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Constrained cosmological simulations: towards analyses of large cosmological surveys without systematics

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To understand dark matter and energy — 95% of the Universe according to the standard cosmological model — large cosmological surveys are designed to reach a few percent precision. This large quantity of data needs to be analyzed in light of cosmological simulations, to be fully exploited. Such preliminary analyses brought out tensions between the standard cosmological model and observations. Reaching a 1% precision, systematics of the same order of magnitude, due to our cosmic environment, our survey specificities and our tool properties, rise out. Analyses need to be fueled with a new type of cosmological simulations designed to reproduce our cosmic environment. Such simulations, that I named CLONES (Constrained LOcal & Nesting Environment Simulations), provide a robust methodological framework to minimize the systematics. After presenting a few tension examples, I will introduce the CLONES giving a few study examples that promise to tremendously increase our capacity to evade systematics in future survey analyses.