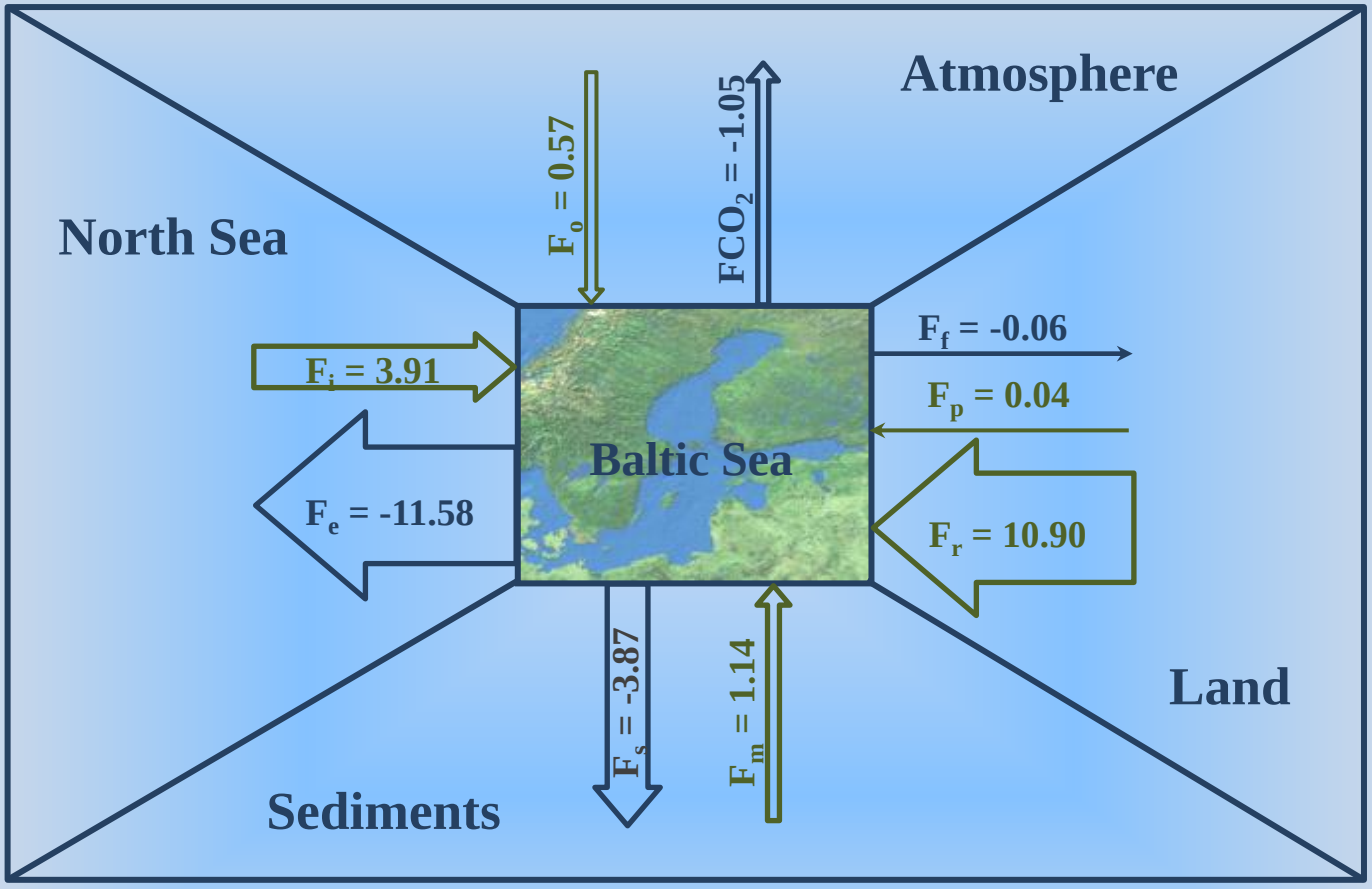
Carbon return flux from the Baltic bottom sediments

Aleksandra Szczepańska

Anna Maciejewska, Karol Kuliński, Janusz Pempkowiak

Institute of Oceanology, Polish Academy of Sciences, Sopot, Poland

Baltic Sea carbon budget



F_e – carbon export to the North Sea
F_i – carbon import from the North Sea
F_o – precipitation
F_f – fishery
F_a – Net CO_2 exchange between Baltic and the atmosphere
F_p - wastewater
F_r – river run-off
F_m – carbon return flux from sediments
F_s - sedimentation

Karol Kuliński, Lund, 2010

Methods of the carbon return flux estimation from the bottom sediments

1. „Labile carbon” – incubation

2. DIC and DOC concentration in the pore waters

$$J = -\Phi \cdot D_{sed} \cdot \frac{\Delta c}{\Delta x}$$

J – strumień dyfuzyjny $[\mu g\ cm^{-2}]$

Φ – porowatość

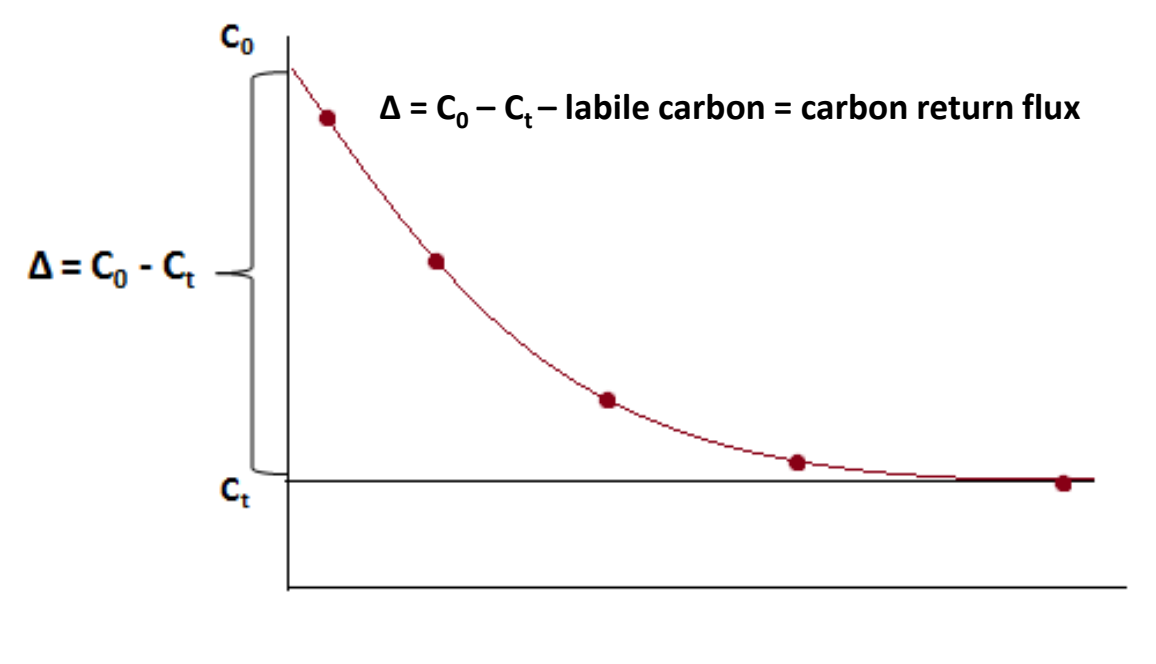
D_{sed} – współczynnik dyfuzji $[cm^2 s^{-1}]$

$\frac{\Delta c}{\Delta x}$ – zmiana stężenia po głębokości $[\frac{\mu g\ cm^{-3}}{cm}]$

Ullman & Aller, 1982

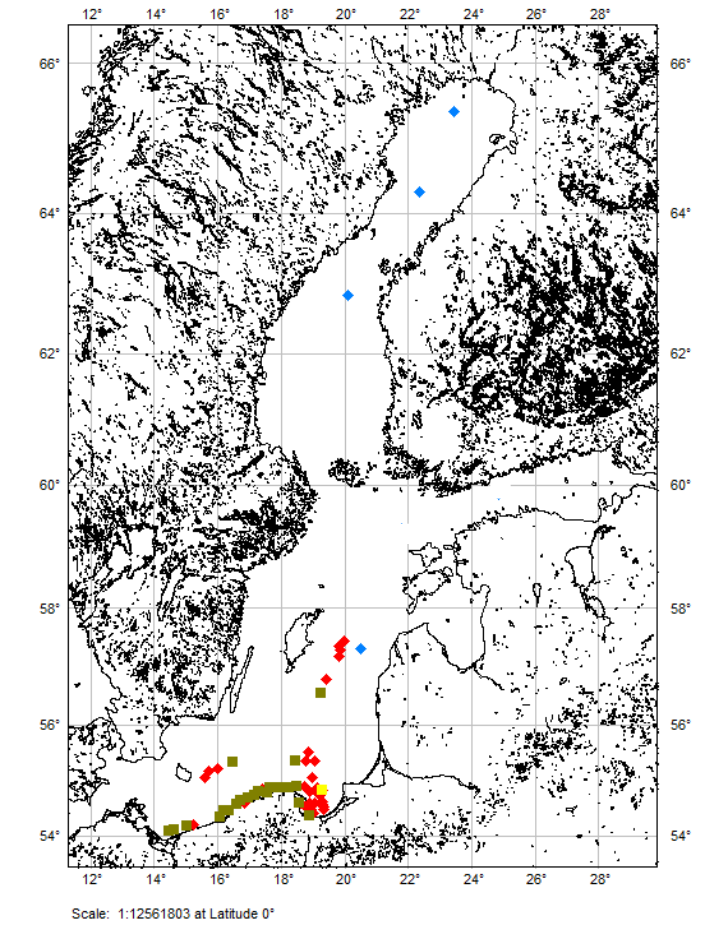
Fig. HyPerTOC analyzer

„Labile carbon”



Incubation

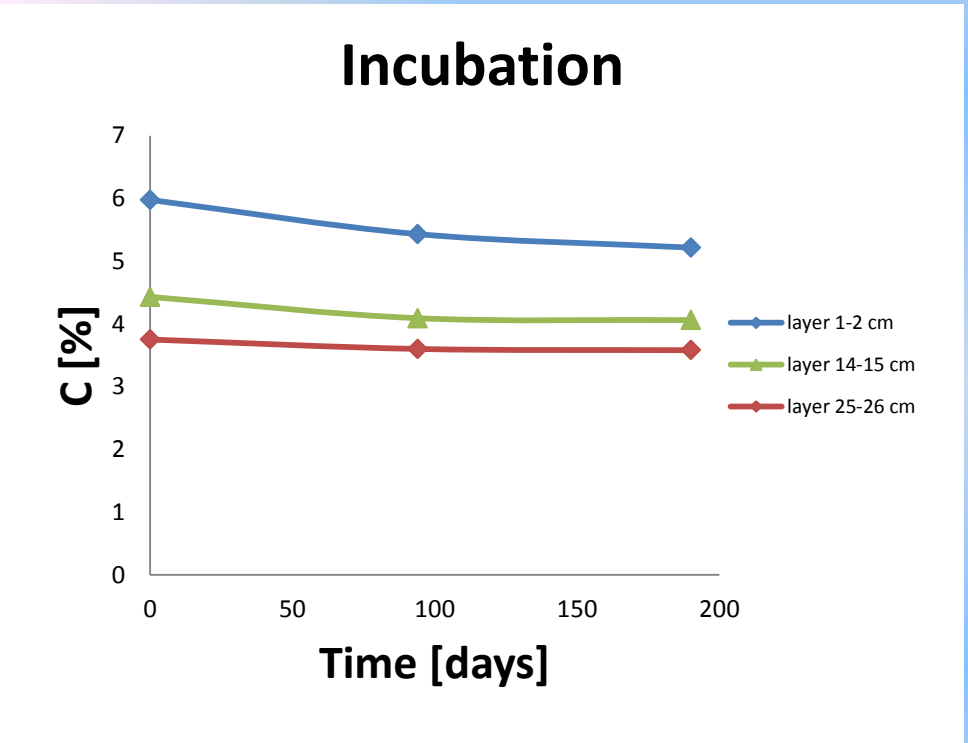
Sampling stations



Conditions

- 19°C ± 1
- darkness
- Ar atmosphere

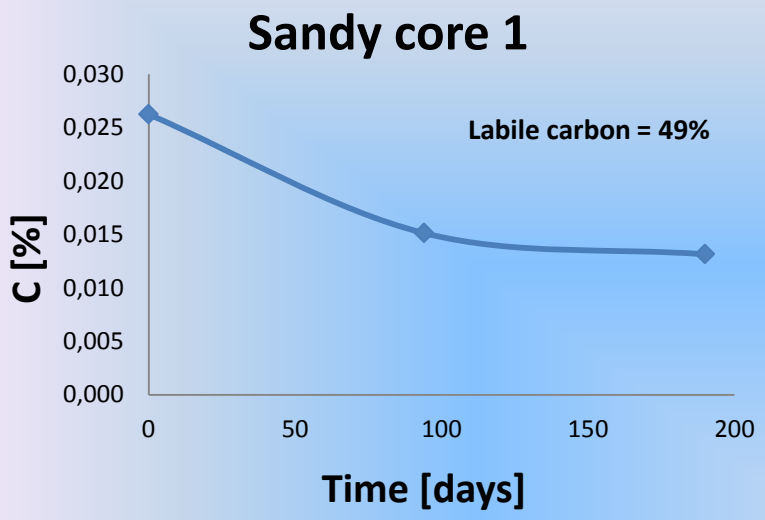
Incubation

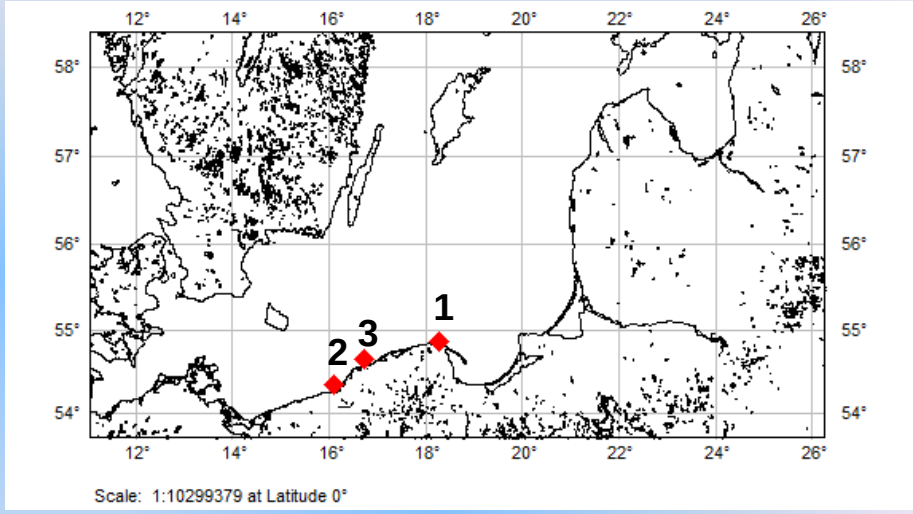


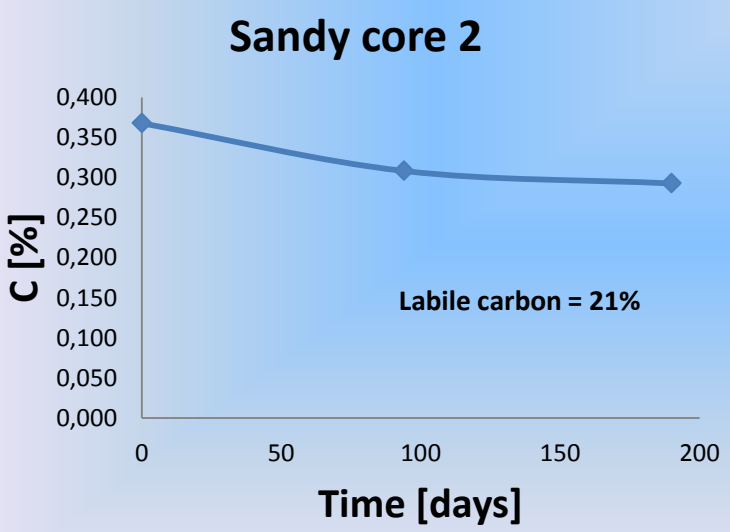
Deep [cm]	Labile carbon [%]
1- 2	12,7
14-15	8,4
25-26	4,5

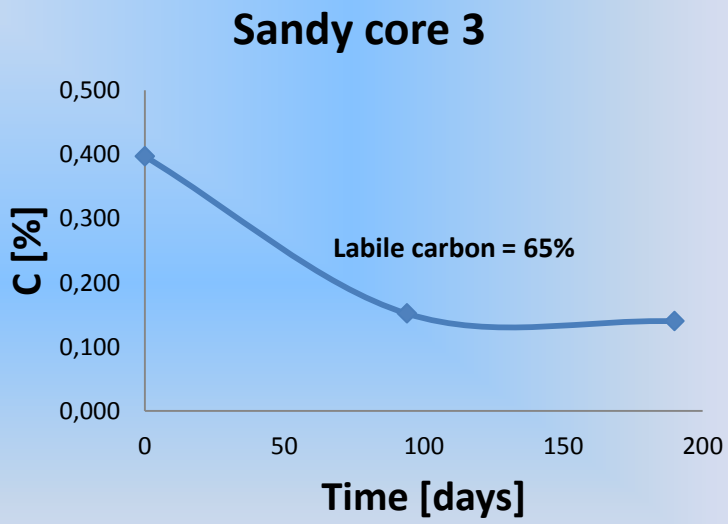
Organic carbon accumulation rate = 46 [g C m^{-2} $year^{-1}$]

Incubation c.d.









Summary

Source	Location	Organic carbon accumulation rate [g C m^{-2} yr^{-1}]	Carbon return flux [g C m^{-2} yr^{-1}]		Return flux % of deposition
			DIC	DOC	
Karol Kuliński	Gdansk Deep	60	1,0	18,1	31%
This work	Gdansk Deep	46	1,8	20,2	47%

Conclusions

Source	Number of samples	Average deposition [g C m^{-2} yr^{-1}]	Average return flux [g C m^{-2} yr^{-1}]	Return flux % of deposition
Karol Kuliński	8 muddy sediments	40	12	30%
This work	7 muddy sediments (presented in Lund)	38	10	26%
	30 sandy sediments (during the analysis)	-	-	-

Thank you