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Relating Adaptive Optics and Image Quality for Exoplanet Detection[1] OLLIE JACKSON, Cabrillo College, DR. MAAIKE VAN KOOTEN COLLABORATION — When you look up at the stars to watch them twinkle, you are actually observing the star's light waves become distorted by fluctuations in our atmosphere as they reach our eyes. Our telescopes also capture the twinkling of stars, which makes it incredibly difficult to get useful science images of our universe, particularly when we try to take pictures of exoplanets. Adaptive Optics (AO) is a system built into modern telescopes that directly corrects for the distortions of incoming lightwaves through the use of a wave sensor and a deformable mirror that is reshaped to counteract the changes in light caused by our atmosphere. A properly functioning AO system is key to exoplanet research, but according to a 2020 study by Cantalloube et. al. on the Chilean SPHERE VLT telescope, high wind speeds in our atmosphere can create a "wind-driven halo" of light in images as the AO system becomes overwhelmed, making it impossible to examine the region for exoplanets. This displays how our atmosphere not only distorts incoming lightwaves, but also impacts how well the AO system can correct those distortions. My research focuses on understanding the relationship between weather conditions, AO, and image quality at the W. M. Keck Observatory to determine what weather conditions limit the performance of Keck's AO system and what weather conditions limit our ability to image exoplanets. My initial findings show that the direction of wind flow has an effect on correlations between weather, image quality, and AO readings.

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