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Flow effects on benthic stream invertebrates and ecological processes

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Flow is the main abiotic factor in the streams. Flow affects the organisms in many direct and indirect ways. The organisms are directly affected by various hydrodynamic forces and mass transfer processes like drag forces, drift, shear stress, food and gases supply and washing metabolites away. Indirect effects on the organisms are determining and distribution of the particle size and structure of the substrate and determining the morphology of riverbeds. Flow does not affect only on individual organism, but also on many ecological effects. To expose just the most important: dispersal of the organisms, habitat use, resource acquisition, competition and predator-prey interactions. Stream invertebrates are adapted to the various flow conditions in many kinds of way. Some of them are avoiding the high flow with living in a hyporeic zone, while the others are adapted to flow with physical adaptations (the way of feeding, respiration, osmoregulation and resistance to draught), morphological adaptations (dorsoventrally flattened shape of organism, streamlined shape of organism, heterogeneous suckers, silk, claws, swimming hair, bristles and ballast gravel) or with behaviour. As the flow characteristics in a particular stream vary over a broad range of space and time scales, it is necessary to measure accurately the velocity in places where the organisms are present to determine the actual impact of flow on aquatic organisms. By measuring the mean flow at individual vertical in a single cross-section, we cannot get any information about the velocity situation close to the bottom of the riverbed where the stream invertebrates are living. Just measuring the velocity near the bottom is a major problem, as technologies for measuring the velocity and flow of natural watercourses is not adapted to measure so close to the bottom. New researches in the last two decades has shown that the thickness of laminar border layer of stones in the stream is only a few 100 micrometers, what is not enough to make a shelter for stream invertebrates. It serves as a shelter only for microorganisms, but the stream invertebrates have to avoid the swift flow or adapt to flow with adaptations described above. To understand what conditions are subject to aquatic organisms and how to adapt, it is essential. Both, knowledge of fluid dynamics in natural watercourses and ecology are needed to understand to what conditions the stream invertebrates are exposed and how they cope with them. Some investigations of near bed flow will be performed on the Glinščica stream. The acoustic Doppler velocimeter SonTek will be adapted to measure so close to the bed as possible. It is expected we should be able to measure the velocities just 0,5 cm above the bed surface. We intend to measure the velocities on a natural and on a regulated reach and then compare the results.