HIGH-PRECISION KEPLER MONITORING OF ACTIVE GALACTIC NUCLEI

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We propose to monitor 20 of the brightest AGN in the Kepler field (V = 11.0-18.7) to obtain the first AGN light curves that uniformly cover time scales of hours to months. Most AGN show significant optical variability on these time scales, which is connected to emission from the accretion disk and thus provides one of the few ways of to study the physics of accretion in these objects. For the 10^6 to 10^9 solar mass black holes thought to power most AGN, one expects time scales ranging from the light-crossing times of minutes to weeks to the thermal time scales of order months to years. Previous optical monitoring was unable to access the critical short time scales due to diurnal and weather-related interruptions and poor photometric repeatability. These uninterrupted, high-precision light curves will yield the first AGN optical power spectral density functions (PSDs) of comparable quality to those obtained in the X-rays. This will allow us to determine the overall shape of optical PSDs, and if they are like X-ray PSDs, we will be able to measure slopes to 0.02-0.1 and detect breaks indicative of a characteristic variability time scale indicative of light-crossing or dynamical time scales in the accretion disk. Based on what is known about the optical variability characteristics of AGN our simulations show that Kepler will represent a breakthrough in this area allowing the determination of precision PDSs for several 10s of AGN. This is directly connected to one of NASA key goals in astrophysics, understanding the nature of black holes and active galaxies.