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Impact of the errors induced by the Halo Mass Function mapping at different masses definitions on cosmological parameters constraints.

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The galaxy cluster count is a particularly effective probe to constrain cosmological parameters and study the limits of the ΛCDM model. Indeed, the abundance of galaxy clusters is strongly correlated with cosmological parameters such as Ω_m, σ_8, and the dark energy equation of state. Future surveys such as Euclid will enable us to acquire astrophysical data on a very large number of clusters. The statistical uncertainties linked to the observations will therefore be greatly reduced, and it seems necessary to ask questions about the uncertainties linked to the theoretical predictions of the cluster count, such as the halo mass function. Certain mass functions have been calibrated using N-body simulations and the Virial masses of the dark matter halos. However, the observable masses are the masses where the astrophysical processes of the baryons are preponderant, such as M_{200c} and M_{500c}. It therefore seems necessary to be able to establish a robust relation between the HMFs calibrated at M_{vir} and the HMFs at other mass definitions. To do this, two methods are available; the first is based on the sparsities of the halos and the stochastic nature of their masses. The second is based on the universality of dark matter density profiles. This project aims to quantify the systematic errors in the mapping between different mass functions using these two methods to reduce the uncertainties in the theoretical predictions of the cluster counts and thereby improve the robustness of the cosmological constraints.

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