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Towards the one-loop galaxy bispectrum in the weak field approximation

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The large scale structure bispectrum contains information about the dynamics of the early universe in the squeezed limit since it couples large scales and short scales. Therefore, we compute the dark matter and galaxy bispectrum in a framework that is non-linear and based on General Relativity. To start, we use the weak-field approximation and standard perturbation theory to find the fluid evolution for dark matter density contrast to fourth-order in perturbations. Hereafter, we compute the galaxy density contrasts through the bias expansion. To do that, we evolve the Lagrangian bias expansion. We write the Lagrangian bias expansion in terms of operators built on the curvature of early time hypersurface of a comoving observer and the dark matter density contrast. Before computing the galaxy bispectrum, we properly renormalized the bias operators by adding the counter-terms that cancels the cut-off dependencies in the one-loop integrals. We find that in the squeezed limit, the non-linear relativistic corrections to the bispectrum are as large as the Newtonian ones and degenerates with the primordial non-gaussianity signal. Still, we have to add projection effects to our results. So, these are the first steps towards determining the gauge-invariant galaxy bispectrum.

Primary authors: CASTIBLANCO, Lina (Pontificia Universidad Católica de Valparaíso); NOREÑA, Jorge

Presenter: CASTIBLANCO, Lina (Pontificia Universidad Católica de Valparaíso)

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