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Relation of hydrogeomorphology of Gravel Bar to Particulate Organic Matter Dynamics in Braided Alpine River

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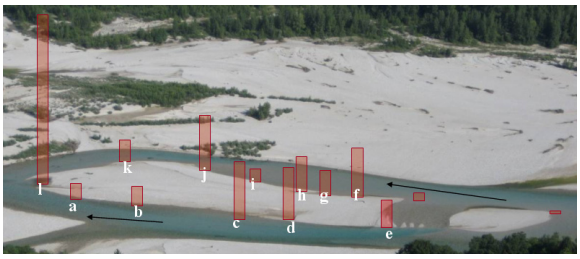
Channel geomorphology has ecologically important functions to remove organic particles from flowing water and to provide availability of organic matter for benthic organisms. However the retention processes in natural fluvial rivers are still obscure due to complex interaction between formation dynamics of fluvial channel in relation of surface/subsurface flows and biochemical processes. The present study focuses on the roles of island gravel-bar for riverine organic matter retention. We aim to identify and to classify the retention processes corresponding to the diverse hydrogeomorphologic conditions within gravel bar scale in the braided channels of the Tagliamento River in north east Italy.

Methods: The Tagaliamento River has highly dynamic channel geomorphology created by natural flooding events and large amounts of sediment supply from upstream Alpine region. Field study was conducted in an island gravel-bar located at Flagogna in July 2010. River stage was relatively low and showed a diel fluctuation by hydropeaking by the hydropower discharge upstream. A total of 14 sampling points were established along shore of the bar, including barhead riffle, barhead backwater, downwelling inflows, intermittent pond, upwelling pool, middle backwater, bartail backwaters. Benthic particulate organic matters (BPOM) were collected at each point by both quantitative and qualitative samplings for estimation of standing stock, stable isotope composition and C/N ratio. Depth, velocity, flow direction and elevation were also measured.

Results: Amount of standing stock of fine BPOM was highest at the bartail backwater and next followed barhead backwater and intermittent pond, whereas relatively low at the downwelling shoreline (Fig. 1a). Results of stable isotope and C/N ratio analyses showed that the BPOM source composition differed significantly along shoreline (Fig.1b); Sorting effect according to source materials was found within the island, resulting in high filtering of epilithic algae along upstream shoreline with downwelling inflows, whereas that of terrestrial plant at downstream shoreline, especially the barhead backwater collected mostly only terrestrial fragments. Relatively low C/N ratios of BPOM indicate the retention from suspended POM may trigger to decomposition or primary production in the wetted area. Based on the findings in island gravel bar scale, our discussion will extend to the effects of water level fluctuation on contribution changes of hydrodynamic retention processes.

(a)



(b)

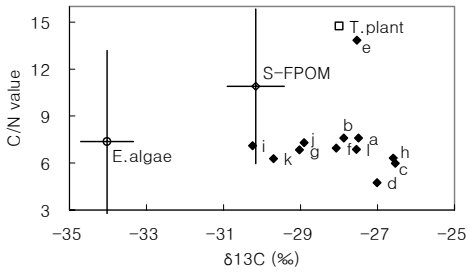


Fig.1 Spatial distribution of standing stock (a) and isotope to C/N ratios (b) of fine BPOM within an island gravel bar with 370m length