

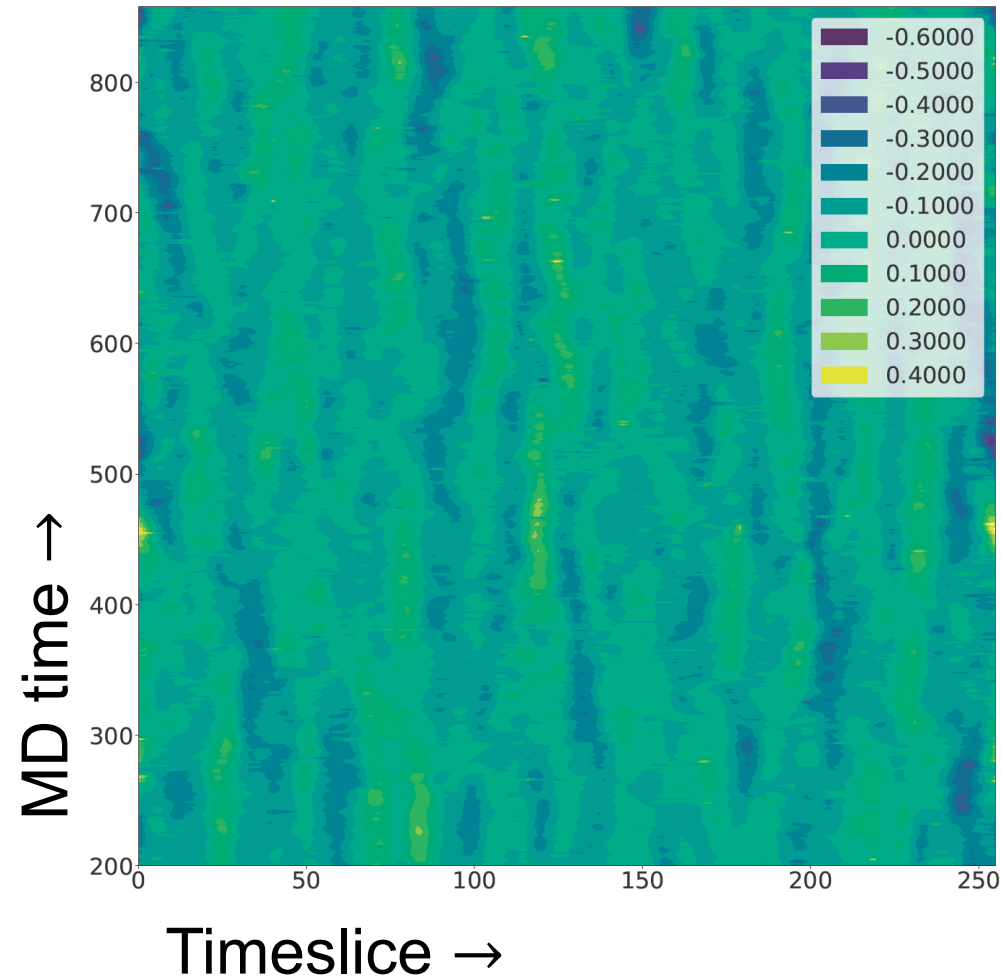
# CRITICAL SLOWING DOWN

## The final frontier

- Continuum limit  $a \rightarrow 0$ , with  $a = 0$  a critical (second order) point, the correlation length  $\xi$  diverges
- Implies slowing down of simulations:  $\tau_{int} \propto \xi^z$ , with some critical exponent  $z$ , depending on algorithm, observable
- Anyhow: costs  $\propto N_s^3 N_t$ , with  $N_{s,t} = L_{phys}/a$
- Topological charge is considered the worst case for LQCD

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## Some phenomenology

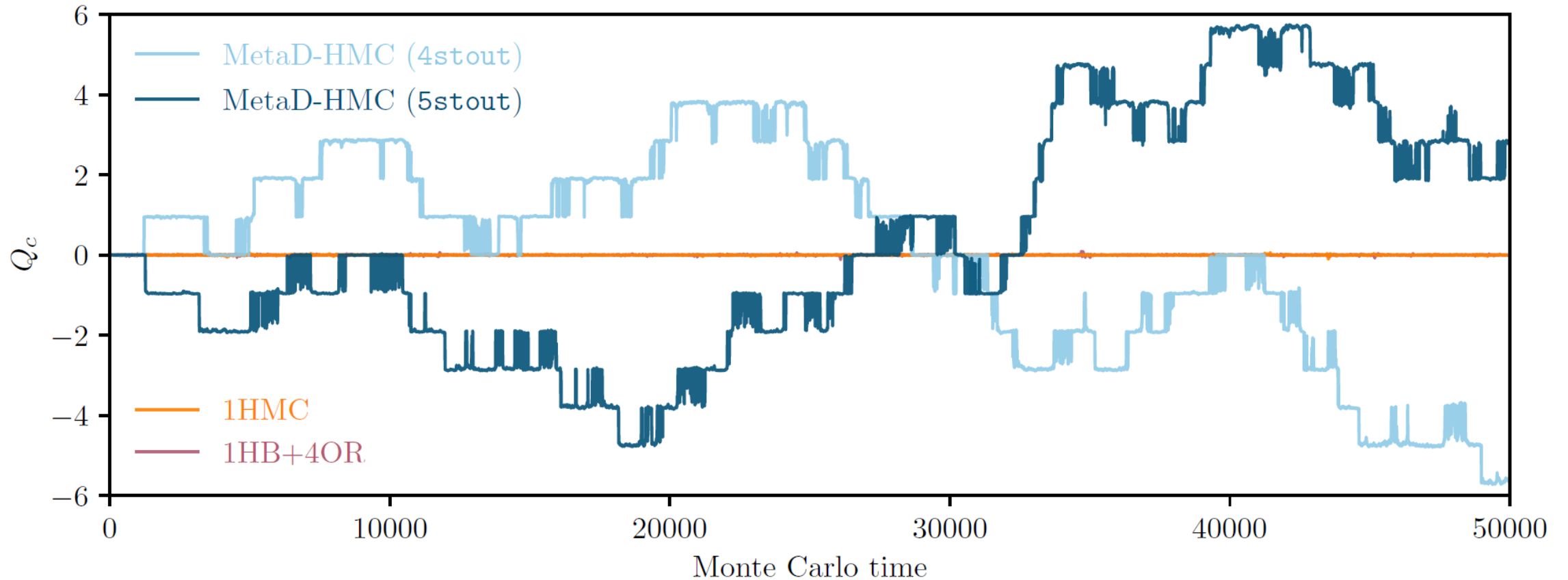


- Top. charge density integrated over timeslice, flow time of  $t_f = 32$
- Hybrid Monte Carlo
- DWF  $32^3 \times 256$ ,  $a^{-1} \approx 4$  GeV
- Long-term correlations visible
- Autocorrelation with this setup expected to scale as  $a^{-10}$
- Alternative algorithms proposed:  
Riemannian Manifold Hybrid Monte Carlo
- Field dependent mass term accelerating slow modes

⇒ IMPLICIT INTEGRATORS

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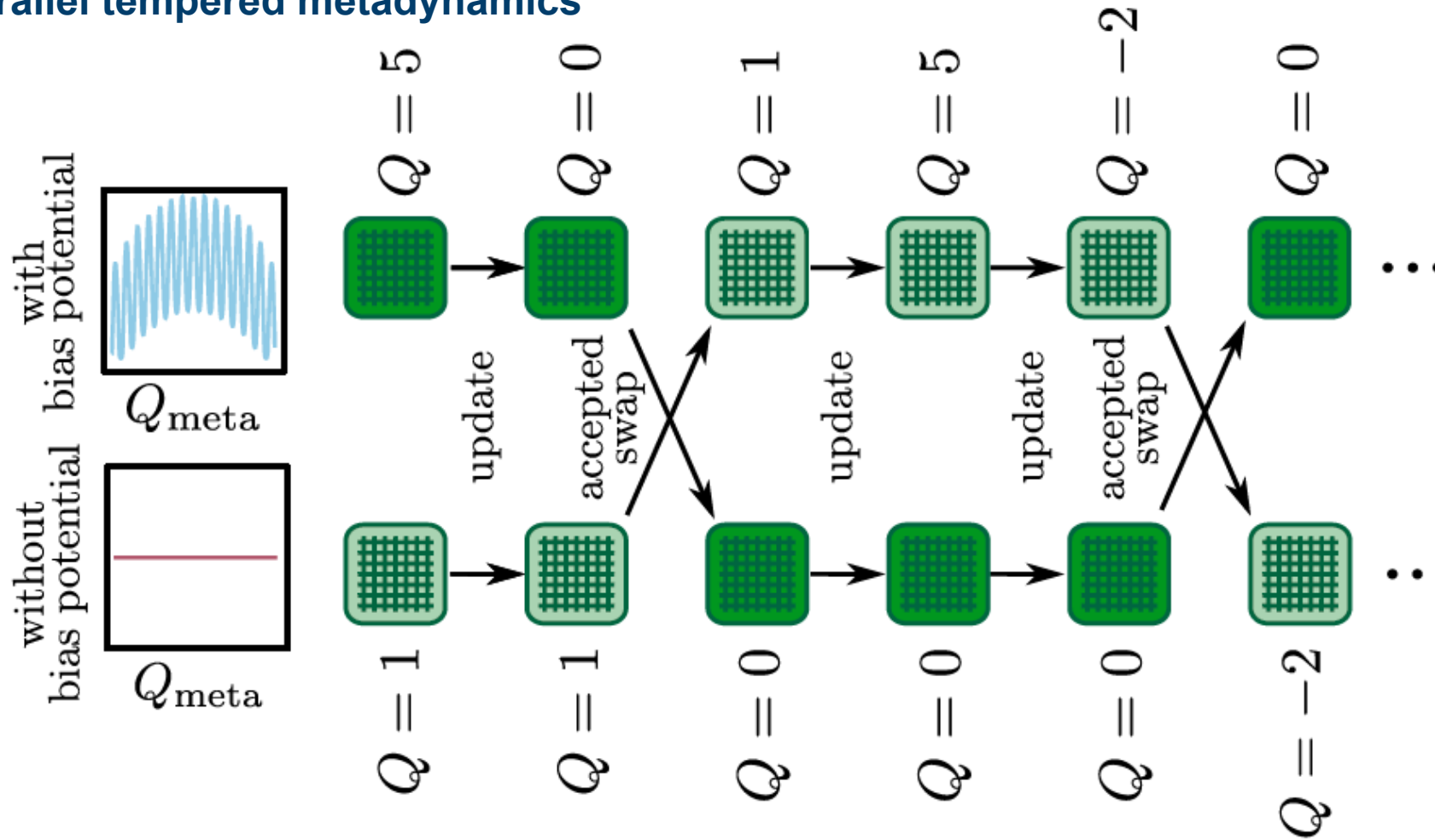
More ideas: parallel tempered metadynamics



“learned” bias potential driving system away from past regions

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