



Supplement of

Assessing volumetric change distributions and scaling relations of retrogressive thaw slumps across the Arctic

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1 Propbility density function of area and volumetric change rates

To compute the rollover, cutoff, exponetial decay coefficients we fitted a three-parameter inverse Gamma function defined by:

$$pdf(X_{RTS}|\rho, a, s) = \frac{1}{a\Gamma(\rho)} \left(\frac{1}{X_{RTS} - s} \right)^{\rho+1} \exp \left(-\frac{a}{X_{RTS} - s} \right) \quad (1)$$

where X_{RTS} is either the yearly area or volume change and $\Gamma(\rho)$ is the gamma function of ρ . The determined values of the

5 fitting parameters as well as the rollover, cutoff and exponential decay coefficients can be seen in Table S1 and S2.

Table S 1. Rollover Cutoff and Exponential decay for yearly area change rate.

Area	Rollover [$10^2 \text{m}^2 \text{yr}^{-1}$]	Cutoff [$10^3 \text{m}^2 \text{yr}^{-1}$]	Exp.decay	ρ	a [10^3]	s [10^3]
Peel	4.96 ± 0.48	1.98 ± 0.94	2.4 ± 0.4	1.45	1.47	-0.11
Banks	10.84 ± 0.66	3.95 ± 2.10	3.0 ± 0.5	1.76	3.60	-0.21
Ellesmere	11.46 ± 0.98	5.41 ± 2.74	3.2 ± 0.9	1.49	3.10	-0.10
Tuktuyaktuk	2.42 ± 0.43	1.31 ± 0.24	3.6 ± 0.8	1.82	0.76	-0.03
Noatak	4.89 ± 1.79	1.23 ± 0.21	2.8 ± 0.6	12.9	27.62	-1.38
Chukotka	3.36 ± 1.50	1.13 ± 0.15	3.2 ± 0.5	29.59	100.76	-2.82
Taymyr	4.02 ± 0.28	1.15 ± 0.24	3.0 ± 0.4	0.85	0.34	-0.19
Yamal/Gydan	3.92 ± 0.73	1.36 ± 0.20	3.7 ± 1.2	4.26	4.34	-0.41

Table S 2. Rollover Cutoff and Exponential decay for yearly volumetric change rate.

Area	Rollover [$10^2 \text{m}^3 \text{yr}^{-1}$]	Cutoff [$10^3 \text{m}^3 \text{yr}^{-1}$]	Exp.decay	ρ	a [10^3]	s [10^3]
Peel	15.21 ± 1.86	3.31 ± 1.60	1.9 ± 0.1	0.97	3.71	-0.37
Banks	16.57 ± 1.14	5.34 ± 2.96	2.0 ± 0.2	0.95	3.33	-0.05
Ellesmere	29.83 ± 4.34	3.97 ± 2.73	1.9 ± 0.2	1.28	7.17	-0.32
Tuktuyaktuk	7.28 ± 0.67	1.35 ± 0.84	2.3 ± 0.2	2.15	2.89	-0.20
Noatak	5.83 ± 3.36	1.58 ± 0.45	2.1 ± 0.3	0.73	0.63	-0.14
Chukotka	10.42 ± 4.70	2.19 ± 0.90	2.6 ± 0.5	7.22	32.29	-2.55
Taymyr	9.63 ± 1.71	2.06 ± 1.40	2.3 ± 0.5	0.97	1.32	0.26
Yamal/Gydan	10.23 ± 2.93	2.41 ± 0.88	2.8 ± 0.6	4.25	12.54	-1.23

2 Additional Figures

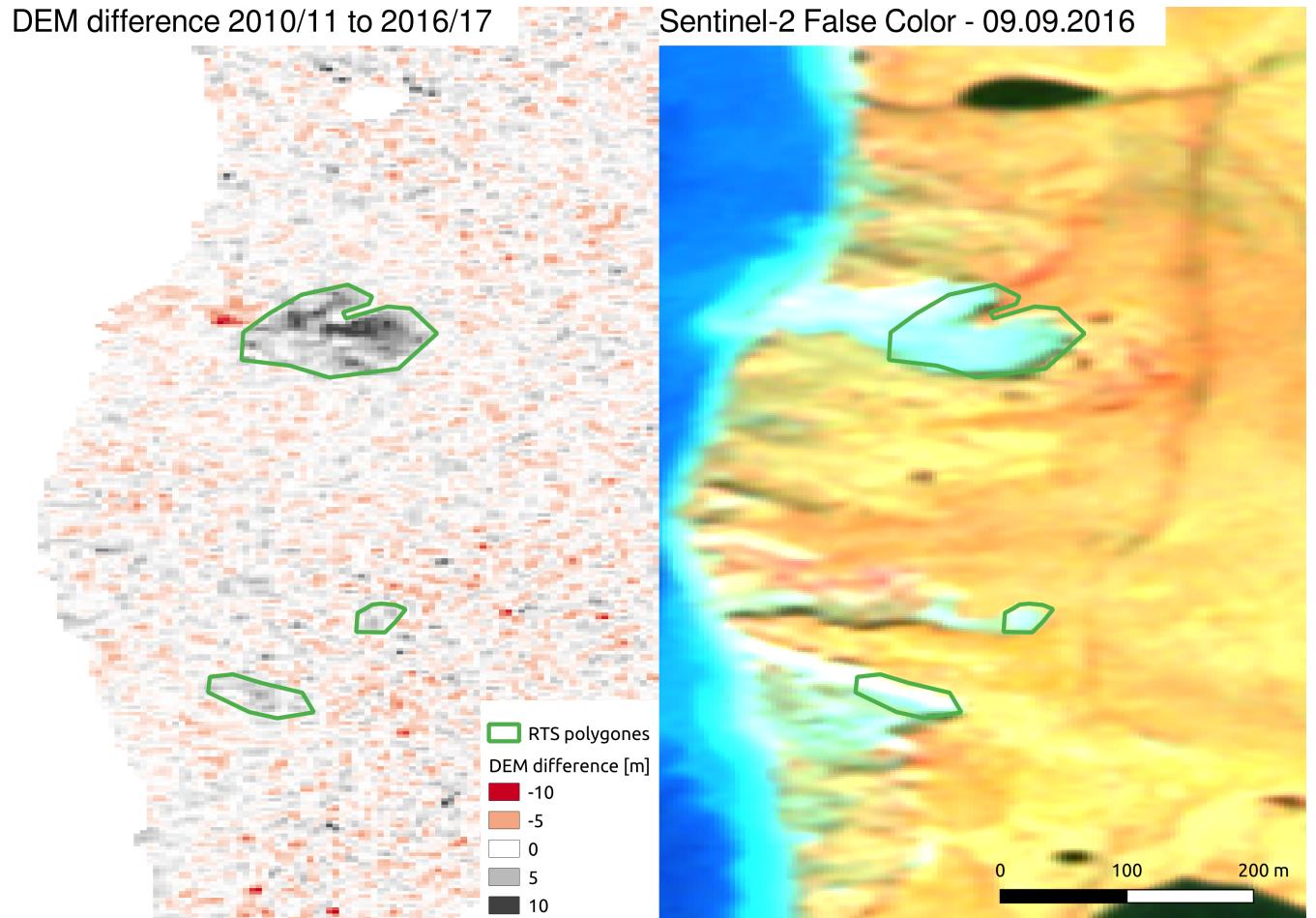


Figure S 1. Example of RTS polygons in the Chukotka study region located at N65.93 W-178.82. Left: DEM difference image between winter 2010/11 and 2016/17. Right: False color Sentinel-2 image taken on 09.09.2016.

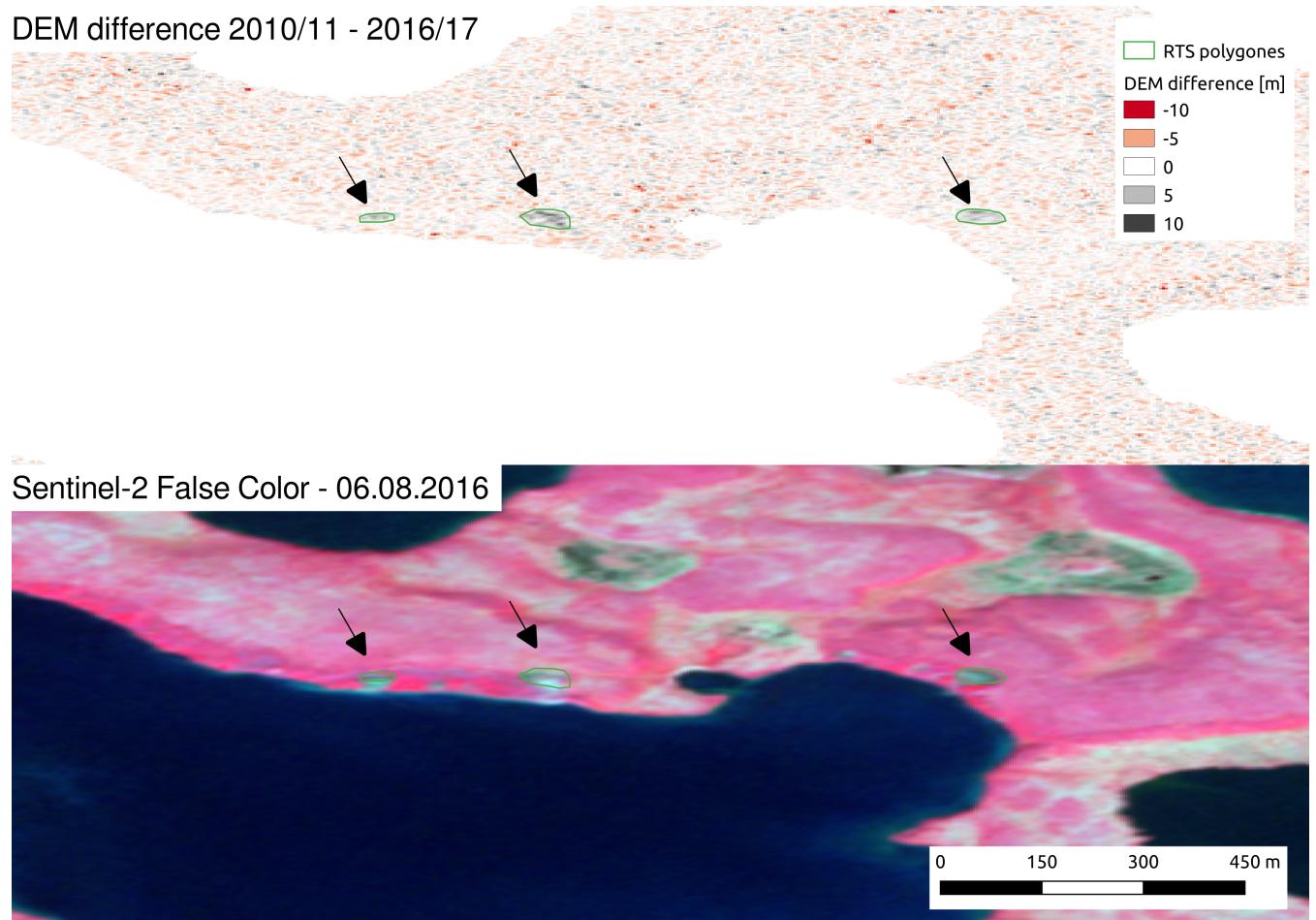
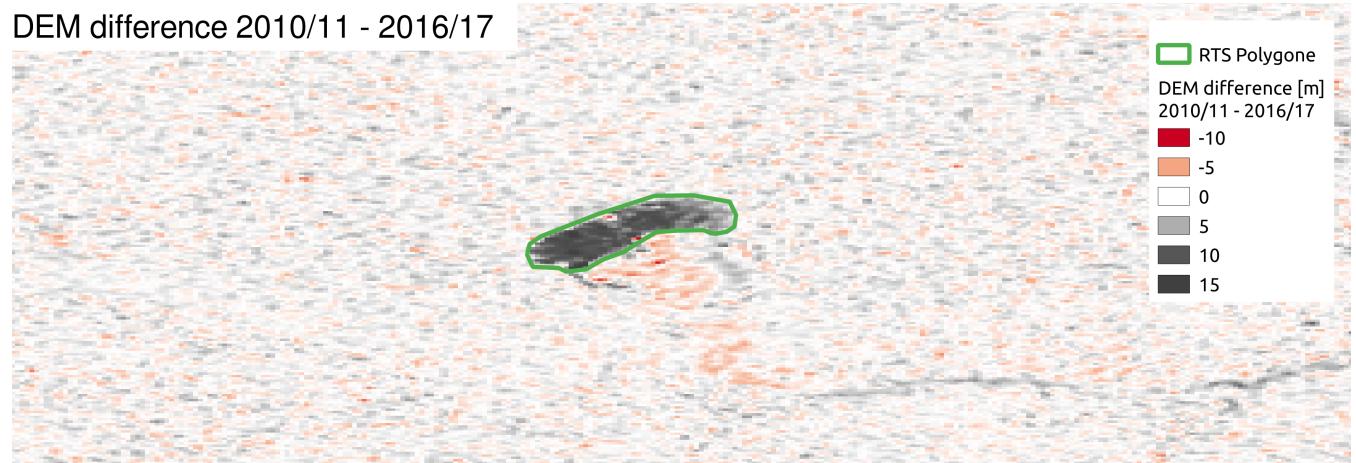


Figure S 2. Example of RTS polygones in the Tuktoyaktuk study region located at N69.08 W-134.02. The black arrows indicate the RTS locations Left: DEM difference image between winter 2010/11 and 2016/17. Right: False color Sentinel-2 image taken on 06.08.2016.

DEM difference 2010/11 - 2016/17



Sentinel-2 False Color - 06.08.2016

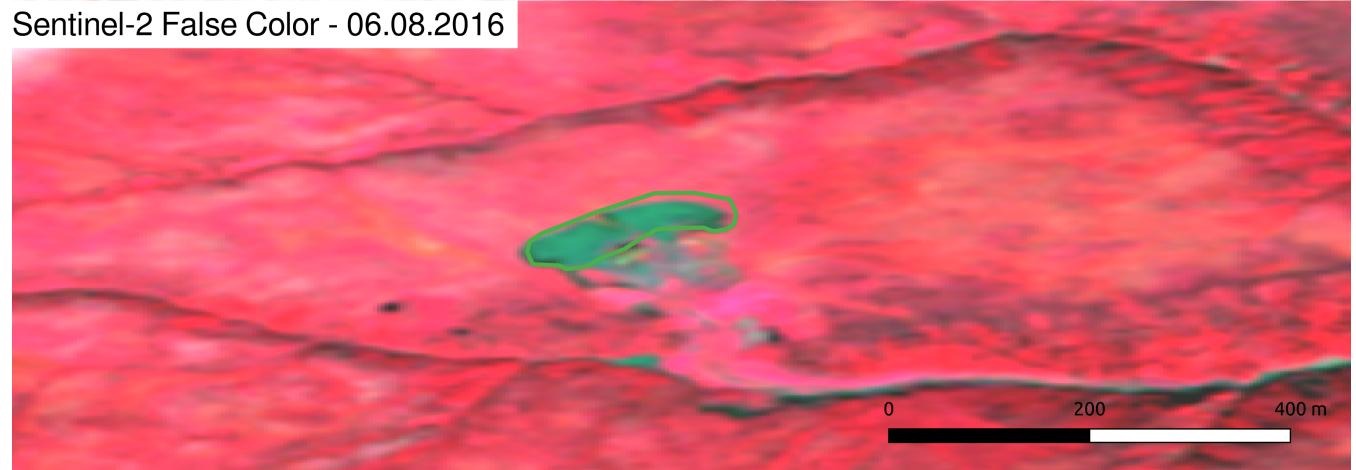


Figure S 3. Example of RTS polygons in the Peel study region located at N67.26 W-135.27. Left: DEM difference image between winter 2010/11 and 2016/17. Right: False color Sentinel-2 image taken on 06.08.2016.

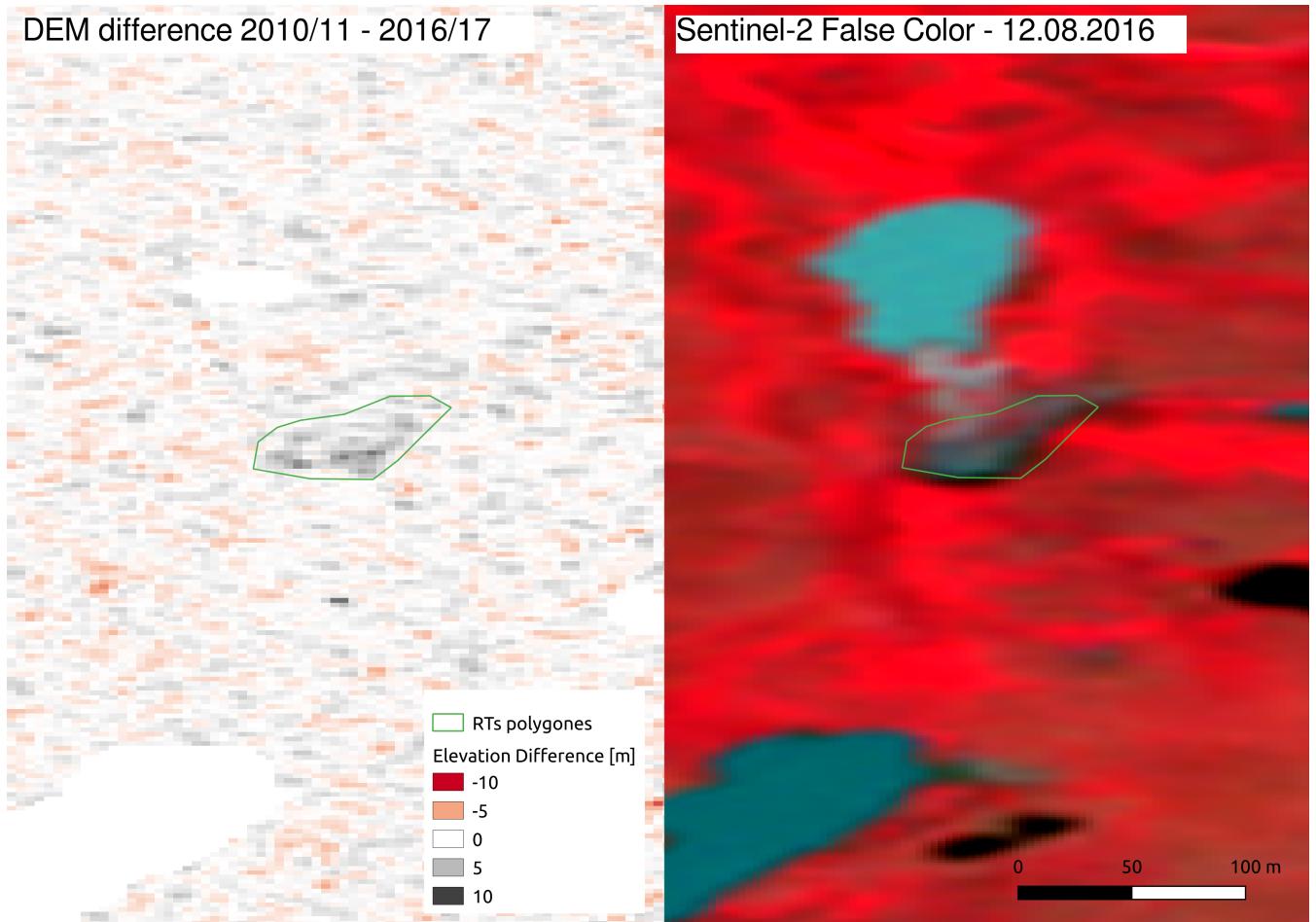


Figure S 4. Example of RTS polygones in the Yamal study region located at N71.09 W70.40 . Left: DEM difference image between winter 2010/11 and 2016/17. Right: Fasle color Sentinel-2 image taken on 12.08.2016.

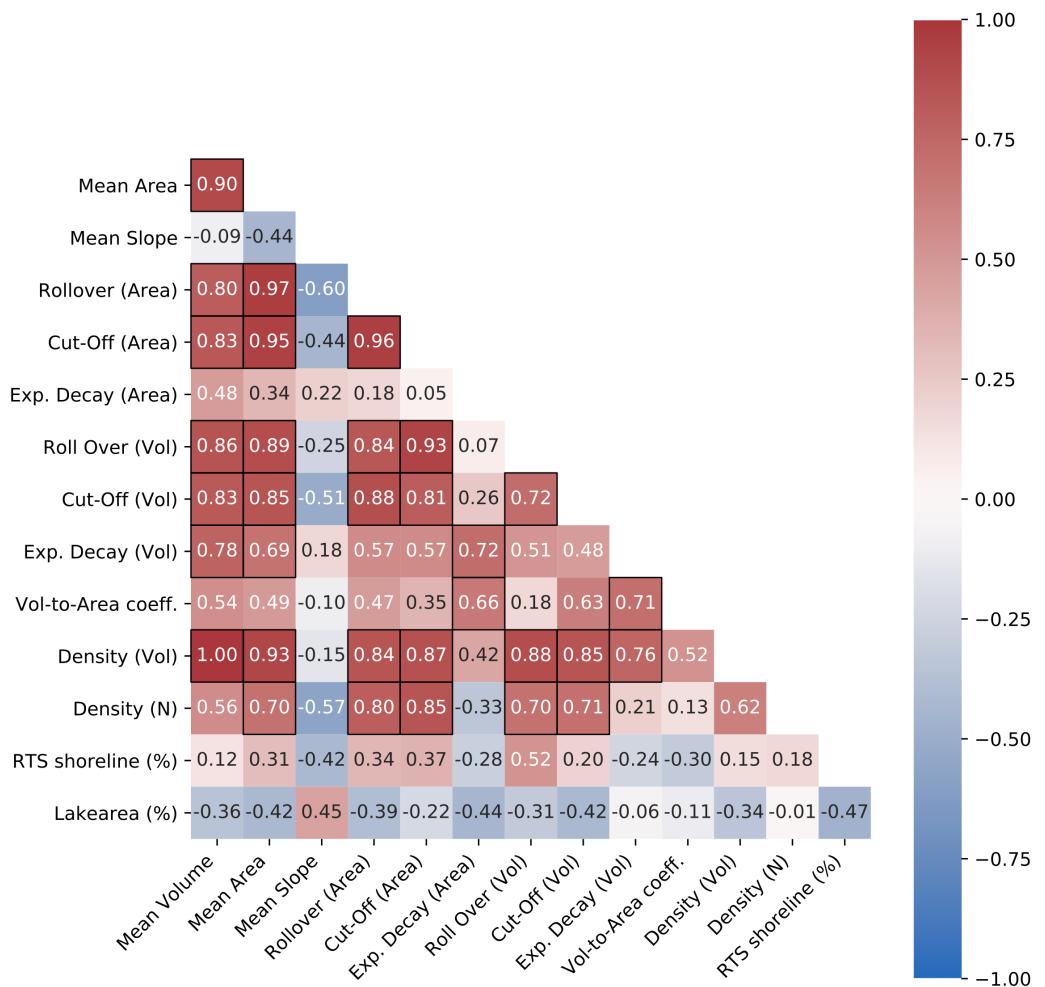


Figure S 5. Correlation coefficients between all computed quantities of all areas. Values below -0.64 and above 0.64 are statistically significant (t-Test with a p-value < 0.05).

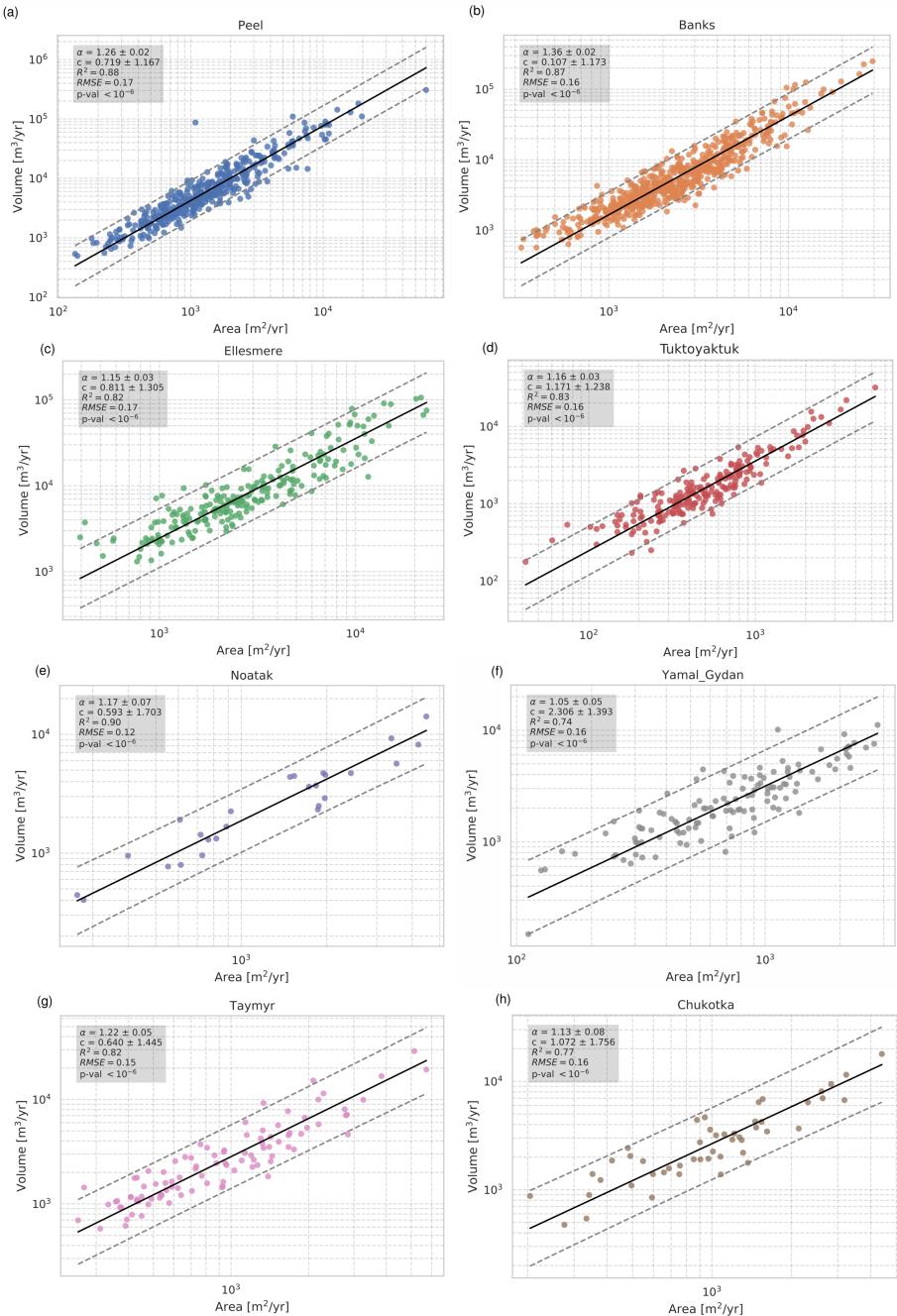


Figure S 6. Area to volume scaling for each study area.

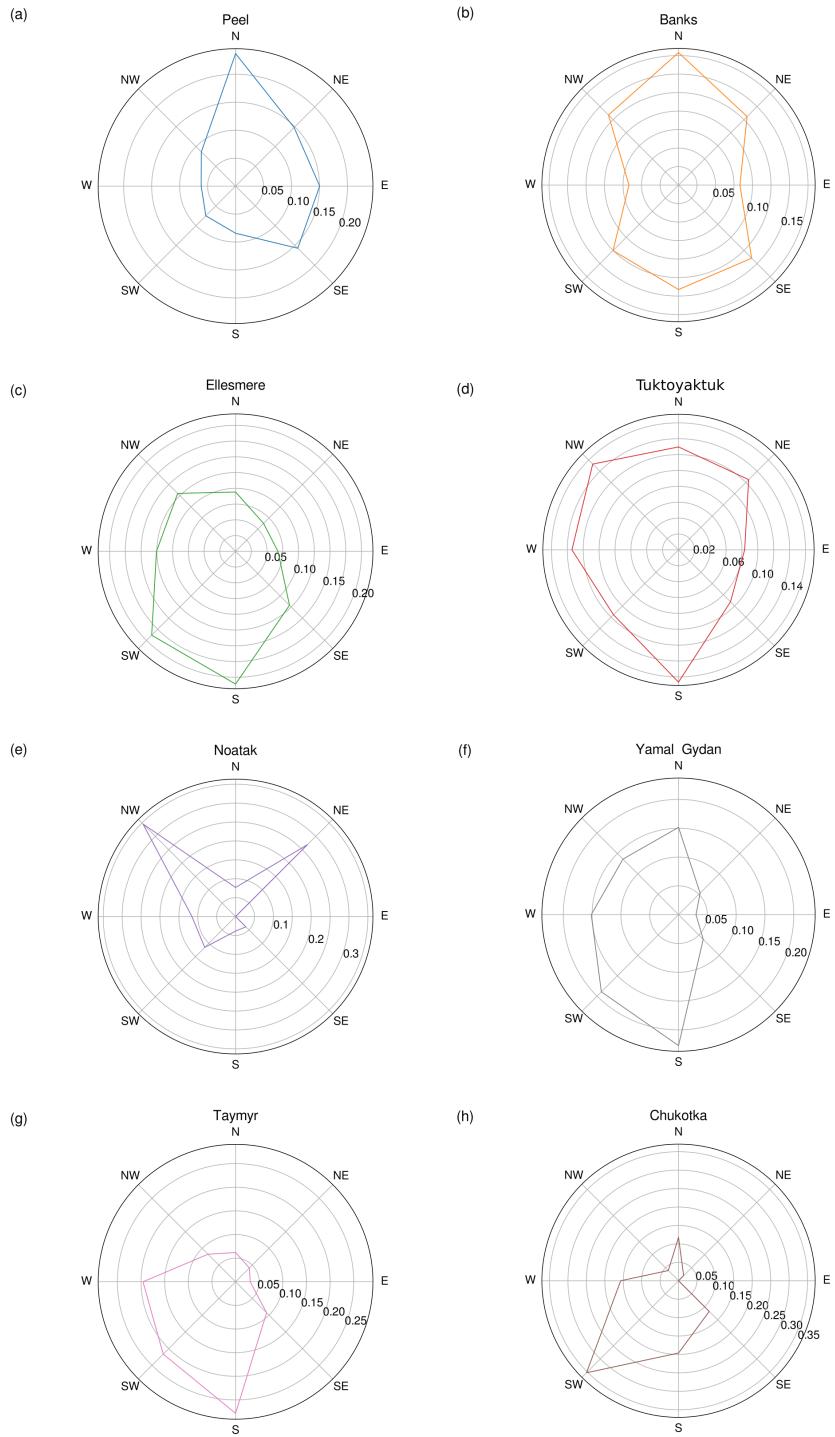


Figure S 7. Aspect distribution of all study areas.