Automated high-frequency flow cytometry

Microbial in-situ process monitoring, control and optimization

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Technical and natural aquatic systems are subject to dynamics on short time scales (seconds – weeks).

This also includes temporal changes of the concentration of bacteria and thus potentially of water quality.

We are able to detect such temporal dynamics *in situ*, fully automated, in near real-time, and highly quantitatively.

This allows you to understand these dynamics better in order to assess, manage, and optimize your system better.

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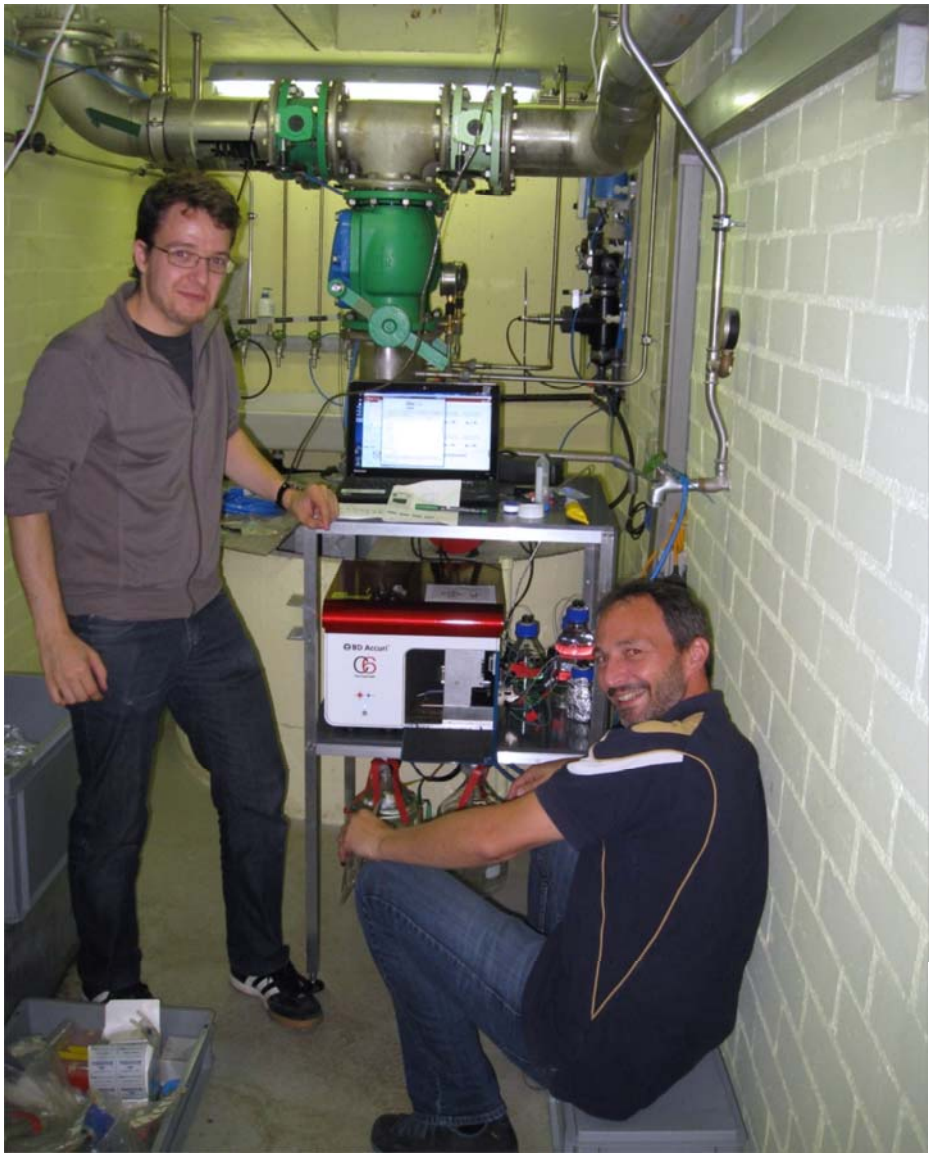
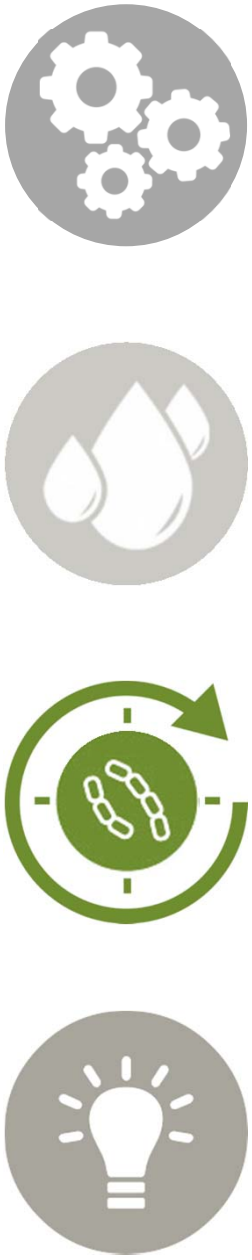
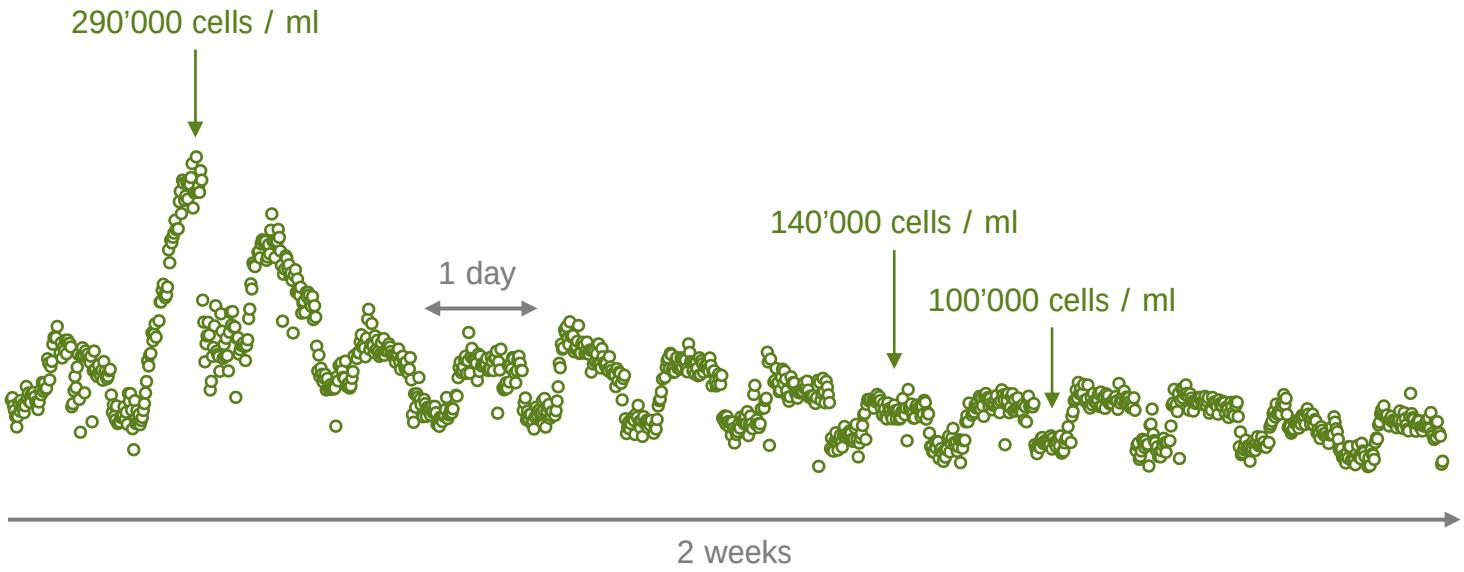
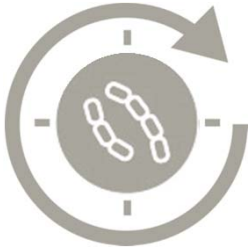
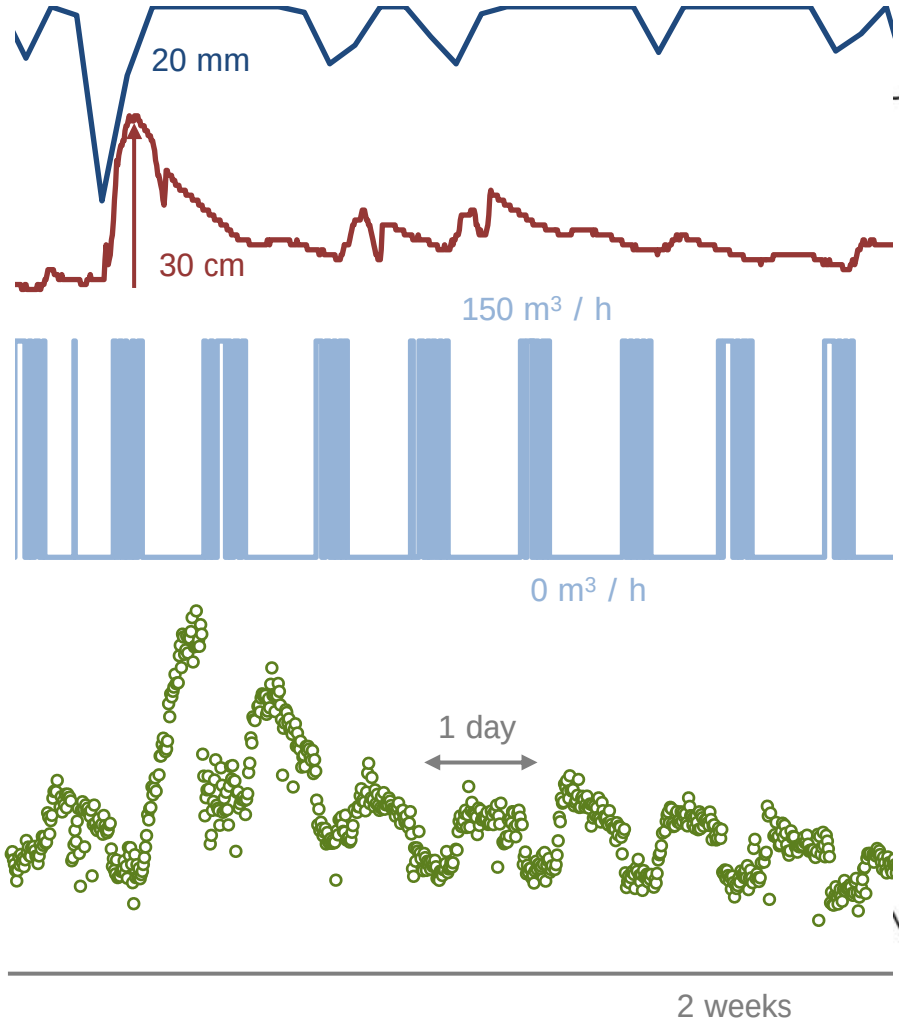
Groundwater extraction

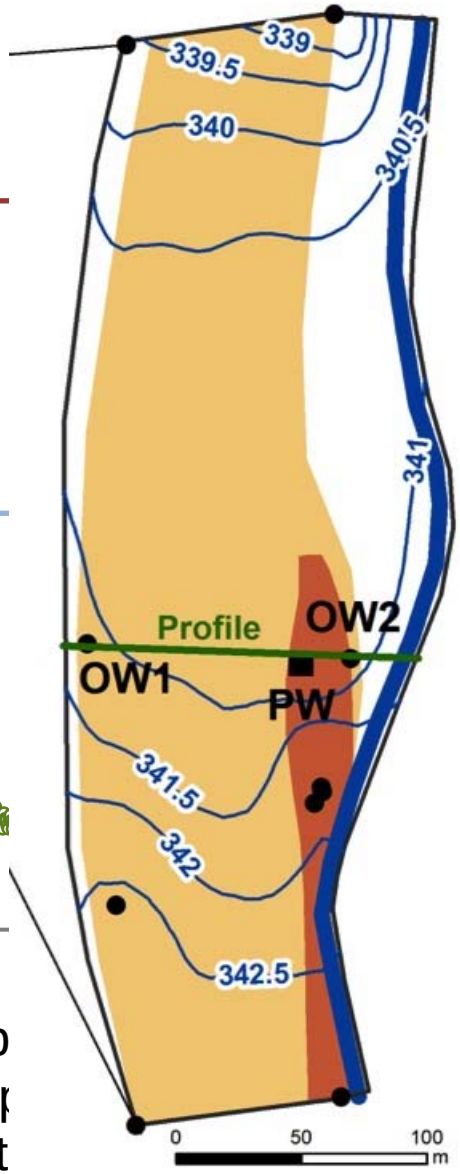





290’000 cells / ml
1 day
140’000 cells / ml
100’000 cells / ml
2 weeks







Take home: Microbial dynamics in pump
influenced by irregular events (e.g., precip
and by regular events (e.g., water extract

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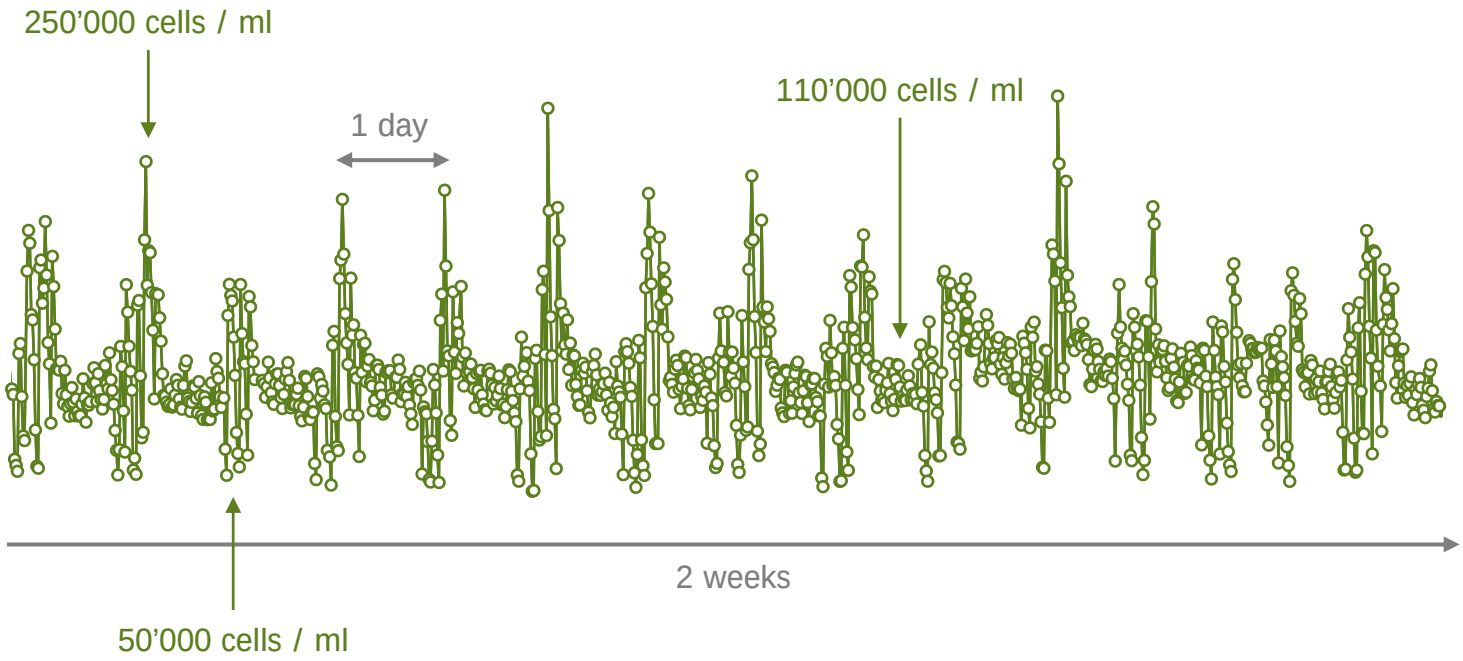
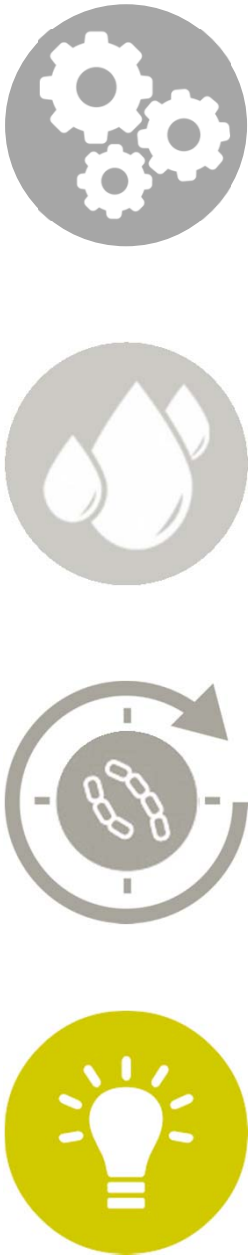
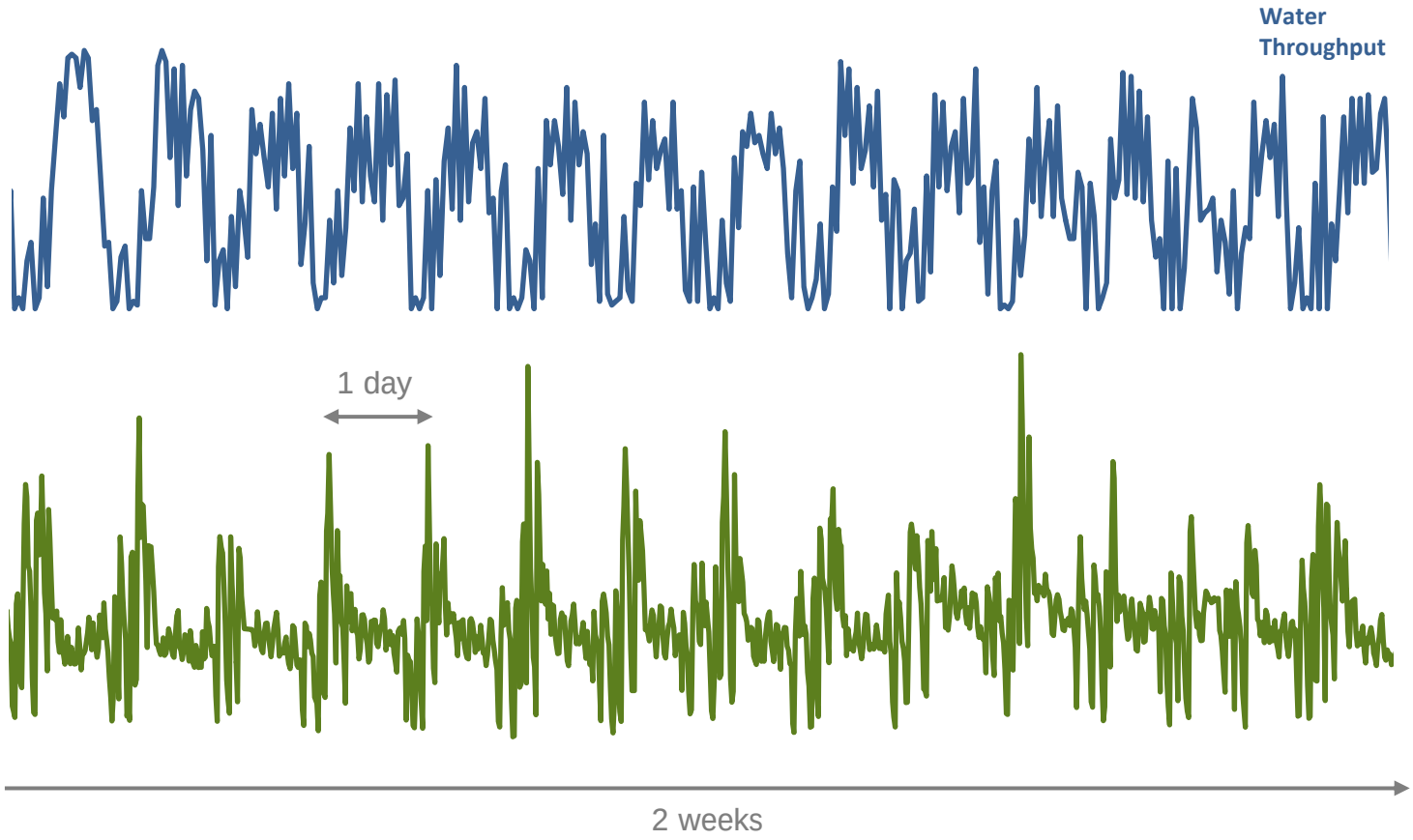
Water treatment


250’000 cells / ml
1 day
110’000 cells / ml
2 weeks
50’000 cells / ml





Take home: Microbial dynamics in treated water are influenced by regular, frequent operational events (e.g., water throughput, filter backwashing).

Emergency control

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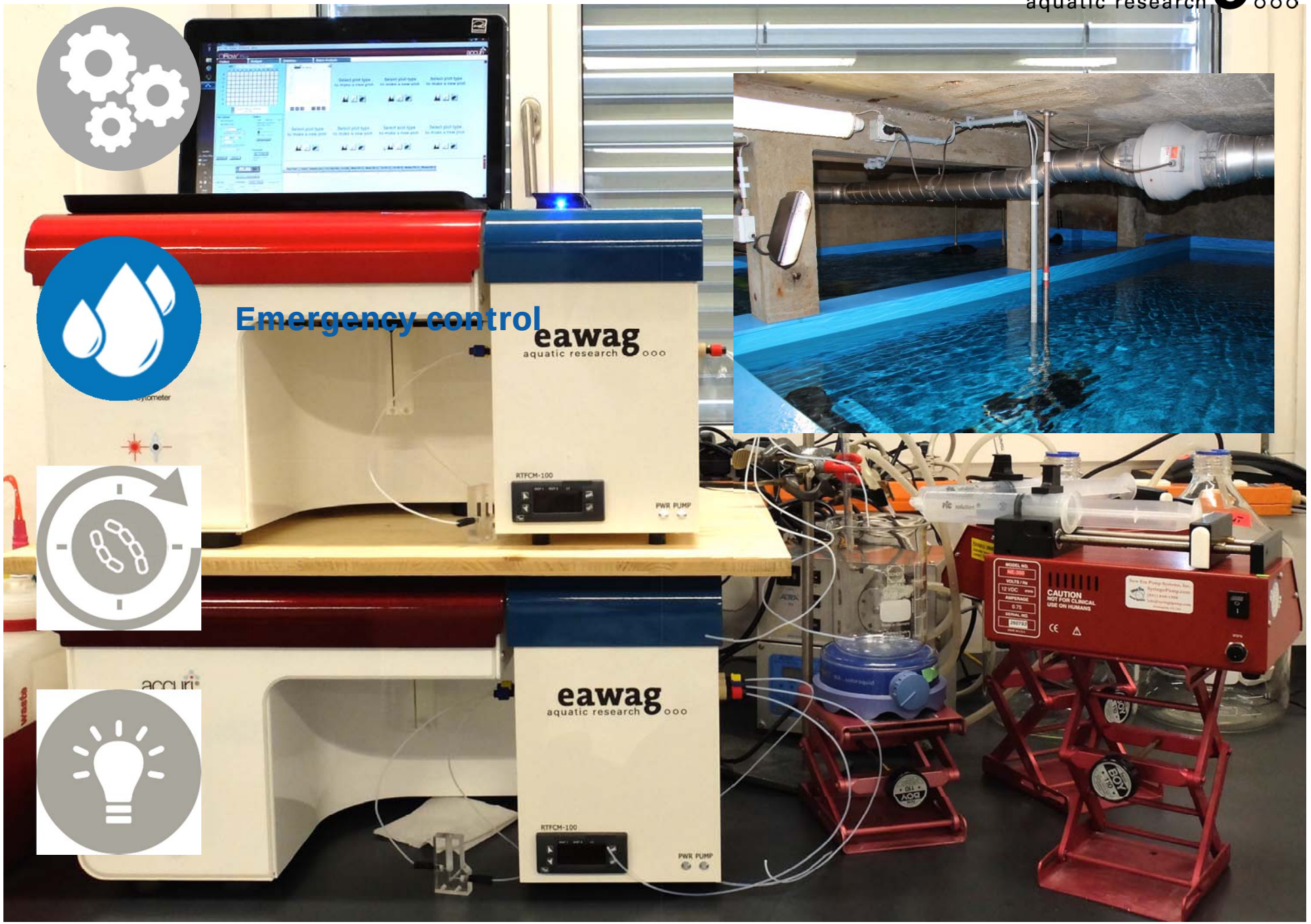

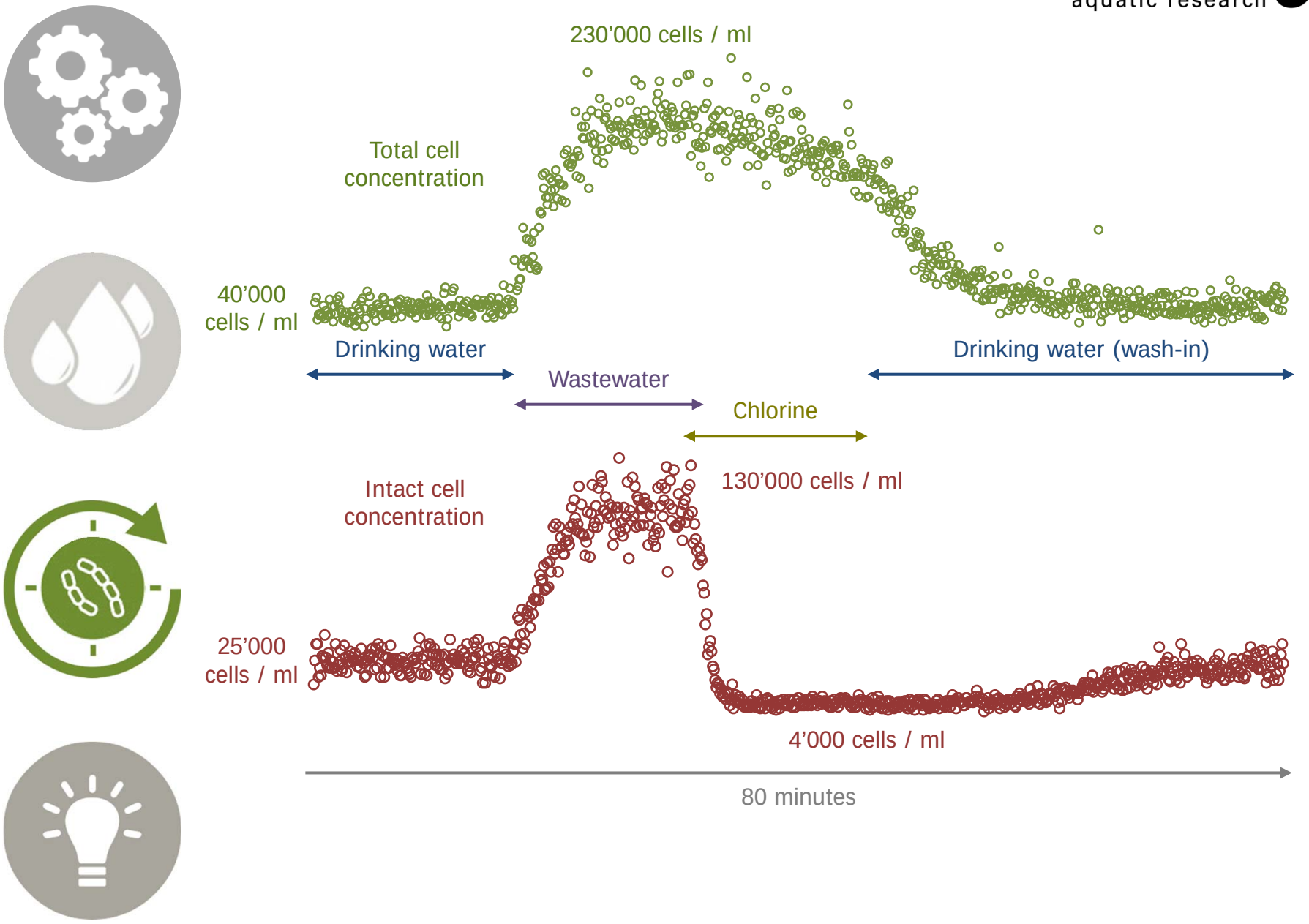
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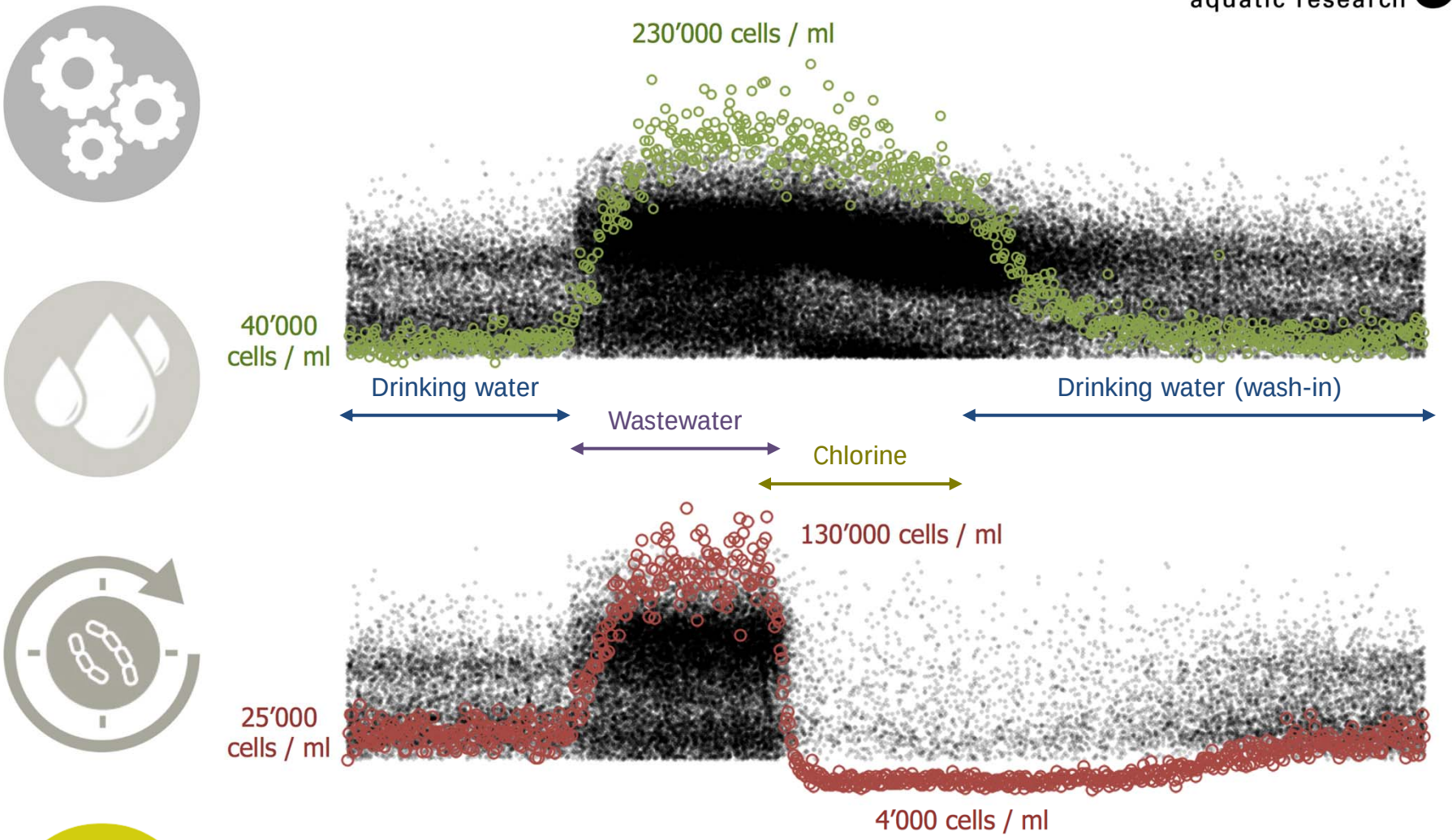
230'000 cells / ml
Total cell
concentration
40'000
cells / ml
Drinking water
Wastewater
Chlorine
Drinking water (wash-in)
Intact cell
concentration
130'000 cells / ml
25'000
cells / ml
4'000 cells / ml
80 minutes



Take home: Microbial dynamics can have very short timescales (e.g., pollution, disinfection) and different detection methods can show different aspects.

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New tools and methods allow for fully automated, *in situ*, high-frequency measurements of bacterial concentrations.

Every aquatic system – natural or technical – is subject to short-term microbial dynamics.

There are many irregular (event-driven) microbial dynamics but also subtle repetitive fluctuations.

Knowledge on microbial dynamics improves understanding of ecosystems and management of technical systems.

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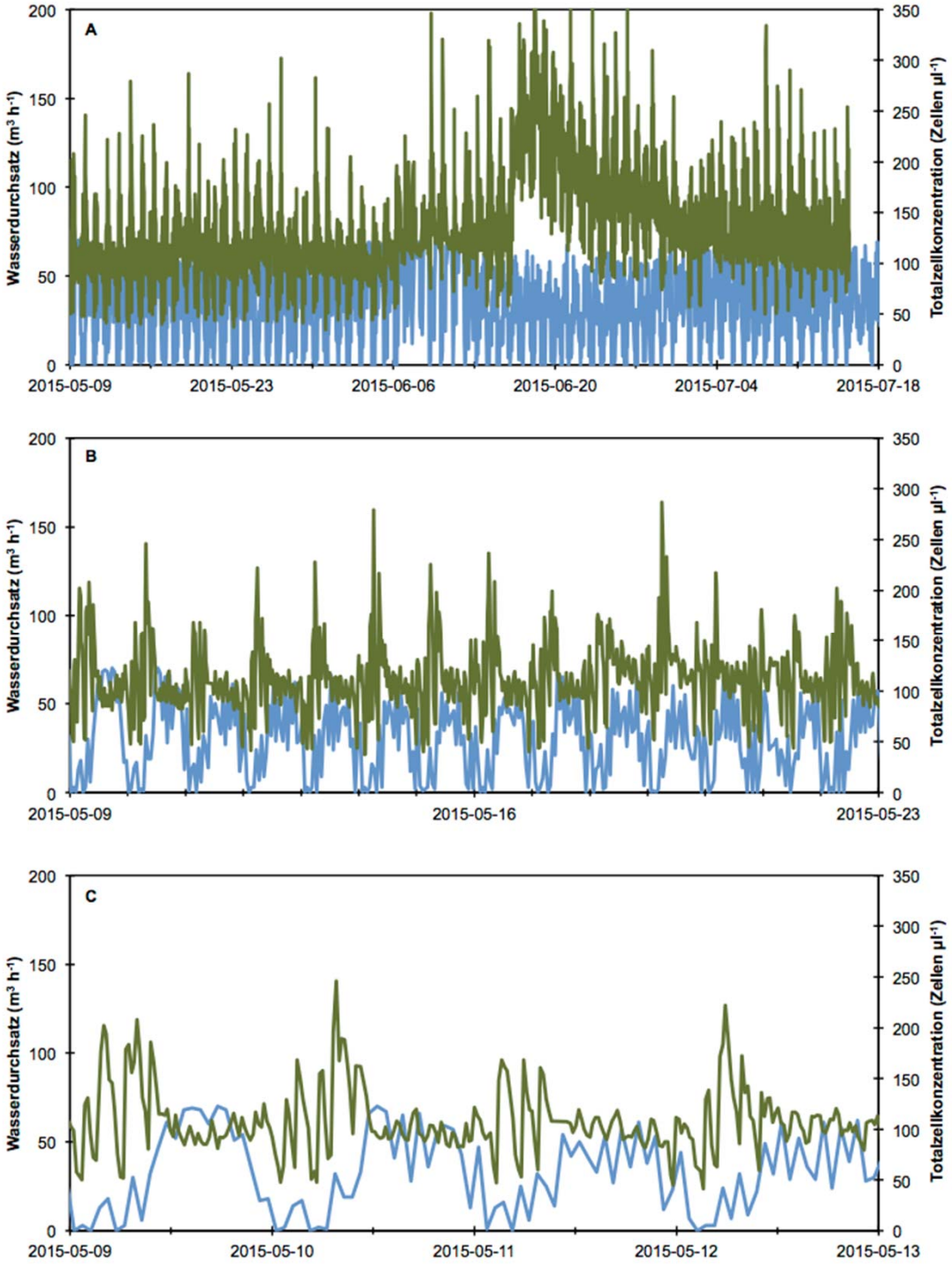
A
B
C
Wasserdurchsatz (m³ h⁻¹)
Totalzellkonzentration (Zellen µl⁻¹)
0
50
100
150
200
250
300
350
2015-05-09
2015-05-23
2015-06-06
2015-06-20
2015-07-04
2015-07-18
2015-05-16
2015-05-10
2015-05-11
2015-05-12
2015-05-13