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Simulating the effect of massive neutrinos on large-scale structure

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The massive neutrino background makes up a component of the dark matter, and as such affects the growth of large-scale structure, such as galaxy clusters. This affords us an opportunity to measure the neutrino mass. However, to do this we must accurately and efficiently characterize how neutrinos affect structure growth. I will describe a new method for including massive neutrinos in N-body simulations which is uniquely accurate in the limit of small neutrino masses, and incurs no cost above that of the N-body simulation. It uses perturbation theory for the neutrinos, modified to include source terms for the non-linear dark matter clustering. A small fraction of low-energy neutrinos which cluster more strongly may be treated as particles, but this does not substantially affect the overall structure.

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