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# Constraining neutrino mass using three-point mean relative velocity statistics

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Velocity field provides a new avenue to constrain cosmological information, and one of the commonly used statistics is the mean radial pairwise velocity. In this talk, we consider the three-point mean relative velocity (i.e. the mean relative velocities between pairs in a triplet), and show that it is a novel probe of neutrino mass estimation. We explore the full cosmological information content of the halo mean pairwise velocities, and the mean relative velocities between halo pairs in a triplet using 22,000 simulations from the Quijote suite. We find that the mean relative velocities in a triplet allows a 1-sigma neutrino mass constraint of 0.065 eV, an order of magnitude better than the mean pairwise velocity constraint. We also introduce a new estimator based on three-point mean relative velocities, and showcase how it can constrain neutrino mass independent of sigma8 and optical depth alleviating the degeneracy with these parameters. These results illustrate the possibility of exploiting the mean three-point relative velocities for constraining the cosmological parameters accurately from future cosmic microwave background experiments and peculiar velocity surveys.

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