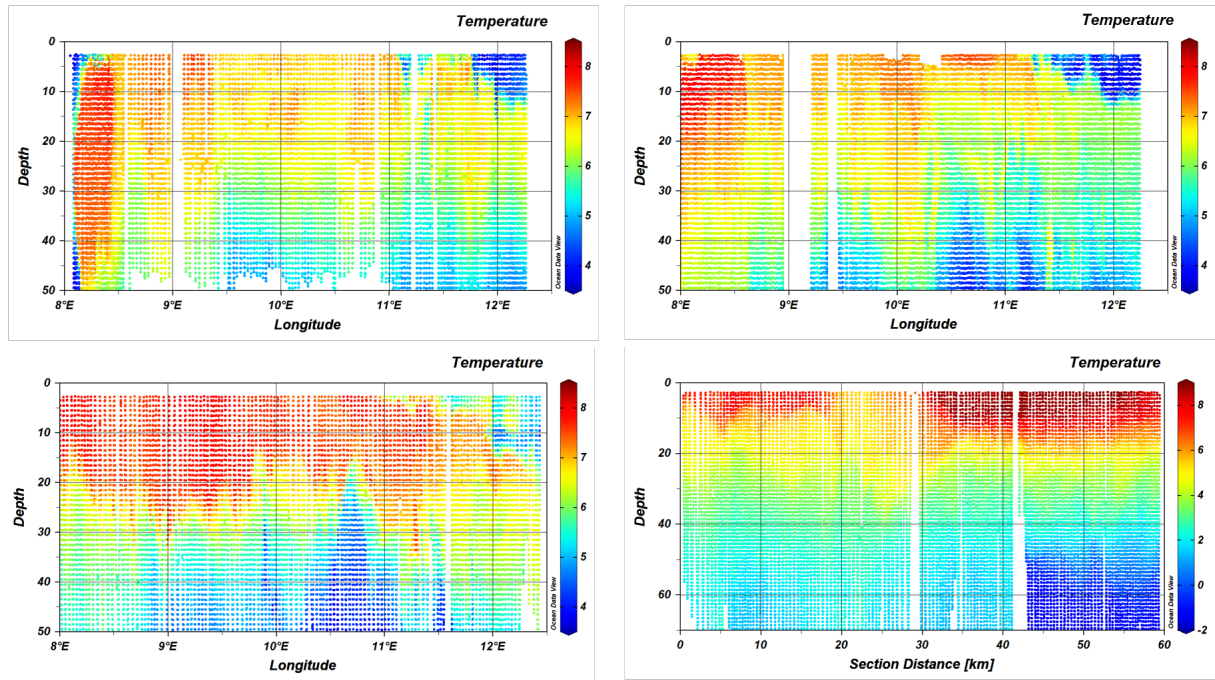
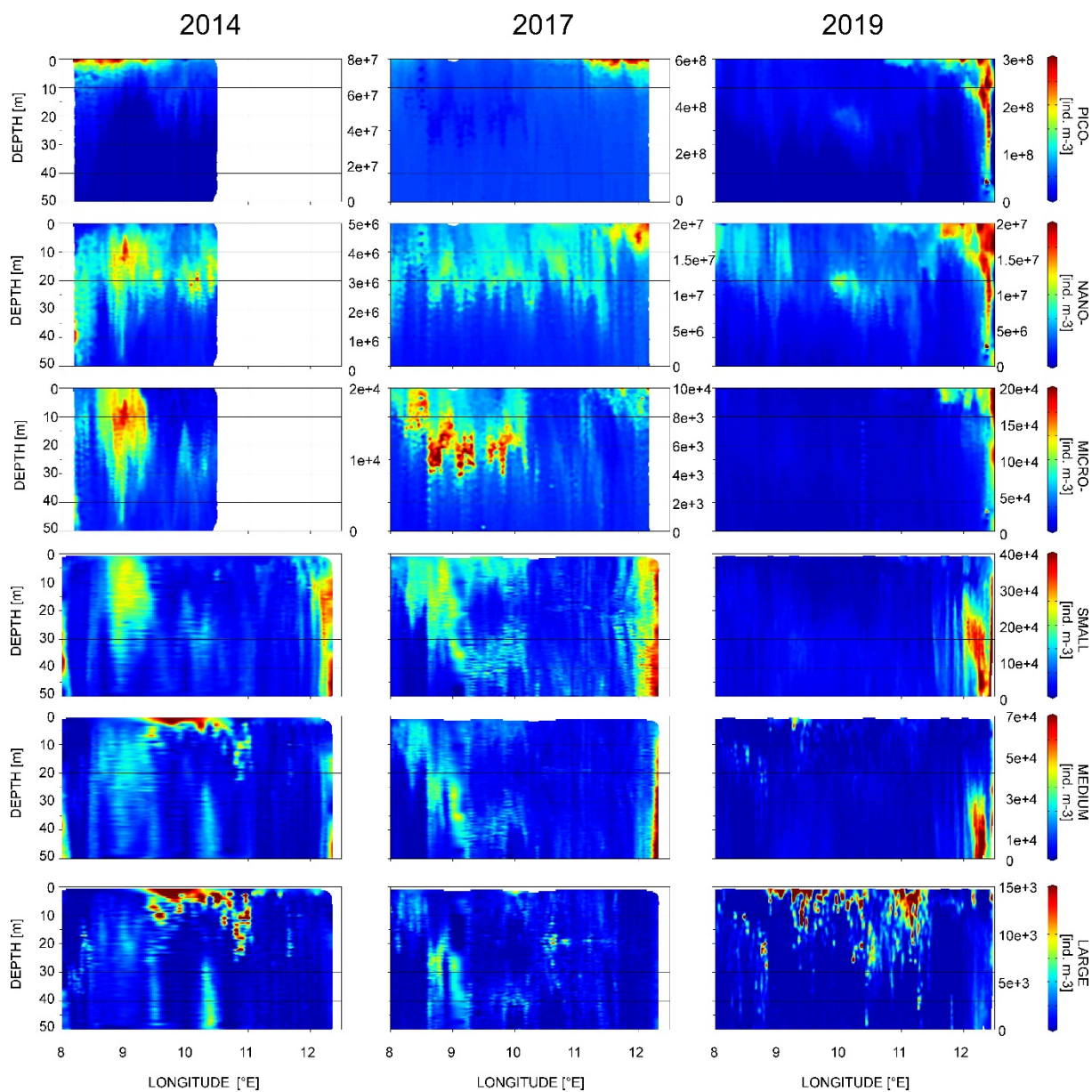
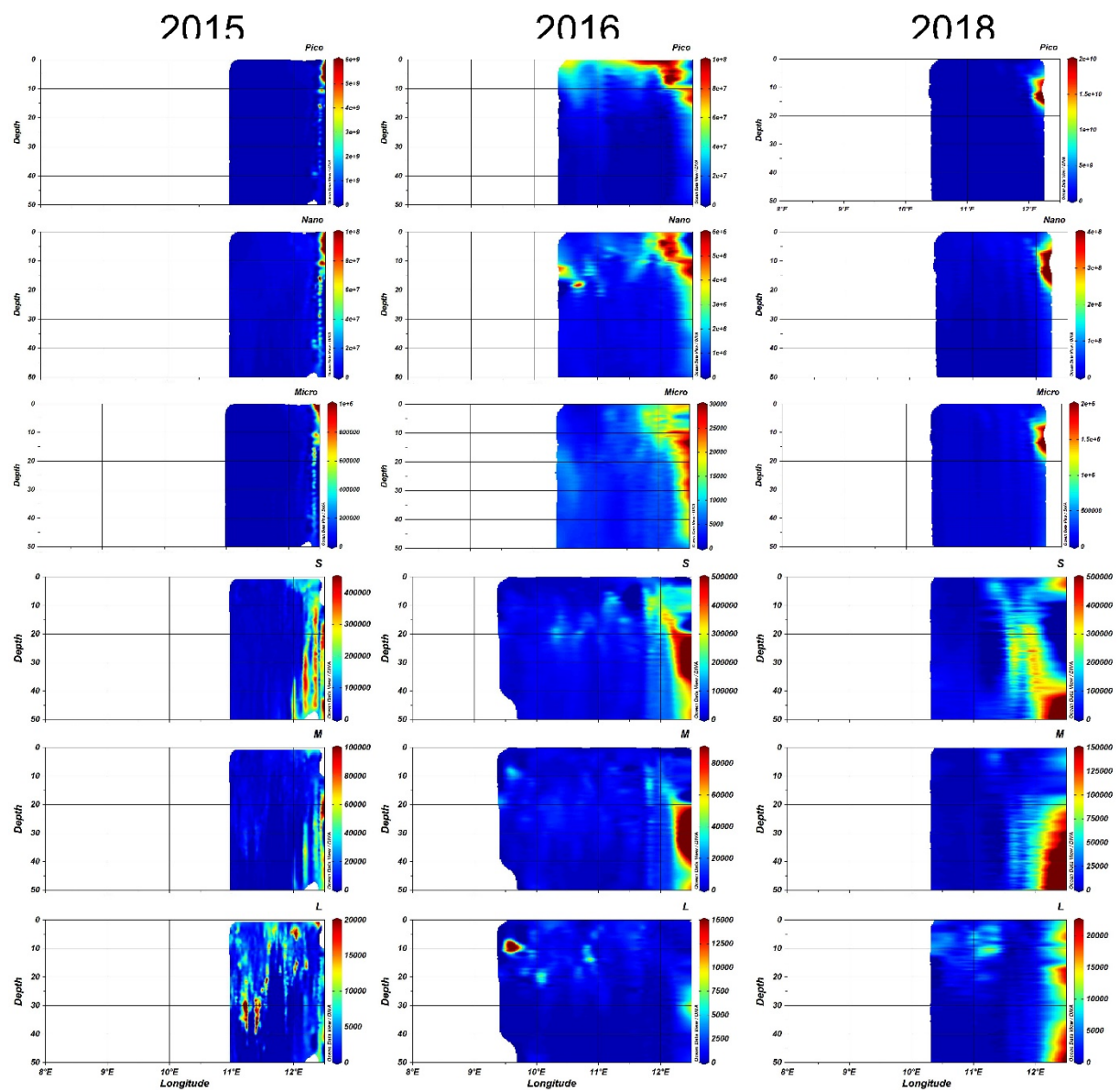




Supplementary Fig. 1. The examples of the resolution of measurements. Each dot represents a datapoint used for interpolation and further gridding. Here examples of temperature from Kongsfjorden from 2014, 2017 (1st row) and 2019 (left in 2nd row), as well as from the Isfjorden transect from 2017 (right in 2nd row).

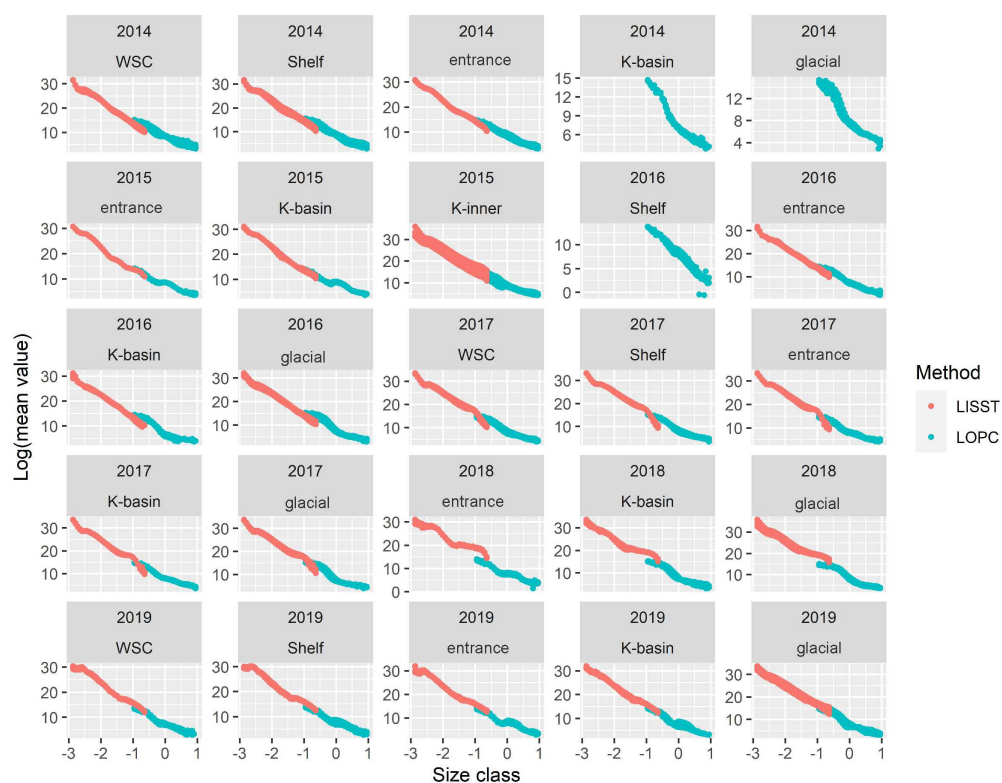


Supplementary Fig. 2. The section plots of concentrations of Pico-, Nano-, Micro-, Small-, Medium- and Large- size fractions of particles and plankton of transects fully investigated in Kongsfjorden.

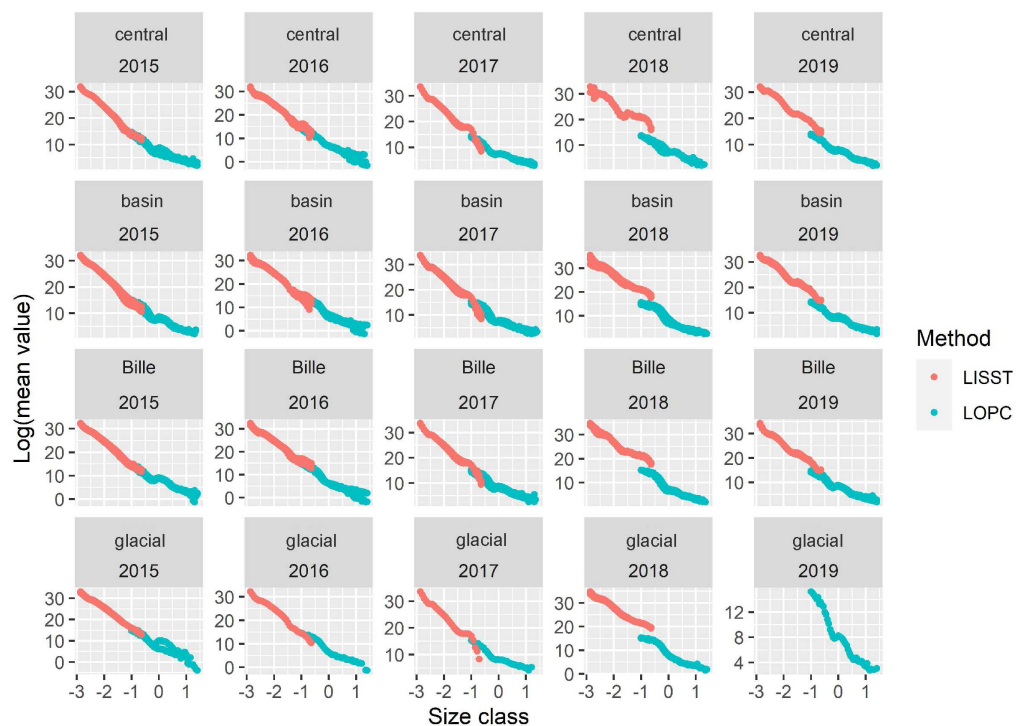


Supplementary Fig. 3. The section plots of concentrations of Pico-, Nano-, Micro-, Small-, Medium- and Large- size fractions of particles and plankton of transects fully investigated in Kongsfjorden.

Kongsfjorden

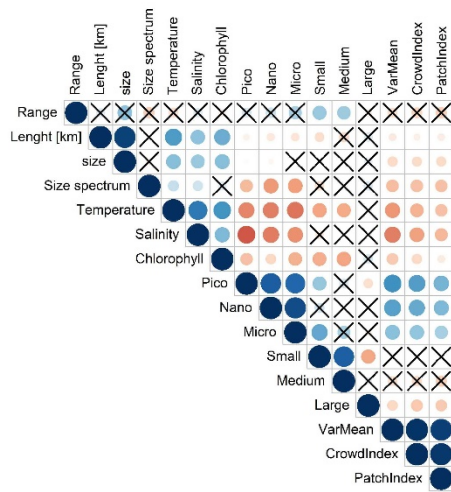


Isfjorden

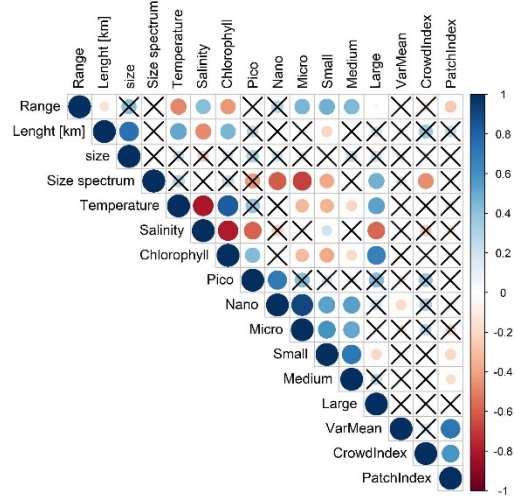


Supplementary Fig. 4. Size spectra of particles and plankton in Kongsfjorden and Isfjorden over specific sub-regions and years

Kongsfjorden



Isfjorden



Supplementary Figure. 5. Cross correlations between patch characteristics (depth range, horizontal length, area, size spectrum), environmental settings (temperature, salinity, chlorophyll), spatial heterogeneity indices (logarithms of variance/mean ratio, Lloyd's crowding and patchiness indices), and concentrations of particular size fractions of particles and plankton (log10()) in two investigated fjords (Kongsfjorden and Isfjorden). The size of the dot indicates strength of the correlation and the direction of the correlation is marked with a colour (positive is blue, negative is red). Non-significant ($p > 0.005$) correlations are marked with X.



Supplementary Figure. 5. Legends (colour and size of dots) of concentrations of particles and plankton within patches in Kongsfjorden presented at Figure 5 over different years (columns) and size fractions (rows).



Supplementary Figure. 6. Legends (colour and size of dots) of concentrations of particles and plankton within patches in Isfjorden that are presented at Figure 6 over different years (columns) and size fractions (rows).

Supplementary Table 1. Dates of measurements of high resolution transects of two laser counters mounted on the same oscillating platform in two fjords of Svalbard (Kongsfjorden, Isfjorden) over consecutive summer seasons (2014-2019).

Fiord	Days	Month	Year
Kongsfjorden	5, 6 & 10	August	2014
Kongsfjorden	4	August	2015
Kongsfjorden	3 & 6	August	2016
Kongsfjorden	5 & 6	August	2017
Kongsfjorden	5 & 6	August	2018
Kongsfjorden	8, 9 & 12	August	2019
Isfjorden	10	August	2015
Isfjorden	9 & 10	August	2016
Isfjorden	12 & 13	August	2017
Isfjorden	2 & 3	August	2018
Isfjorden	26 & 27	July	2019

Supplementary Table 3. Results of the DistLM model for Kongsfjorden and Isfjorden, when all the explanatory variables were tested together and when explanatory variables were tested separately for considered groups: i) spatial (depth and horizontal location (Part)), ii) environmental (temperature, salinity, chlorophyll), and iii) size (vertical extension and area (Range)).

KONGSJODEN

SEQUENTIAL TESTS

Variable	R ²	SS	Pseudo-F	P	Percent of variability		res.df	Type
					Prop.	Cumul		
Part	0,27	290	17,3	0,001	0,27	0,27	47	Spatial
Salinity	0,33	66	4,2	0,008	0,06	0,33	46	Environmental
Depth_mean	0,40	79	5,5	0,006	0,07	0,40	45	Spatial
Range	0,45	50	3,7	0,030	0,05	0,45	44	Size
Temperature	0,48	32	2,5	0,079	0,03	0,48	43	Environmental
Chlorophyll	0,50	18	1,4	0,247	0,02	0,50	42	Environmental
size	0,51	15	1,2	0,317	0,01	0,51	41	Size

Spatial

Part	0,27	290	17,3	0,001	0,27	0,27	47	
Depth_mean	0,33	64	4,1	0,015	0,06	0,33	46	

Environmental

Temperature	0,20	218	11,9	0,001	0,20	0,20	47	
Salinity	0,27	73	4,3	0,009	0,07	0,27	46	
Chlorophyll	0,29	22	1,3	0,292	0,02	0,29	45	

Size

Range	0,08	82	3,9	0,018	0,08	0,08	47	
size	0,10	24	1,2	0,310	0,02	0,10	46	

ISFJORDEN

Range	0,14	120	7,3	0,002	0,14	0,14	43	Size
Salinity	0,30	125	9,0	0,001	0,15	0,30	42	Environmental
Chlorophyll	0,35	48	3,7	0,030	0,06	0,35	41	Environmental
Temperature	0,38	25	2,0	0,129	0,03	0,38	40	Environmental
Depth_mean	0,41	25	2,0	0,152	0,03	0,41	39	Spatial
size	0,44	26	2,1	0,109	0,03	0,44	38	Size
Part	0,45	5	0,4	0,687	0,01	0,45	37	Spatial

Spatial

Depth_mean	0,07	56	3,1	0,031	0,07	0,07	43	
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Environmental

Chlorophyll	0,12	100	5,8	0,005	0,12	0,12	43	
Salinity	0,19	60	3,8	0,028	0,07	0,19	42	
Temperature	0,24	38	2,5	0,095	0,05	0,24	41	

Size

Range	0,14	120	7,3	0,001	0,14	0,14	43	
size	0,17	21	1,3	0,270	0,03	0,17	42	