Abstract Submitted
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A tunable laser system for precision wavelength calibration of spectra CLAIRE CRAMER, Harvard University — We present a novel laser-based wavelength calibration technique that improves the precision of astronomical spectroscopy, and solves a calibration problem inherent to multi-object spectroscopy. We have tested a prototype with the Hectochelle spectrograph at the MMT 6.5 m telescope. The Hectochelle is a high-dispersion, fiber-fed, multi-object spectrograph capable of recording up to 240 spectra simultaneously with a resolving power of 40000. The standard wavelength calibration method uses of spectra from ThAr hollow-cathode lamps shining directly onto the fibers. The difference in light path between calibration and science light as well as the uneven distribution of spectral lines are believed to introduce errors of up to several hundred m/s in the wavelength scale. Our tunable laser wavelength calibrator is bright enough for use with a dome screen, allowing the calibration light path to better match the science light path. Further, the laser is tuned in regular steps across a spectral order, creating a comb of evenly-spaced lines on the detector. Using the solar spectrum reflected from the atmosphere to record the same spectrum in every fiber, we show that laser wavelength calibration brings radial velocity uncertainties down below 100 m/s. We also present results from studies of globular clusters, and explain how the calibration technique can aid in stellar age determinations, studies of young stars, and searches for dark matter clumping in the galactic halo.

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