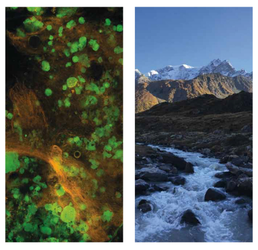
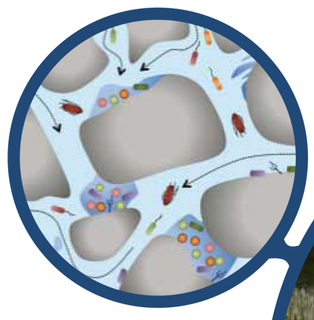


SBER

Stream Biofilm and Ecosystem Research Laboratory

EPFL

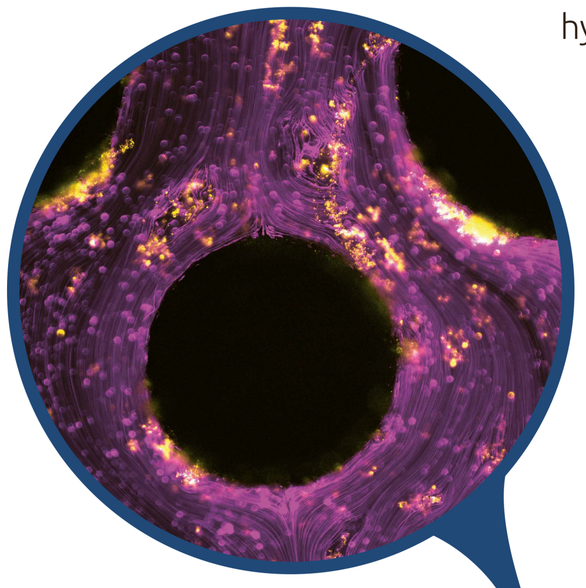


BACKGROUND & AIMS

Biofilms are matrix-enclosed and surface-attached communities of microorganisms that prevail in porous habitats of streams and greatly contribute to ecosystem functioning.

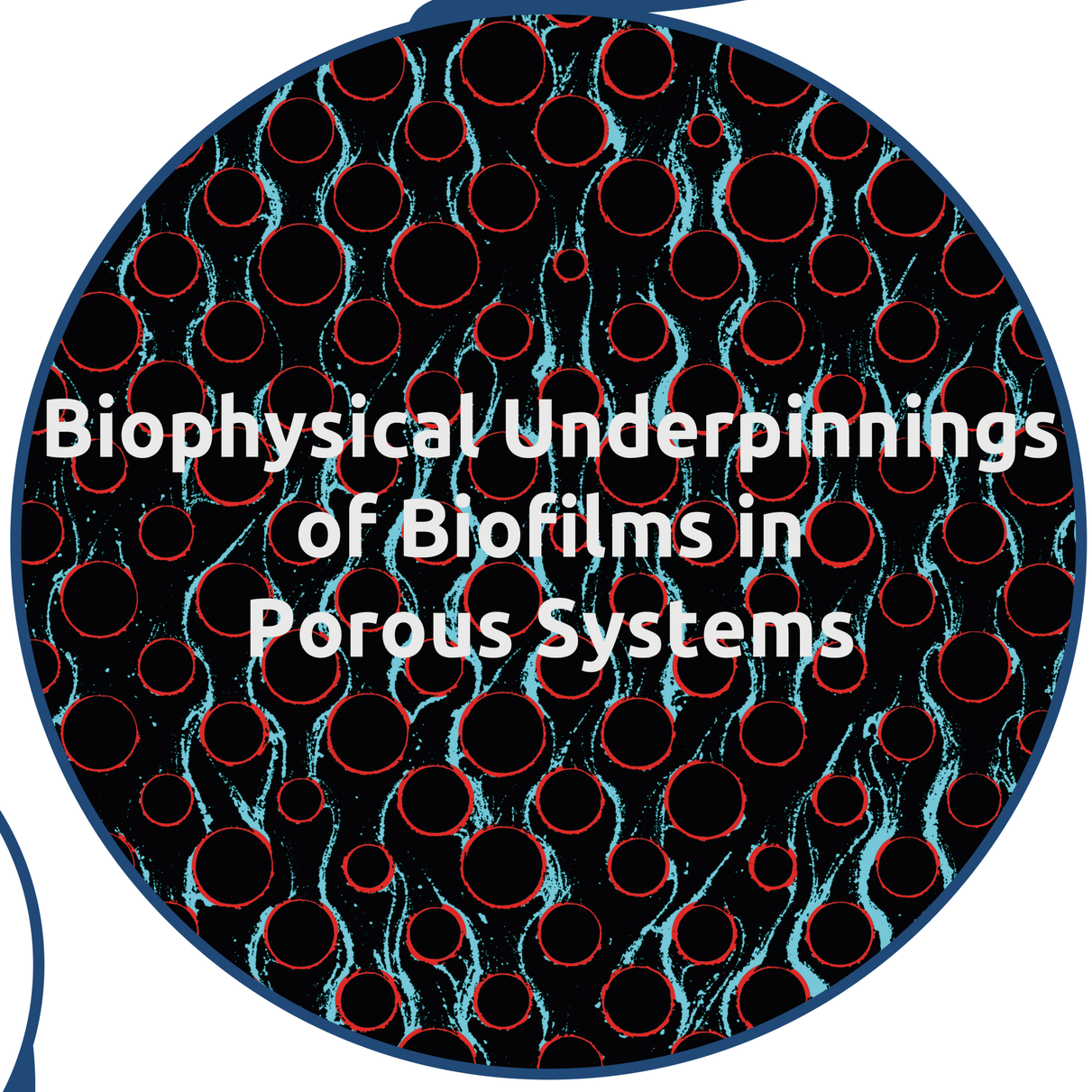
We study the morphogenesis of biofilms in porous systems by experimenting with complex communities and using microfluidic devices.

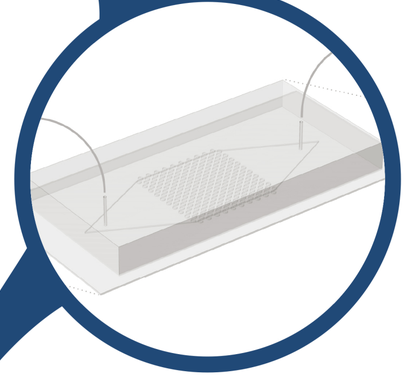
The goal of this study is to better understand the ecological strategies of biofilms to cope with spatial and hydrodynamic constraints in porous environments.



IMPLICATIONS

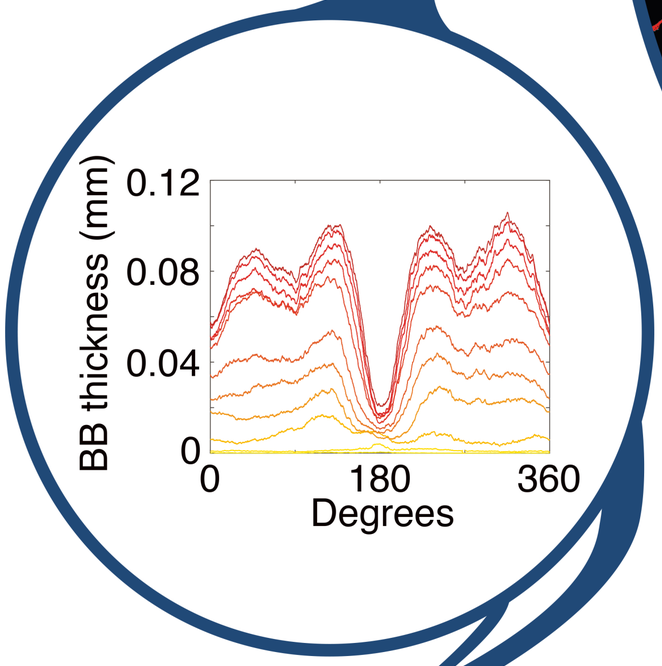
Our work sheds new lights on the success of the biofilm mode of life in porous environments as they are widespread in nature and engineered systems.

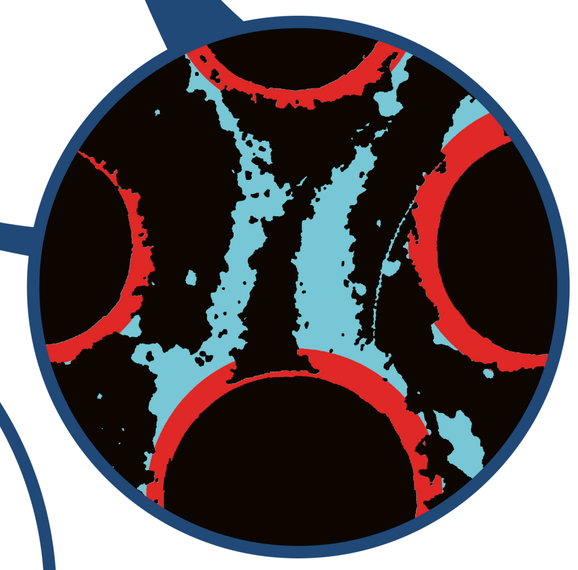




METHODS

We use microfluidic devices and time-lapse microscopy to monitor biofilm growth in porous environments. We further combine micro-particle image velocimetry and mathematical modeling to better understand the biopyhiscal controls on biofilm growth. Sequencing bacterial marker genes allows us to unravel compositional similarities of different biofilm architectures.

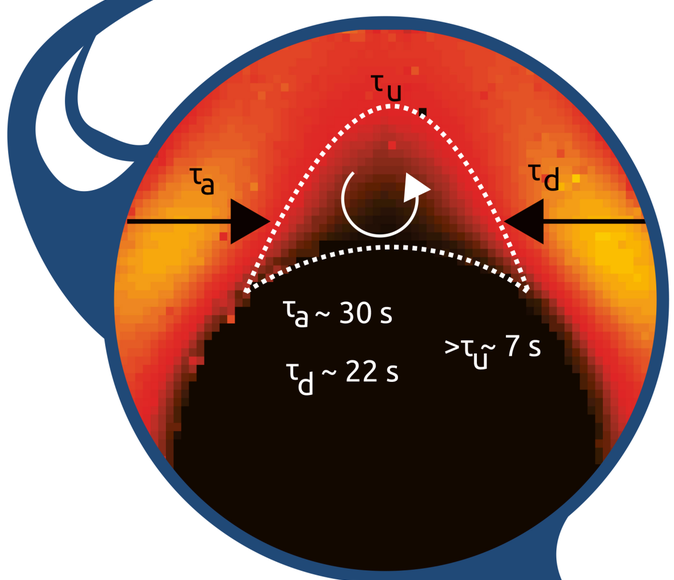


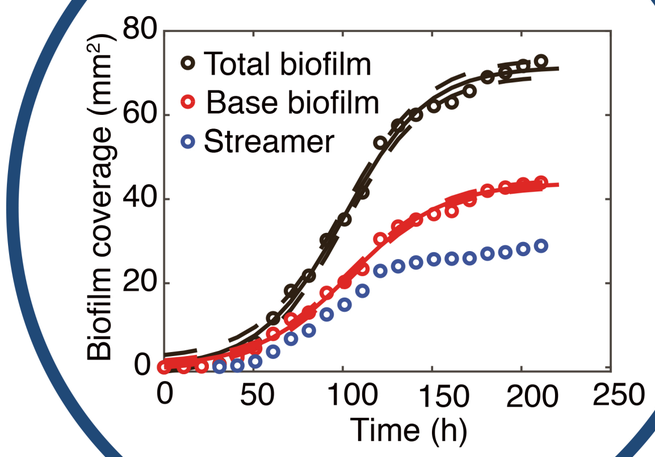


RESULTS

Filtration of cells by streamers contributes to biofilm growth. Diffusive constraints underly the tradeoff between streamer formation and base biofilm coverage.

The architectural plasticity allows complementary use of space. This comes at the cost of a trade-off as streamers locally inhibit the growth of the base biofilm. However this benefits biofilms at larger scale.





RESULTS

Biofilms differentiate into elongated streamers and tortuos base biofilms. Community composition did not follow this architectural differentiation, which is evidence for architectural plasticity.

NOMIS FOUNDATION Creating the Spark

FNSNF Swiss National Science Foundation

MARIE CURIE ACTIONS