

EOS LIMITATIONS AND IMPACT ON HYDRODYNAMIC SIMULATIONS

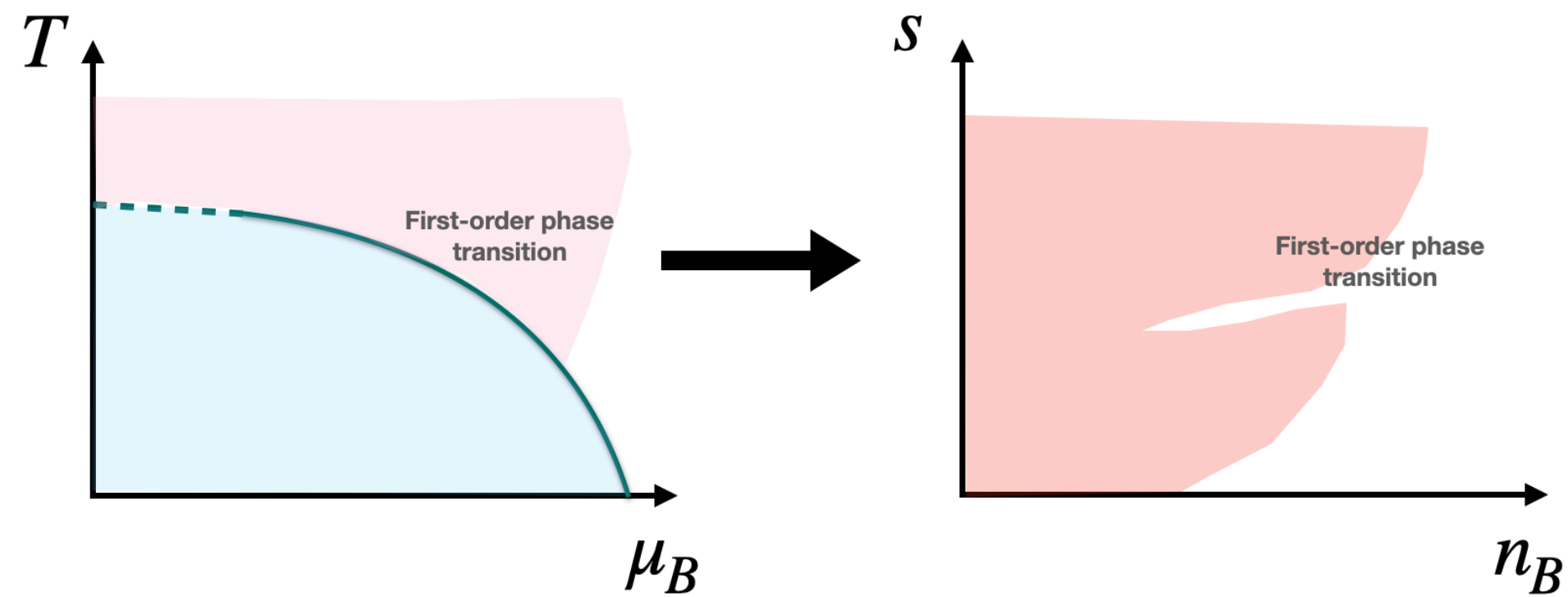
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Collaboration



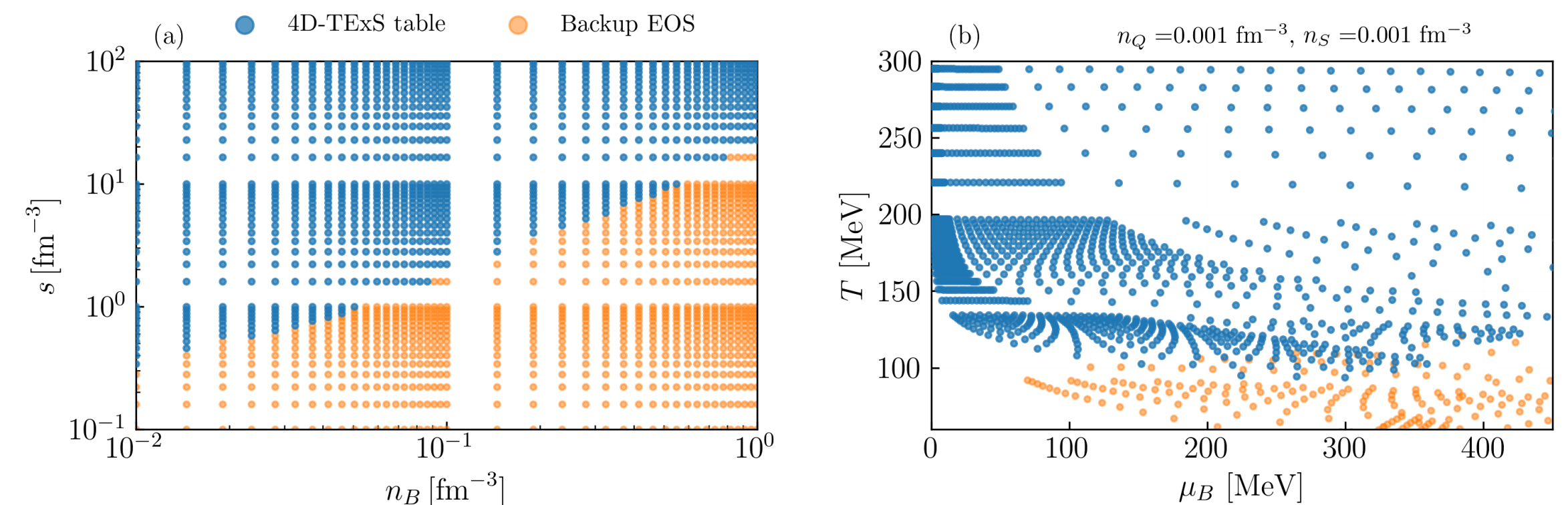
HOW DOES EOS LIMIT AFFECT HYDRO SIMULATIONS AND OBSERVABLES?

- At lower beam energies, the system explores regions of higher baryon chemical potential (μ_B), where the EoS tables have limited coverage.

Mapping T, μ_B - Plane into Natural Hydrodynamic Variables



This mapping is in general highly non-linear!

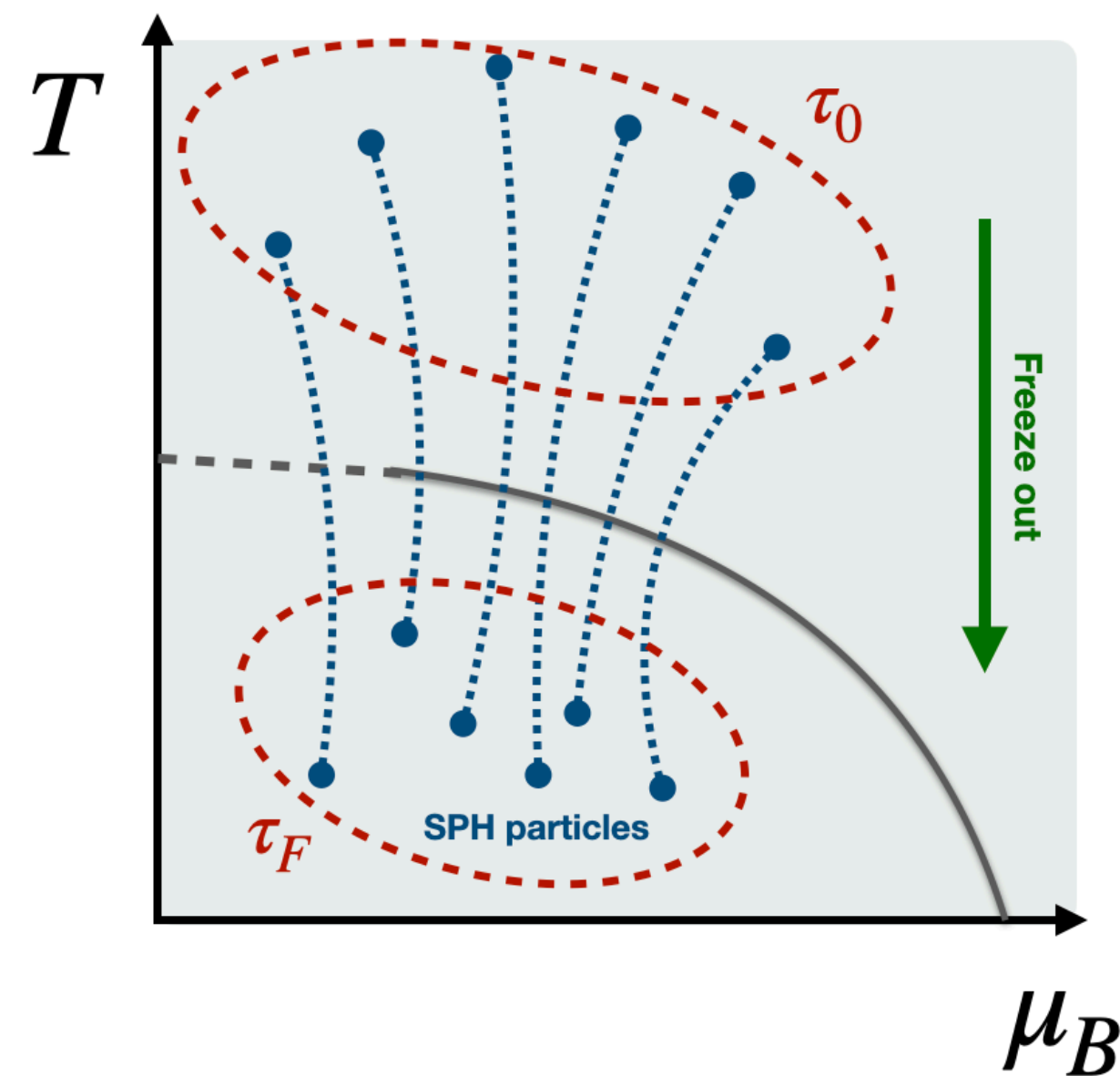


For the inversion algorithm: [arXiv:2405.09648 [nucl-th]]

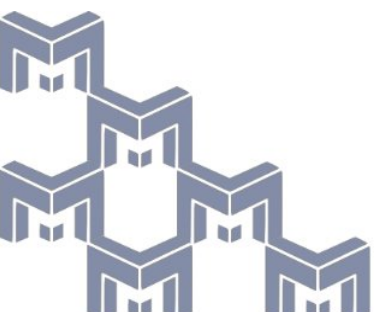
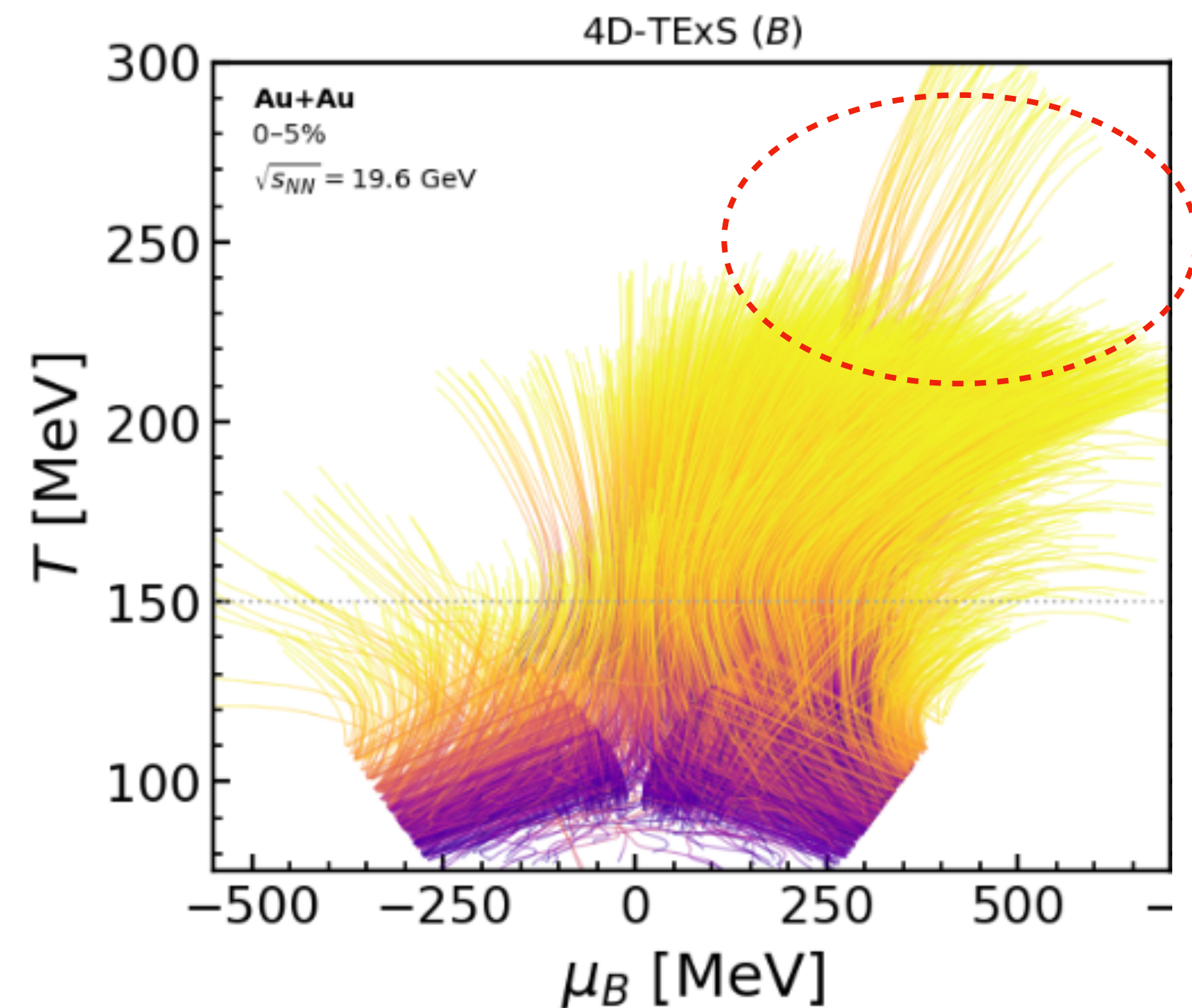
- In this region, hydro simulations either rely on backup (conformal) EoS tables or uncontrolled extrapolations, to ensure that every fluid cell has an EoS.

HOW DO BACK-UP TABLES AFFECT SPH TRAJECTORIES?

- Using the SPH particles formalism, one can follow the individual trajectories of each fluid cell along the QCD phase diagram.

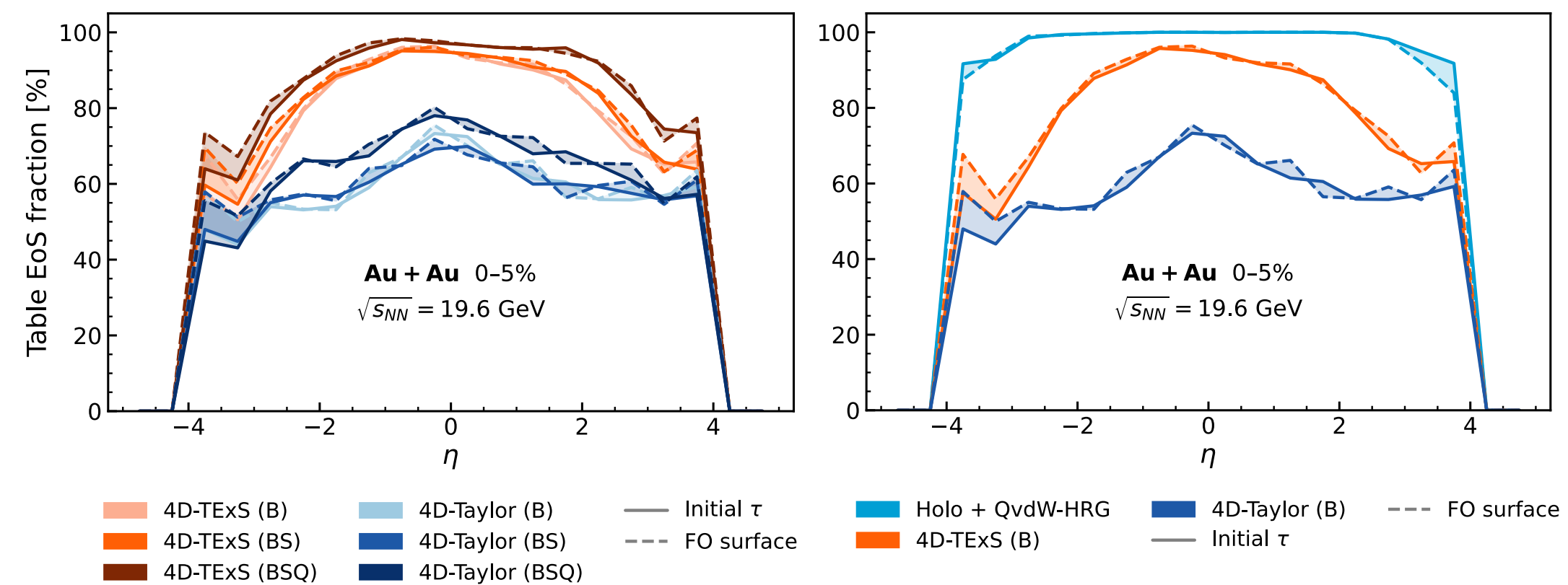


- Backup EoS trajectories: particles continue to evolve to stabilize the hydro evolution, but the mapping from $s, n_B \rightarrow T, \mu_B$ may look dramatically different.



EOS COMPARISON: BACKUP USAGE IN HYDRO SIMULATIONS

- We compare the different EoS in MUSES and quantify the out-of-bound fluid cell contamination **CCAKE** simulation for a single event!
- How can this contamination affect the observables?



[MUSES] "Studying the QCD Matter produced in Heavy-Ion Collisions using the MUSES Calculation Engine"

Soon to appear!

