LABILE ORGANIC CARBON IN RIVER RUNOFF: THE IMPORTANCE OF CARBON SOURCES AND SURFACE WATER RESIDENCE TIMES

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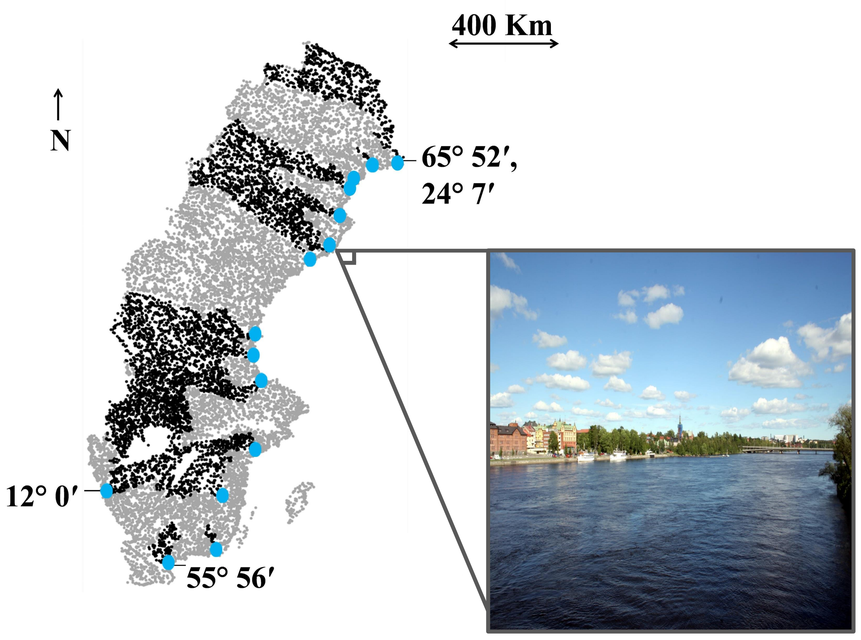
- **Riverine labile DOC is replenished with surface water residence time (SWRT)**
- **The importance of terrestrial sources for the availability of labile DOC decreases with increasing SWRT**

Introduction

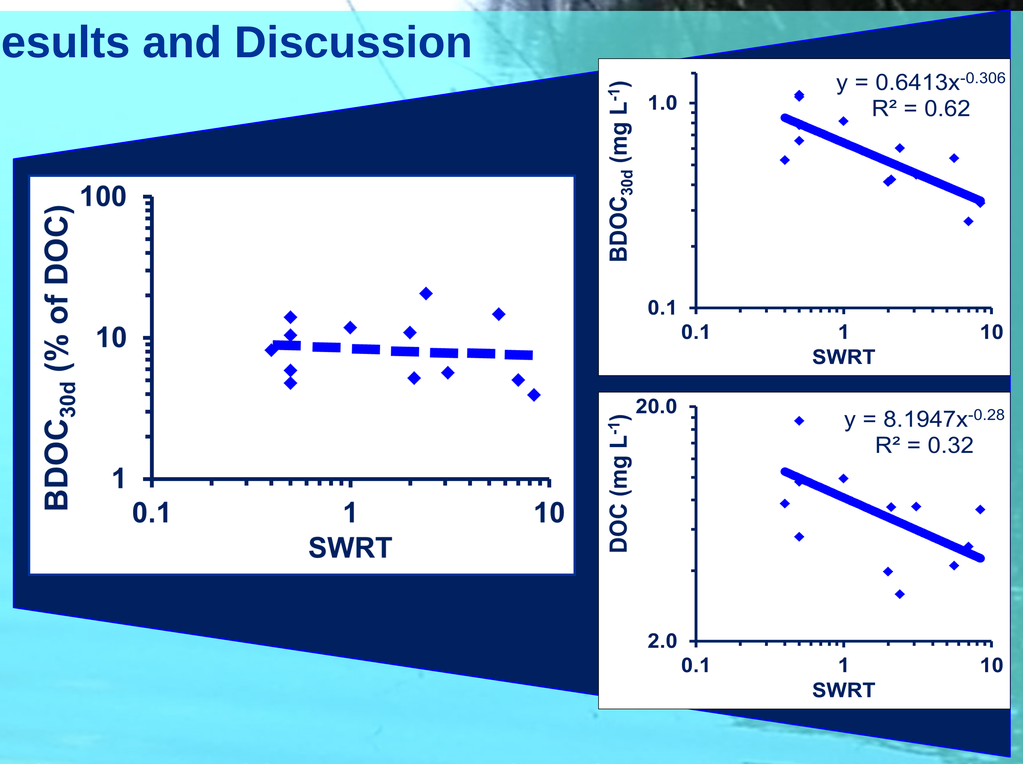
Large quantities of terrestrial DOC are exported with river runoff to the Baltic Sea (Humborg et al. 2010). The current view assumes that the DOC reactivity should decrease during its transit from land to sea, but still this riverine DOC depletes large amounts of dissolved oxygen as it is degraded in costal waters. Therefore, considering the sensitive environmental status of the Baltic Sea, a better understanding of DOC dynamics is essential for adequate coastal water management. Here, we assessed the relationship between SWRT and DOC bioreactivity ($BDOC_{30d}$) in major Swedish river systems spanning a wide range of SWRTs.



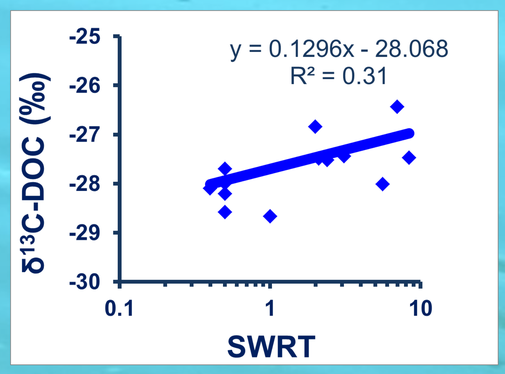
Methods

Water samples were collected from 13 river outlets once during summer 2013. The bioreactivity of the DOC was estimated from decreases in O_2 during 30 day incubations, assuming a respiratory quotient of 1. River DOC concentrations and stable carbon isotope ratios ($\delta^{13}C$) of DOC were measured with standard laboratory procedures.

Results and Discussion



Total DOC ranged from 3 to 23 mg/L and 5-21% of the DOC pools were bioreactive. Absolute amounts of $BDOC_{30d}$ were 0.3-1.1 mg/L. DOC concentrations and absolute amounts of $BDOC_{30}$ tended to decrease with increasing SWRT. In contrast, the $BDOC_{30}$ per unit DOC remained constant with residence time, indicating a replenishment of labile DOC with transit to the sea.



Shifts in $\delta^{13}C$-DOC signatures indicate a shift in the DOC sources that contribute to DOC lability during long transit times. Also, microbial (Kawasaki and Benner 2006) and photochemical (Ranke et al. 2012) DOC processing may contribute to the replenishment of the labile DOC over time.

Humborg C, Mörth CM, Sundbom M, Borg H, Blenckner T, Giesler R, Ittekkot V. 2010. CO2 supersaturation along the aquatic conduit in Swedish watersheds as constrained by terrestrial respiration,aquatic respiration and weathering. Global Change Biology 16: 1966-1978.
Kawasaki, N., and Benner, R.(2006. Bacterial release of dissolved organic matter during cell growth and decline: molecular origin and composition. *Limnol Oceanogr* **51:** 2170–2180.
Ranke, D., Hamilton, M. W. & Ziegler, S. E.. 2012. Variation in the photochemical lability of dissolved organic matter in a large boreal watershed. Aquatic Sciences 74: 751-768

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