Organic and inorganic carbon fluxes in a tropical river system (Tana River, Kenya) during contrasting wet seasons

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Introduction

➢ The majority of discharge in tropical river systems occurs in relatively short time periods. E.g. in Tana River, ~60% of the annual discharge in 4 months.

➢ This seasonality has effect on the carbon (C) transport as C processes, such as respiration and primary production vary with discharge.

➢ Furthermore, connection with the floodplain during flooding significantly alters the biogeochemical functioning.

Research question: What is the role of floodplains on delivery or retention of C to the main channel?

Study area and methods

➢ 2 sampling sites: Garissa and Garsen, situated 385 km apart in the lower Tana River, Kenya

➢ Daily samples to measure the concentration of particulate and dissolved organic carbon (POC and DOC) and dissolved inorganic carbon (DIC) (*).


➢ In 2013, considerable overbank flooding took place between the sampling sites. No significant flooding occurred in the other wet seasons.

➢ Carbon loads were calculated by multiplying water discharge and carbon concentration. Missing values were interpolated based on the flux-discharge relationship. Seasonal fluxes are the sum of the loads.

Results

Carbon loads

➢ Highest DOC and DIC loads during peaks with flooding

➢ Highest POC loads during peaks without flooding

➢ At low discharge, daily loads increase in the downstream direction for all C pools (end of 2014)

Seasonal fluxes

➢ Downstream decrease in water and total C flux during non-flooded seasons; Downstream increase in water and total C flux during the flooded season

➢ POC flux decreased downstream (33%, 8% and 30% in 2012, 2014 and 2013)

➢ DIC flux increased downstream (9%, 6% and 62% in 2012, 2014 and 2013)

➢ DOC flux decreased during non-flooded seasons (38% and 10% in 2012 and 2014), and increased by 163% in the flooded season (2013)

➢ POC was the dominant C pool during the non-flooded season; DIC was the dominant pool during the flooded season

Notes

➢ The calculated loss/gain of C are net fluxes between the two sites. Fluxes between the different pools are not yet taken into account.

➢ The fluxes are only valid for the observation periods and can not be directly extrapolated to the whole season or year.

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