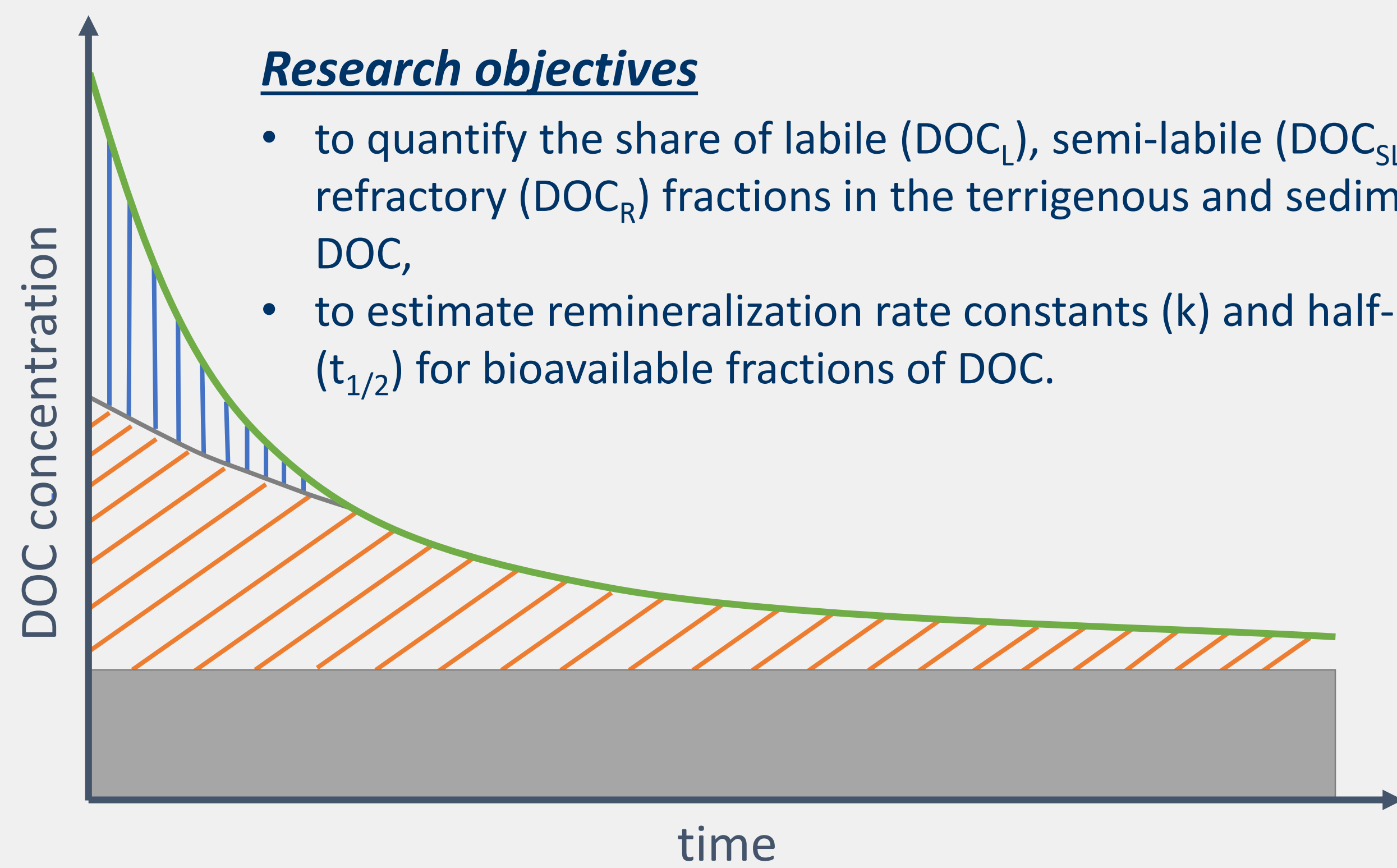


Introduction

Dissolved organic carbon (DOC) is the largest organic carbon pool in the ocean. While in the open waters this pool is relatively constant, it continuously evolves in the coastal zone with the most prominent changes occurring in the Arctic. Although there are some quantitative estimations of different DOC loads to the Arctic fjords, their fate remains highly unknown. It is still unclear to what extent the DOC entering the fjords is bioavailable and how fast can it be remineralised.

Research objectives

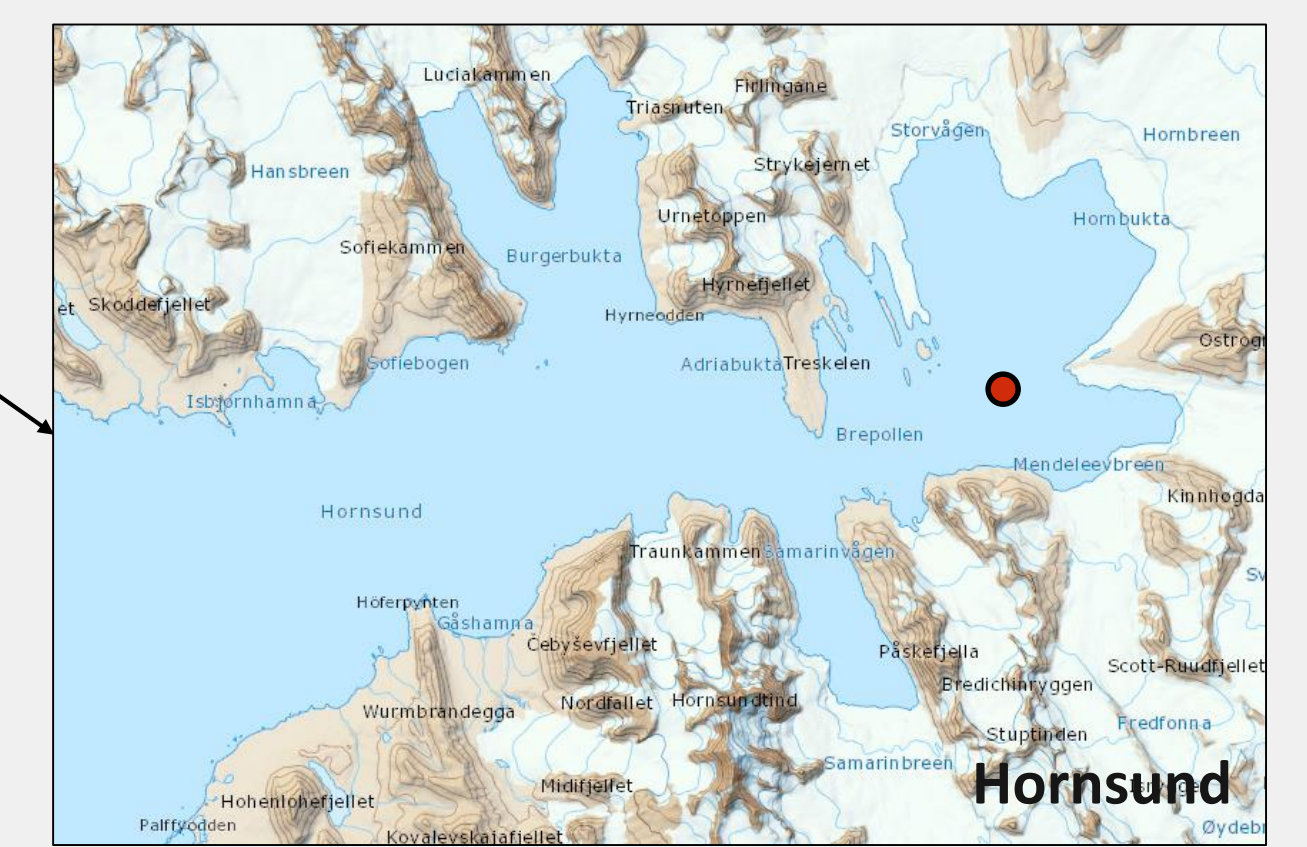
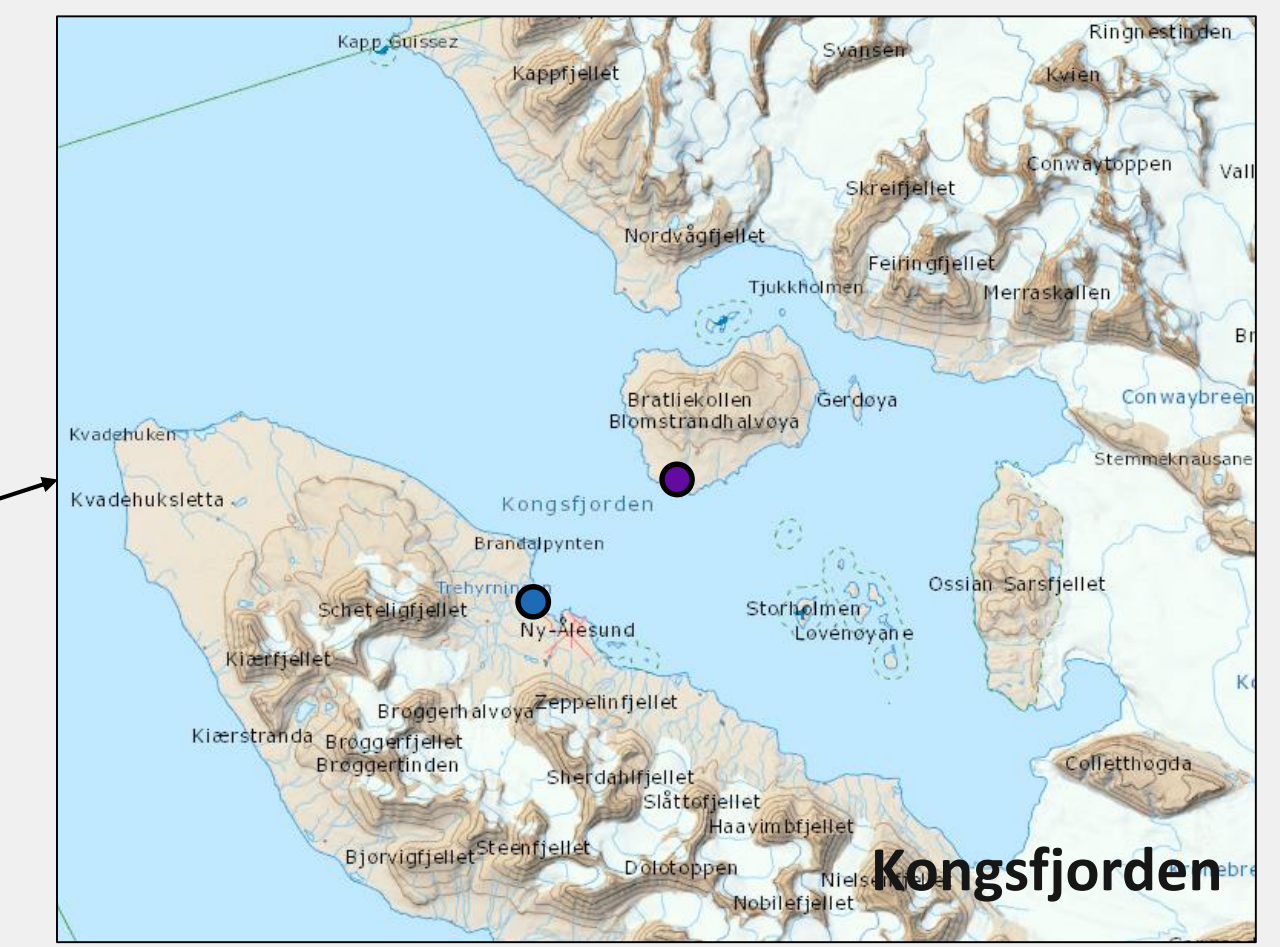
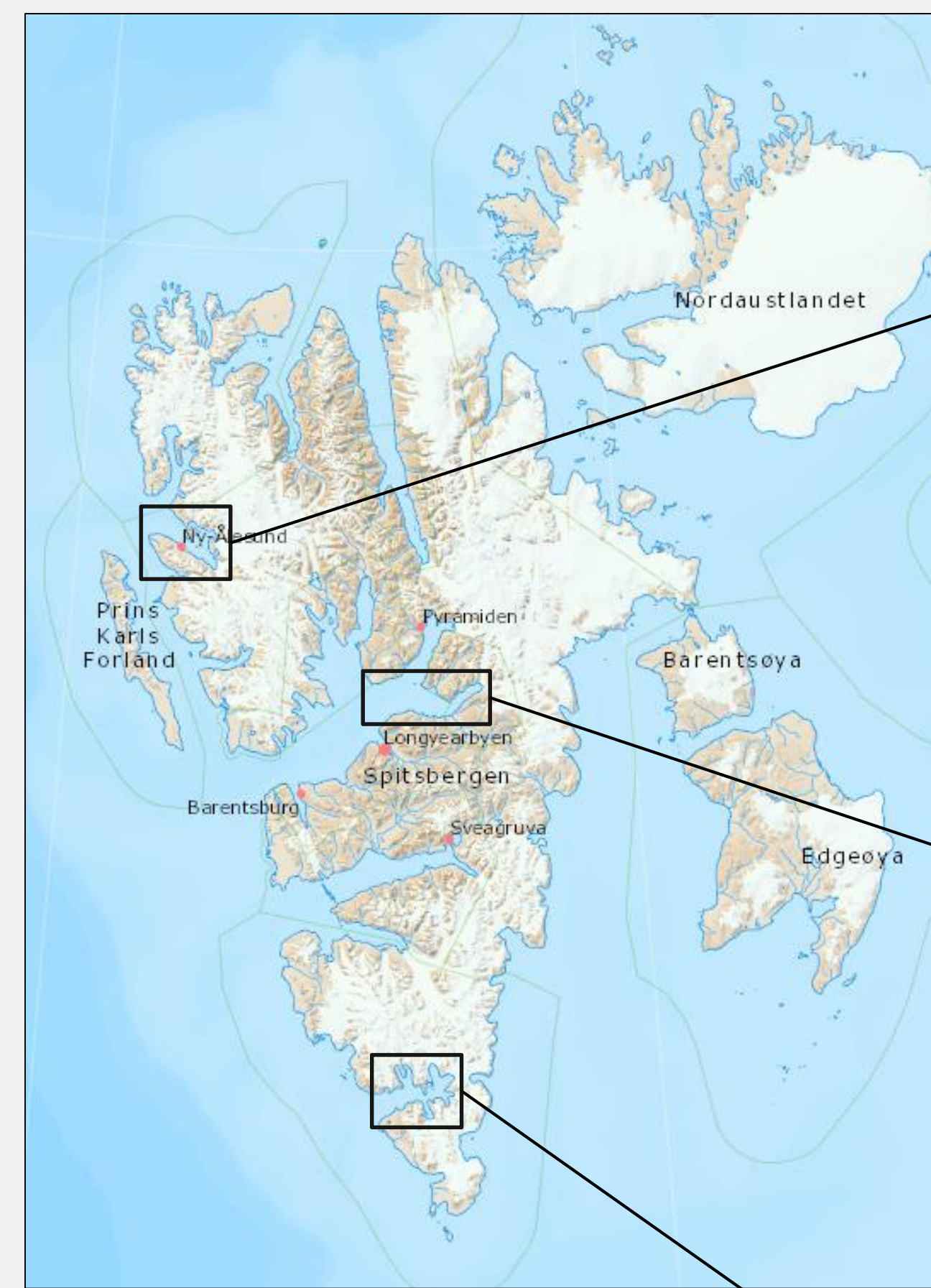
- to quantify the share of labile (DOC_L), semi-labile (DOC_{SL}), and refractory (DOC_R) fractions in the terrigenous and sediment-derived DOC,
- to estimate remineralization rate constants (k) and half-life times (t_{1/2}) for bioavailable fractions of DOC.



$$DOC(t) = DOC_L(t=0) \cdot e^{-k(L)t} + DOC_{SL}(t=0) \cdot e^{-k(SL)t} + DOC_R$$

This has been done through the 180-days-lasting incubation experiments of soil leachates mixed with surface seawater and sediment interstitial waters mixed with bottom water.

Study area



Stations:

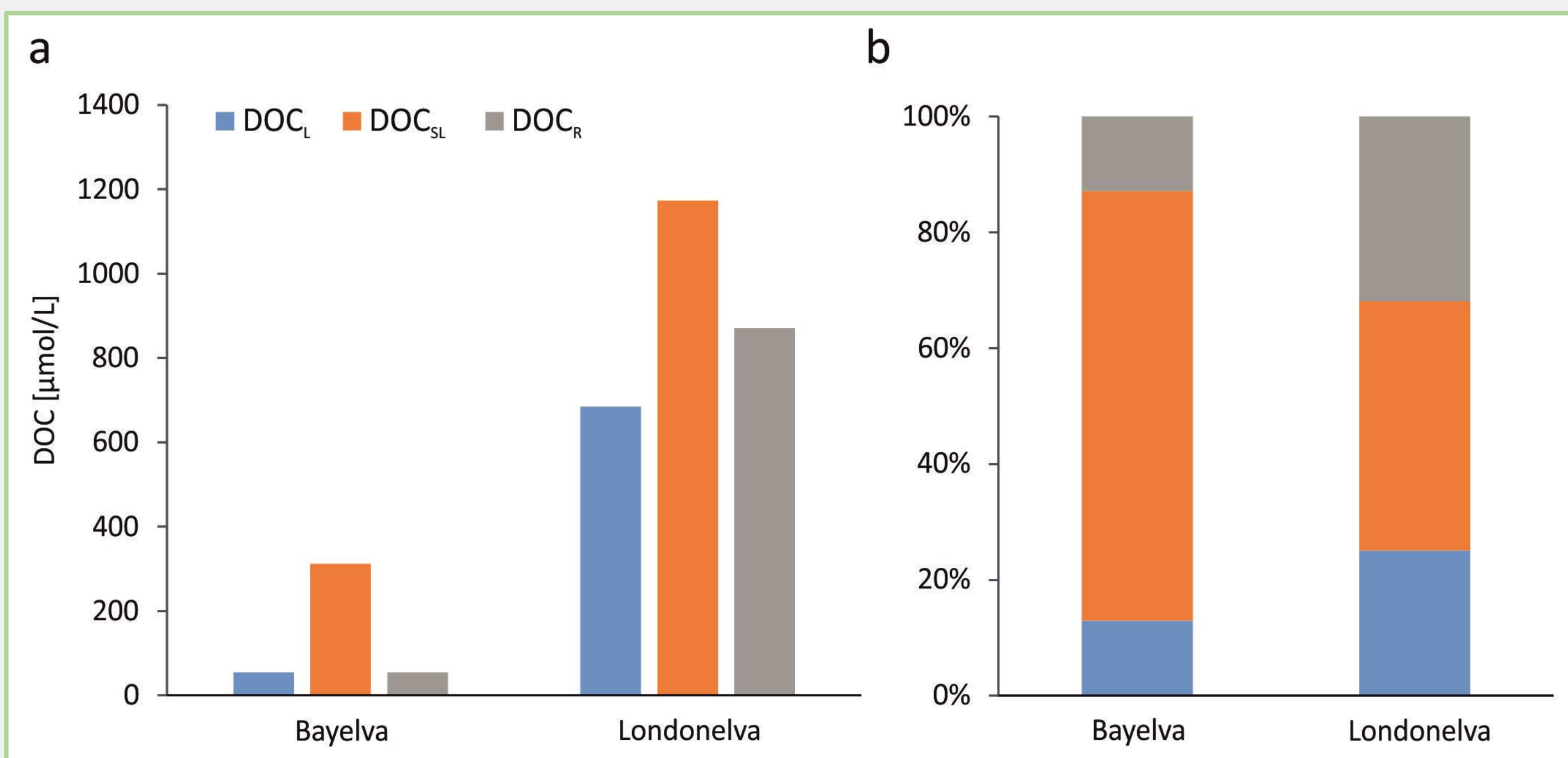
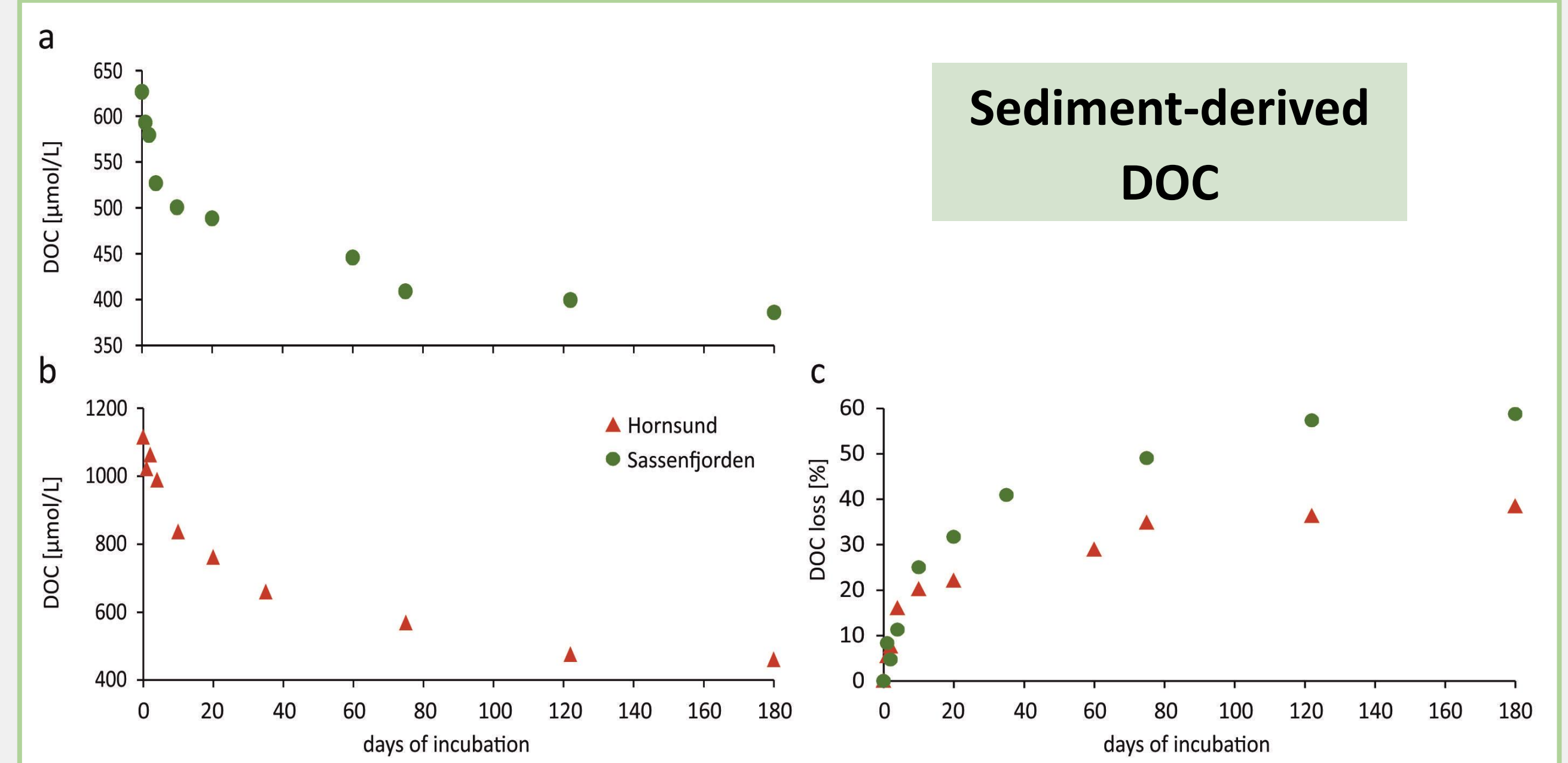
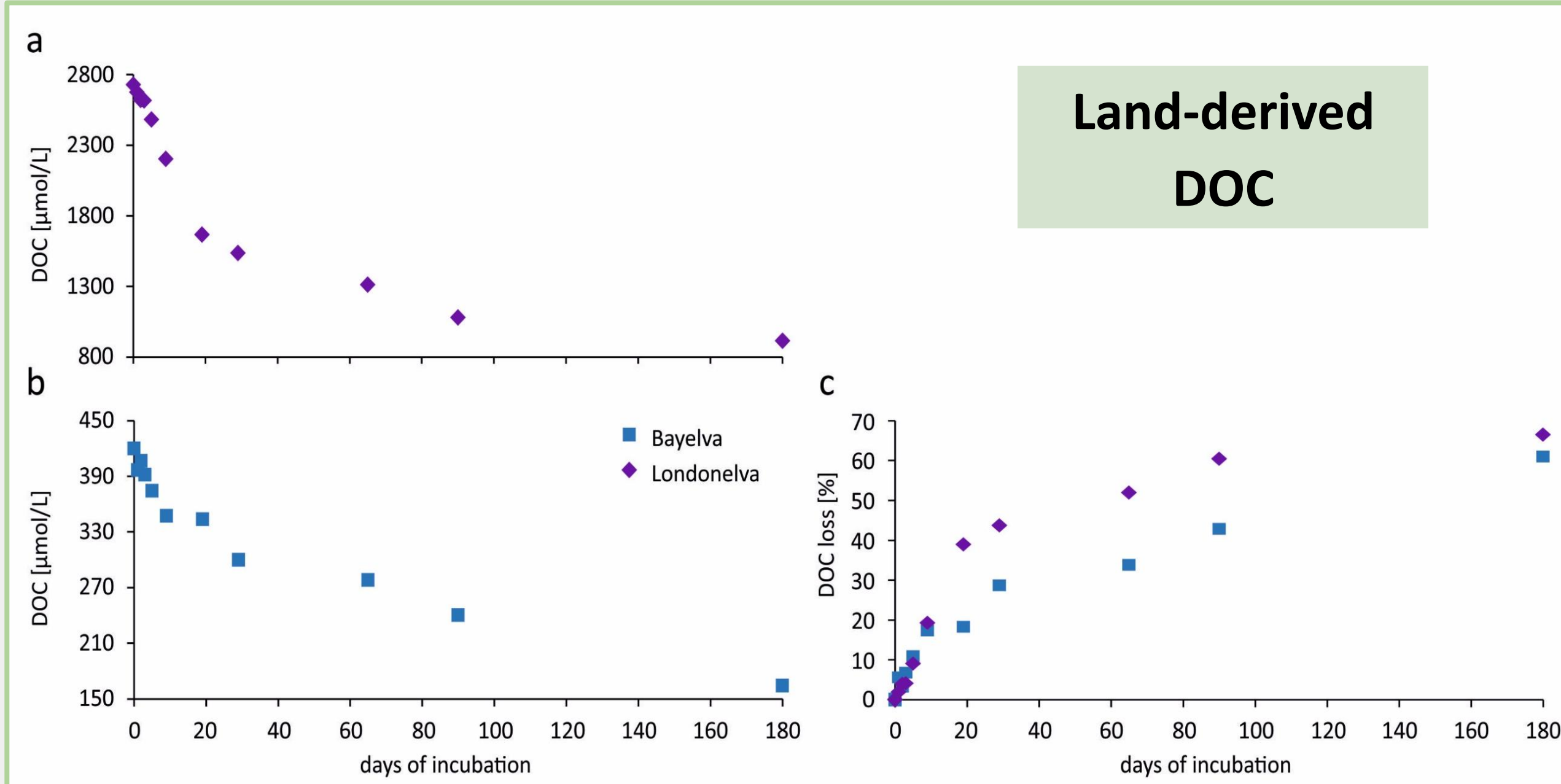
I. Land-derived DOC

- Bayelva River region (Kongsfjorden)
- Londonelva River region (Kongsfjorden)

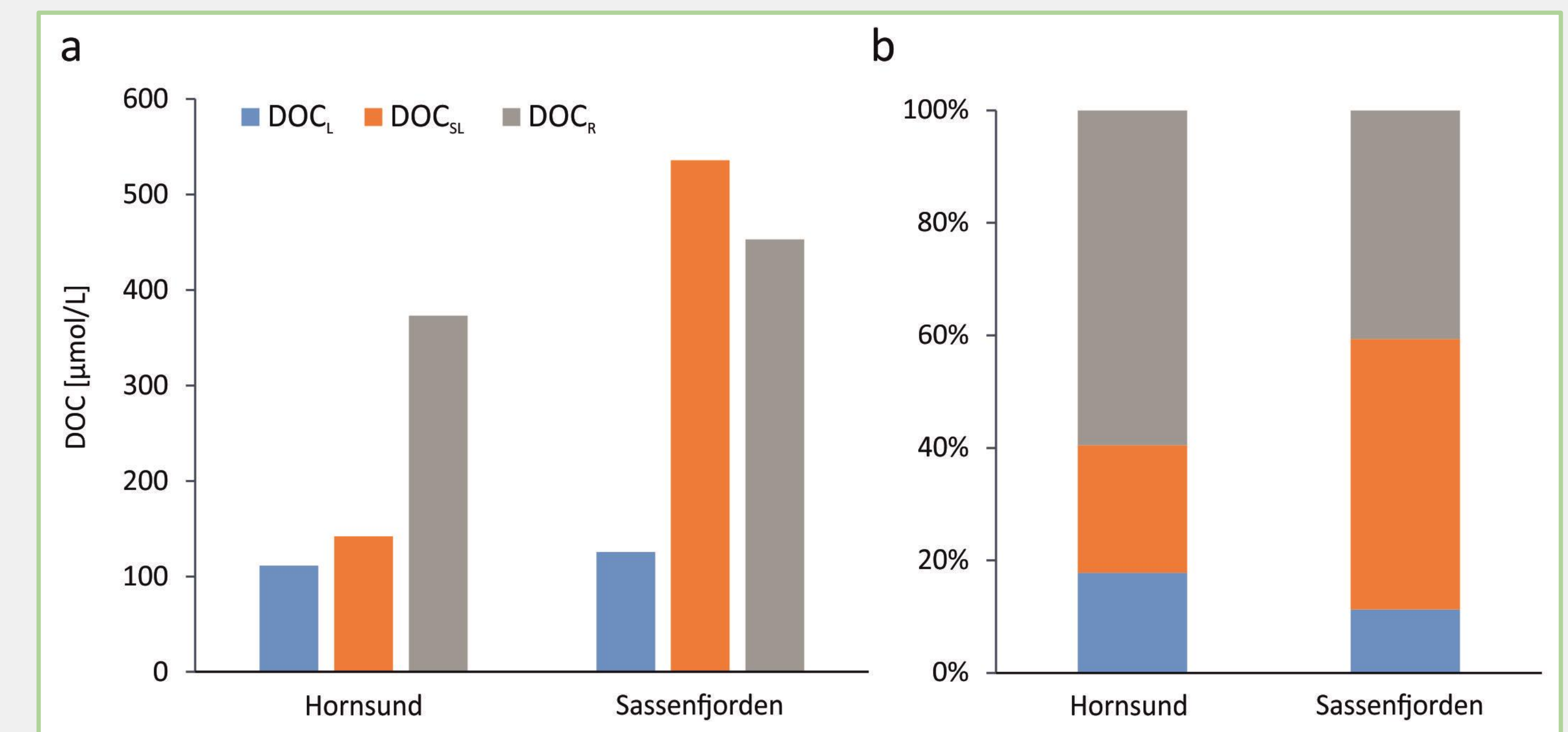
II. Sediment-derived DOC

- Sassenfjorden (Isfjorden)
- Brepollen (Hornsund)

Results



DOC fraction	Bayelva		Londonelva	
	k [days ⁻¹]	t _{1/2} [days]	k [days ⁻¹]	t _{1/2} [days]
DOC _L	0.115-0.029	6-24	0.046-0.012	15-60
DOC _{SL}	0.003-0.001	206-822	0.011-0.003	65-260



DOC fraction	Hornsund		Sassenfjorden	
	k [days ⁻¹]	t _{1/2} [days]	k [days ⁻¹]	t _{1/2} [days]
DOC _L	0.440	1.6	0.157	4.4
DOC _{SL}	0.014	49.9	0.025	28.1

Conclusions

- the soil leachates and interstitial waters contain a lot of DOC (420-2730 μmol L⁻¹ and 220-470 μmol L⁻¹, respectively), which is highly bioavailable - even 68-87% and 40-59% can be susceptible to biodegradation, respectively,
- contribution of the most labile DOC fraction is small and ranges from 13% to 25% for the soil leachates and from 11% to 18% for interstitial waters, but it remineralizes quickly - within days or weeks, while the semi-labile DOC, whose half-life is measured in months, is much more abundant,
- determined remineralization rate constants for both the labile and semi-labile fractions of DOC may be directly applicable in biogeochemical models used in the Spitsbergen region,
- high labiality of DOC indicates that its supply to the fjords water column has the potential to play an essential role in sustaining the bacterial loop in the fjord and, through CO₂ release, in amplifying ocean acidification in the coastal zone.