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Biogeosciences Discussions

Interactive comment on "Regional hydrology controls stream microbial biofilms: evidence from a glacial catchment" *by* T. J. Battin et al.

Anonymous Referee #4

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Comments to Biogeosciences Discussion, 1, 479-531, 2004- 0027 (Battin et al.)

The paper by Battin, Wille, Psenner, and Richter describes the interaction of physical, chemical and biological factors regulating biofilms in an alpine, glaciated region. The study is motivated by the potential importance of climate change and the observed ablation of glaciers. However, the variability of biofilms has been studied here with tools that are applicable to natural biofilms in other habitats. The overall density, cell sizes and prominence of taxonomic groups have been associated with metabolic activity and influx of substrates depending on the melting of snow and ice. High quality up-to-date techniques have been used and allowed to indentify the main causes of variability that depend on seasonal time and location of the site in the basin. The prominent observations are: 1. Tributary streams (fed by snow and ground water) harbored biofilms with higher densities of bacteria dominated by a larger fractions of Eubacteria and these biofilms were more productive than those in the glacial channel. 2. The strong seasonal change in the snow cover and melt water flux leads to marked changes in biofilms

over time. Early in the season the wash-out of DOC and minerals was indicated as a main driver, but in the course of summer/autumn an autonomous development with consolidated phototrophic/heterotrophic biofilms has been observed. It is interesting to see that the seasonality of chemical factors (Fig. 4) matched with that of biological parameters (Figs. 5-7).

These main findings are generally well founded. I see some minor points of discussion: 1. Tributary sites harbor sediments more rich in organic matter, probably because of 'upstream' production of organic matter by thin vegetation. The lower site ('krenal') was stated to be within the zone of peat deposition, while the map shows it to be on the slope above the peat area. Thus the reason for the higher activity and density of biofilms in tributaries could be the input of soil particles or plant fragments from uphill (close to what the authors say), but alternatively the mechanical scour could be much lower than in the glacial stream. All these factors are directly (scour) or indirectly (soil and vegetation) related to hydrology, but not to peat formation. 2. The factor FI requires a calibration and interpretation that is not so well tractable in this publication. I assume that glacial DOC is derived from the Rotmoos glacier, but plant or soil related FI signals will be somewhat different for the two tributary sites. On page 508 it is suggested that FI changes are correlating with the bloom of Chlamydomonas nivalis, but is it really possible to discriminate between seasonal time, ablation of the glacier and the development of the snow algae? The variability of FI is also within a very restricted range and that puts a limit on the detailed interpretation of FI in this paper (Fig. 3).

The concluding line of the abstract could focus on the achievement of the present study and not advance on later modeling studies (avoid that the abstract sets out with 'insufficiently understood' and ends with 'we need better understanding').

The paper is very well presented.

Interactive comment on Biogeosciences Discussions, 1, 497, 2004.