

## **Cone-forming Chloroflexi mats as analogs of Precambrian stromatolites**

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Modern microbial mats provide useful process analogs for understanding the mechanics behind the production of ancient stromatolites. However, studies to date have focused on mats composed predominantly of Cyanobacteria and algae, which makes it difficult to assess a unique role of oxygenic photosynthesis in stromatolite morphogenesis, versus different mechanics such as phototaxis and filamentous growth.

The hot springs of Nakabusa Onsen, Nagano Prefecture, Japan support abundant microbial mats that select against Cyanobacteria as a result of high water temperature and high sulfide concentrations. As a result, mats near the source of this hot spring are dominated by filamentous anoxygenic phototrophs, primarily Chloroflexi, while those downstream are dominated by filamentous Cyanobacteria.

We studied the microbial diversity and formation of cone structures in both Chloroflexi- and Cyanobacteria-dominated microbial mats at Nakabusa Onsen using a combination of iTAG and metagenomic sequencing, autofluorescence and Fluorescent In Situ Hybridization microscopy, and experimental evaluation of trapping and binding of sediment. Furthermore, we have observed the experimental growth of new cone-forming microbial mats in situ by designing and digging new channels and pools with controlled temperature and flow conditions. Together these data illustrate that anoxygenic filamentous microorganisms appear to be capable of producing similar mat morphologies as those seen in Cyanobacteria-dominated systems and commonly associated with conical Precambrian stromatolites.