

Title: Causes and consequences of collective metabolism in microbial communities

Authors: Olga Schubert

Institution(s): Eawag: Swiss Federal Institute of Aquatic Science and Technology

Abstract: Microbial communities play pivotal roles in various processes on Earth, including human health and disease. A defining feature of these communities is their collective metabolism, where metabolic functions are distributed among different microbial species, creating a complex network of metabolic interactions. To comprehend the functioning of microbiomes, it is crucial to understand how these metabolic processes are partitioned among species and interconnected through metabolite exchange. In this seminar, I will first introduce a hypothesis about what may be a fundamental driver of the distribution of metabolic processes among species. This hypothesis is based on the idea that specializing in partial metabolic pathways allows microbes to be more proteome-efficient and hence have more resources available to invest in growth and survival. I will then discuss our research on how individual microbial cells exchange cellular building blocks within their immediate vicinity in spatially structured environments and how these microscale interactions influence growth and activity in communities. In this context, I will also touch upon the role of cell lysis in promoting metabolite exchange among microbes. The overarching aim of our work in this area is to identify principles that govern how the activities and interactions of individual cells scale up to shape the dynamics and functions of entire microbiomes.