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Improving SN Ia Hubble residual scatter with galaxy groups

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Various cosmological parameters such as H_0 and $f\sigma_8$ that can be measured using Type Ia Supernovae (SNe Ia) have been shown to be in tension with measurements from the early universe. We can improve cosmological parameter measurements and reduce scatter on the Hubble diagram by focusing on redshift scatter from leveraging galaxies in groups. Using the low-redshift sample from Pantheon+ combined with a new sample from the AAT spectrograph as well as predictions from simulations with Uchuu, we obtain and average the redshifts of galaxy groups to correct for small-scale peculiar velocities and improve scatter on the Hubble diagram. With the impending arrival of the Rubin-LSST data, which we show will greatly benefit from accounting for peculiar velocities, we encourage an increased effort to define more galaxy groups for both current and future SN samples.

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