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Photometric "Flicker:" Tracer of Granulation and an Accurate Measure of Stellar Surface Gravity

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As a result of the high precision and cadence of surveys like NASA's Kepler, we may now directly observe the very low-level light variations in Sun-like stars. In my dissertation, I found that some of these variations unexpectedly arise from granulation, a result that enables us to more accurately determine the physical properties of Sun-like stars, permits us to understand the nature of surface convection and its connection to activity, and allows us to better determine the properties of planets around Sun-like stars. I find that granulation manifests through light "flicker," thereby yielding a simple measurement of stellar surface gravity with a precision of 0.1 dex. I use this, together and solely with two other simple ways of characterizing the stellar photometric variations in a high quality light curve, to construct an evolutionary diagram for Sun-like stars from the main-sequence on towards the red giant branch. I use flicker to re-determine the fundamental properties of Kepler planet host stars, finding that the stars – and hence the planets orbiting them – are 20-30% larger than previous estimates. Finally, I show that high precision light curves can yield remarkably clean predictors of radial velocity (RV) jitter in magnetically inactive stars, allowing the exoplanet community to prioritize RV follow-up campaigns with discovery light curves and providing insight into the primary physical drivers of RV jitter in such stars.