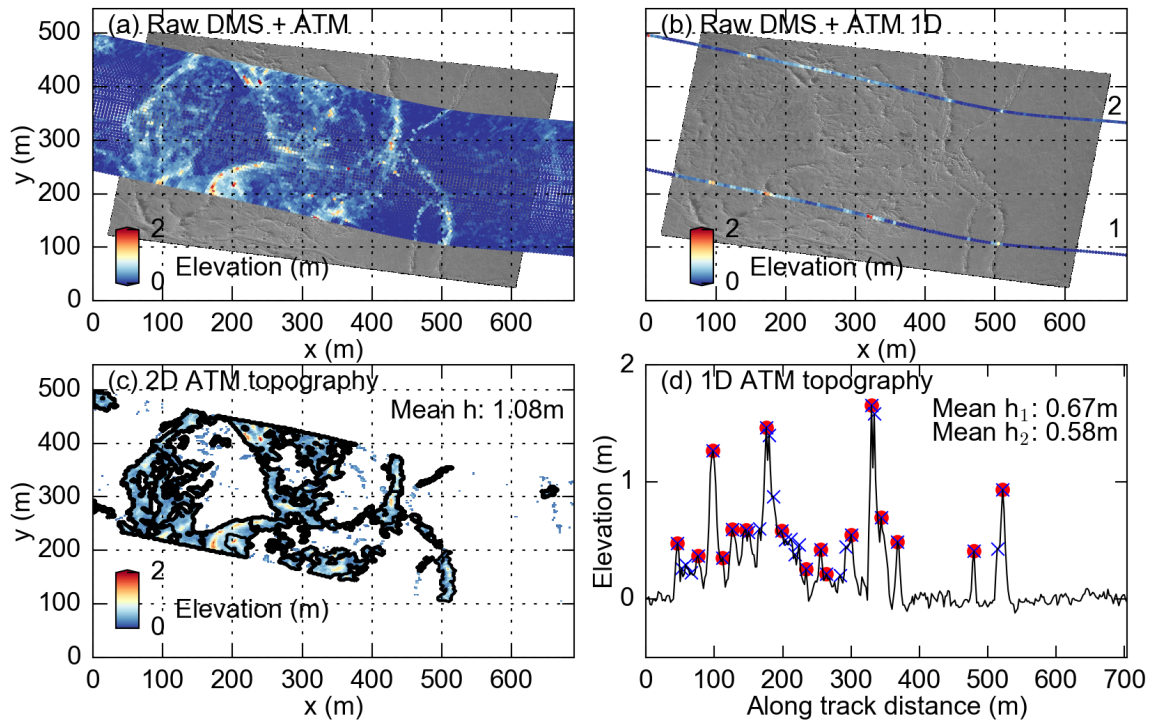


Figure S1. Case study of the full scan and linear profiling feature detection schemes, as in Figure 2 but for a different example (taken later on the 23rd March, 2011).

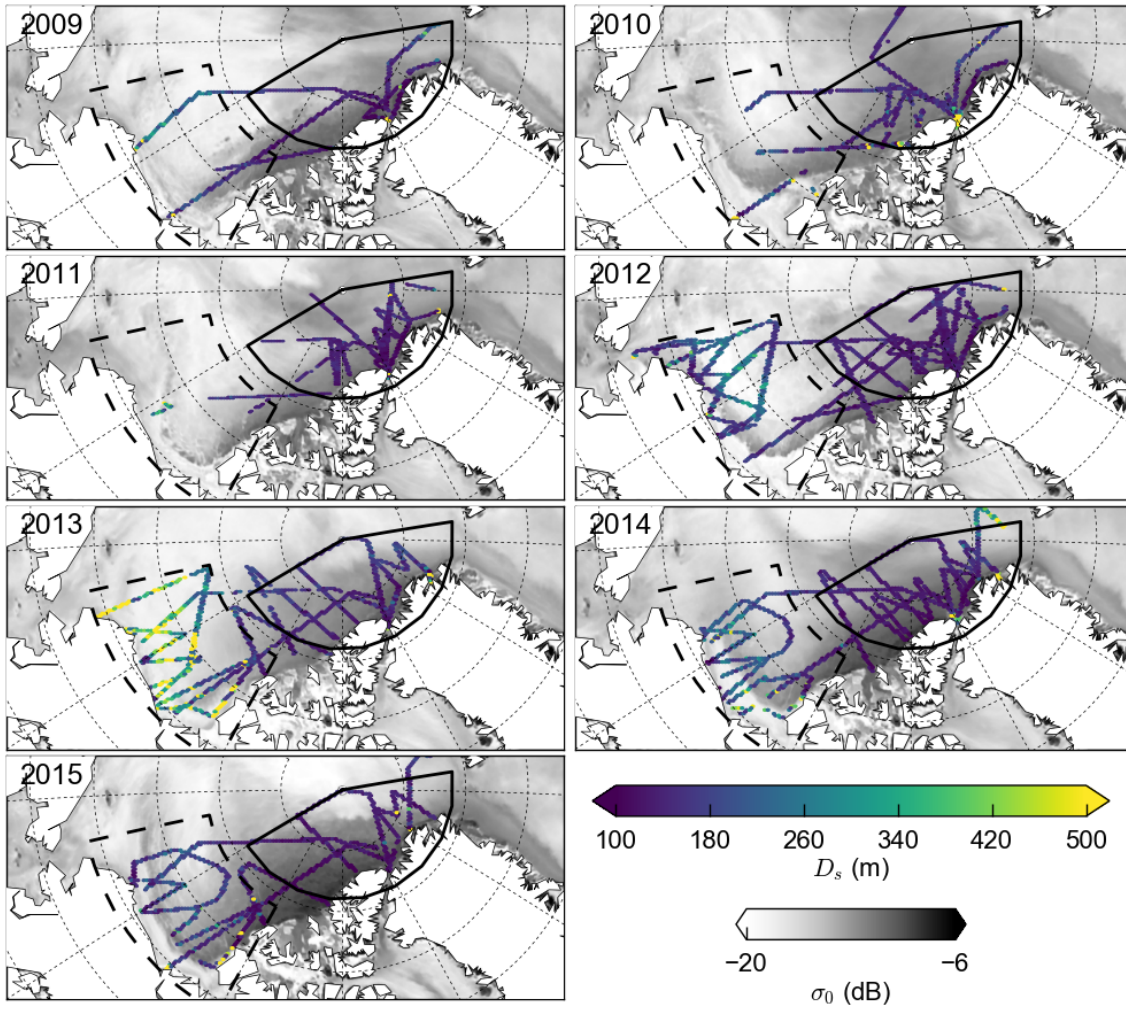


Figure S2. Surface feature spacing, D_s , from 2009 to 2015, estimated using the full scan ice topography data. The results are overlaid on the mean ASCAT satellite radar backscatter data (σ_0) over the same annual IceBridge sea ice campaign time period. The solid (dashed) black lines represent represent the Central Arctic (Beaufort/Chukchi) regions used in this study. The data are plotted using hexagonal bins.

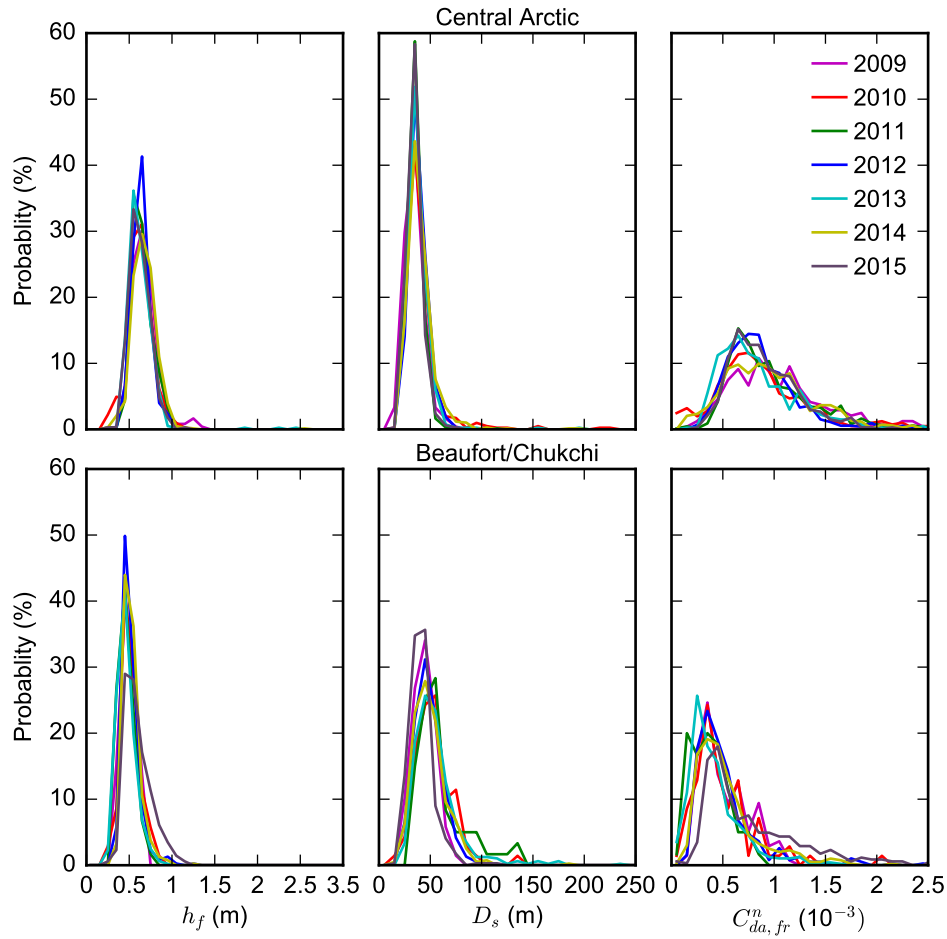


Figure S3. As in Figure 4 but for the probability distributions of the linear profiling data. The statistics: mean/standard deviation (median/mode) of each distribution are summarized in Table 1 (S1).

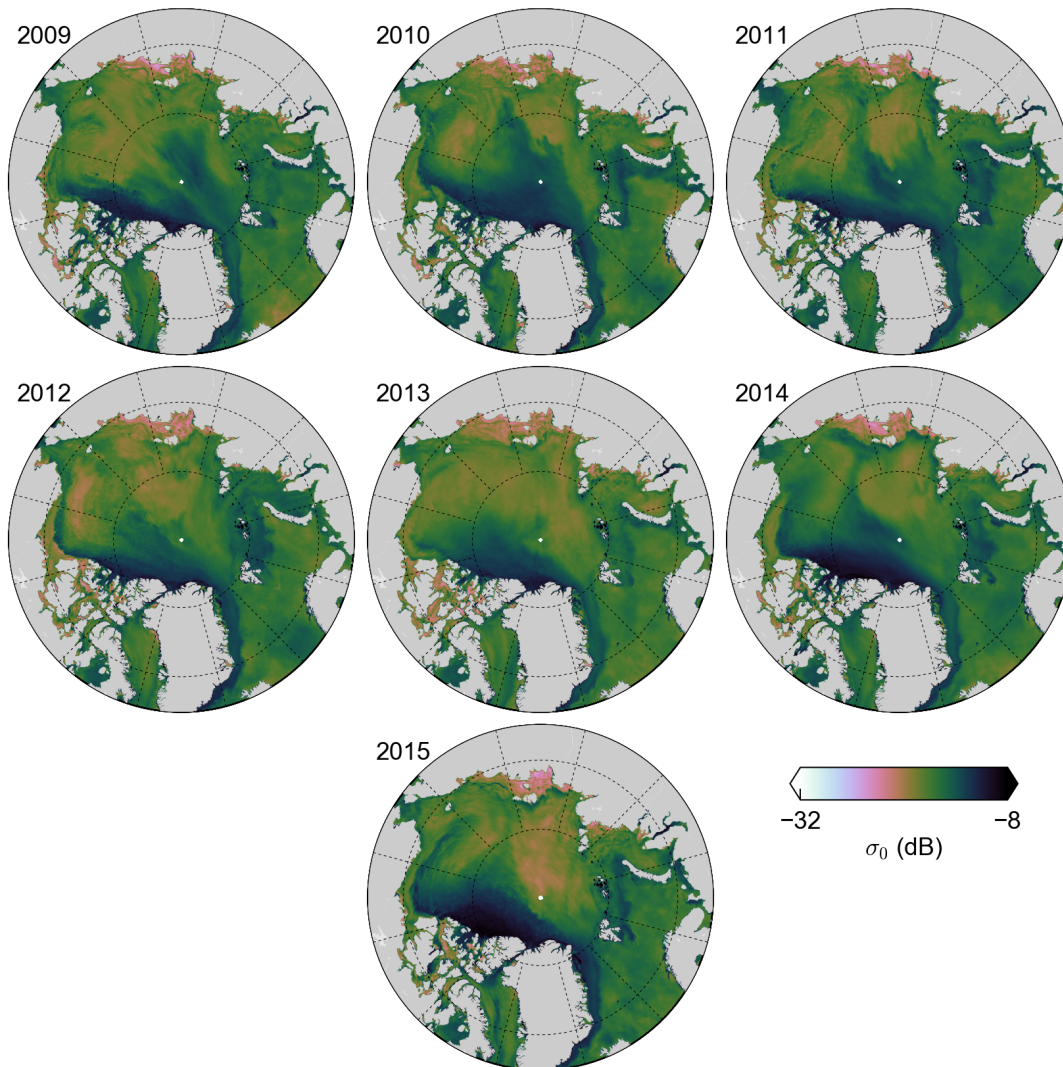


Figure S4. Radar backscatter data (σ_0) from the Advanced Scatterometer (ASCAT), averaged over the spring IceBridge sea ice campaign time periods.

Year	h_f (m)			D_s (m)			$C_{da,fr}^n$ (10^{-3})		
	CA	BC	Arctic	CA	BC	Arctic	CA	BC	Arctic
Linear									
2009	0.66/0.65	0.49/0.45	0.6/0.55	33.4/35.0	44.4/45.0	36.1/35.0	0.98/0.85	0.44/0.35	0.79/0.35
2010	0.63/0.65	0.49/0.45	0.61/0.55	36.6/35.0	51.0/55.0	37.7/35.0	0.81/0.75	0.43/0.35	0.75/0.65
2011	0.63/0.55	0.44/0.45	0.62/0.55	34.6/35.0	52.5/55.0	35.3/35.0	0.85/0.65	0.36/0.15	0.80/0.65
2012	0.64/0.65	0.49/0.45	0.59/0.65	36.8/35.0	45.6/45.0	39.4/35.0	0.81/0.75	0.43/0.35	0.70/0.55
2013	0.60/0.55	0.44/0.45	0.52/0.55	36.9/35.0	50.8/45.0	41.9/35.0	0.75/0.65	0.35/0.25	0.53/0.45
2014	0.67/0.65	0.50/0.45	0.60/0.55	37.6/35.0	46.8/45.0	40.6/35.0	0.89/0.85	0.46/0.35	0.69/0.55
2015	0.61/0.55	0.55/0.45	0.57/0.55	33.3/35.0	40.8/45.0	36.0/35.0	0.83/0.65	0.61/0.45	0.73/0.55
All	0.64/0.65	0.49/0.45	0.59/0.55	35.7/35.0	45.9/45.0	38.3/35.0	0.84/0.65	0.44/0.35	0.70/0.65
Full scan									
2009	1.41/1.15	1.11/1.15	1.3/1.15	133.6/125.0	175.3/145.0	141.0/125.0	0.79/0.55	0.42/0.15	0.66/0.45
2010	1.28/1.25	1.03/0.95	1.25/1.25	144.5/145.0	171.8/135.0	146.6/135.0	0.65/0.65	0.39/0.25	0.61/0.65
2011	1.25/1.15	0.94/0.85	1.22/1.15	131.5/125.0	191.8/145.0	135.0/135.0	0.68/0.55	0.31/0.15	0.63/0.55
2012	1.28/1.25	0.97/0.95	1.17/1.15	130.6/125.0	177.4/135.0	140.7/125.0	0.71/0.55	0.33/0.25	0.56/0.45
2013	1.20/1.15	0.86/0.85	1.01/0.85	146.0/145.0	263.2/145.0	172.4/145.0	0.57/0.45	0.18/0.15	0.37/0.15
2014	1.38/1.45	0.97/0.95	1.18/0.95	129.0/125.0	191.8/165.0	142.6/125.0	0.82/0.85	0.30/0.25	0.56/0.25
2015	1.34/1.15	1.10/0.95	1.21/1.05	123.5/115.0	160.8/175.0	135.3/115.0	0.82/0.55	0.43/0.25	0.61/0.55
All	1.30/1.25	0.97/0.95	1.18/1.15	132.9/125.0	187.1/145.0	143.8/125.0	0.71/0.55	0.31/0.25	0.56/0.45

Table S1. Median/modal surface feature height, h_f , spacing, D_s , and neutral atmospheric drag coefficient, $C_{da,fr}^n$ taken from the probability distributions shown in Figure 4 (full scan) and Figure S3 (linear profiling).

Year	R_i - Linear			R_i - Full scan		
	CA	BC	AO	CA	BC	AO
2009	0.022 (0.010)	0.012 (0.005)	0.018 (0.010)	0.011 (0.005)	0.007 (0.003)	0.010 (0.005)
2010	0.018 (0.009)	0.011 (0.006)	0.017 (0.009)	0.009 (0.004)	0.007 (0.003)	0.009 (0.004)
2011	0.019 (0.006)	0.009 (0.004)	0.018 (0.007)	0.010 (0.003)	0.005 (0.002)	0.009 (0.004)
2012	0.018 (0.006)	0.012 (0.006)	0.016 (0.006)	0.010 (0.003)	0.006 (0.003)	0.008 (0.004)
2013	0.017 (0.006)	0.010 (0.005)	0.013 (0.006)	0.009 (0.003)	0.004 (0.003)	0.006 (0.004)
2014	0.019 (0.007)	0.012 (0.006)	0.016 (0.007)	0.011 (0.004)	0.006 (0.003)	0.009 (0.004)
2015	0.019 (0.005)	0.016 (0.008)	0.017 (0.007)	0.011 (0.004)	0.008 (0.004)	0.009 (0.004)
All	0.019 (0.007)	0.012 (0.006)	0.016 (0.007)	0.010 (0.004)	0.006 (0.003)	0.008 (0.004)

Table S2. Mean ridging intensity, R_i , using the linear profiling (left) and full scan (right) data, averaged over the Central Arctic (CA), Beaufort/Chukchi (BC) and Arctic Ocean (AO) regions. The values in brackets represent one standard deviation.