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The importance of a re-connected side-arm system for the carbon cycling of the River Danube in Austria.

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Connected side-arms are important areas for the biogeochemical cycling in fluvial landscapes. Matter transport and transformation in lotic environments with reduced flow velocities compared to the main channel exhibit higher rates of carbon processing. The contribution to the total carbon dynamics is determined by the interaction of hydrologic connectivity and physical, chemical and biological factors. Main focus of the work was to quantify the biological activity and relate the rate of carbon produced to the total carbon transport.

Therefore, we quantified the carbon processing of a side-arm system of the River Danube (Regelsbrunn) downstream of Vienna from March to September 2003. Gross primary production and community respiration were estimated and compared to total carbon transport of the Danube River. To determine primary production and respiration of the side-arm community, we used diurnal oxygen time curves and implemented an oxygen mass balance. Plankton primary production was determined to estimate the contribution of planktonic to side-arm production at different water ages. Water age – an inverse measure of connectivity, was calculated from a hydrological model, developed for the Regelsbrunn side-arm system.

The value of 11 mt C d^{-1} of autochthonous primary production is in the same order of magnitude as allochthonous inputs of 18 mt C d^{-1} (POC and DOC) entering the side-arm system at mean water conditions (1 % of the discharge of the River Danube). The pelagic photosynthetic activity is generally high at mean water conditions (1.3 – 3.8 g C m^{-2} d^{-1}), with a contribution to the system productivity of up to 90 %. During long stagnant periods with stable hydrological conditions the side-arm is controlled by biological processes, successional developments predominate and a shift from planktonic

to benthic activity can be noticed (benthic production 0.5 – 16.4 g C m^{-2} d^{-1}).

The change in the quality of organic carbon leaving the side-arm points to the importance of these subsystems in providing autochthonous carbon for main channel food webs.