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Finding the Lowest Mass Exoplanet with Improved Radial Velocimetry[1] SHARON XUESONG WANG, JASON WRIGHT, Penn State University — Radial velocimetry detects the star's radial velocity (RV) variations caused by the gravitational pull of the planets orbiting around the star. Surveys using radial velocimetry have been extremely successful in detecting extra-solar planets (exoplanets) and measuring their masses in the counts of hundreds, including many interesting low-mass and likely rocky planets such as Kepler-78b, the first exoplanet known to have radius and mass very close to Earth's. However, the current precision of radial velocimetry ($\sim$0.5-1 m/s) is limiting our ability to detect exoplanets with even lower masses or rocky planets further out in the orbit, especially the ones that are potentially habitable. We have identified several contributing factors to RV systematic errors through our study, including the annual jitter caused by the earth's atmospheric absorption, which creates an systematic signal at $>$ 1m/s level. Through our pilot study, we have successfully removed part of this systematics and improved the RV precision of Keck HIRES, the leading 10-meter telescope and instrument for exoplanet discoveries. Our study will enable the discoveries of more low mass exoplanets through RV surveys or follow-up program on planet candidates discovered via NASA's Kepler mission.

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