

## Moving to exa-scale - challenges to (large) cosmological simulations

The sample size of galaxies used to probe the large-scale distribution of galaxies and thereby cosmology is ever growing thanks to data from Euclid or the upcoming LSST. However, the current generation of numerical codes (GADGET, RAMSES) that are key to generate mock catalogues to compare the observations to are seeing their limit.

In this talk, I will present two routes, one clever and one less so, to beat cosmic variance from a numerical perspective. I will first discuss the “genetic modification” technique –which allows to craft  $\Lambda$ CDM initial conditions –and how it can be turned into a cosmology tool. Moving on, I will present current development in numerical simulations, focusing notably on the code Dyablo in development in France. This code is built from the ground up to operate fully on GPUs. It holds promise to scale on exascale-era supercomputers, providing us with a cosmological hydrodynamical code that could, potentially, simulate tens to hundreds times more galaxies than currently possible.

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