VARIABILITY OF AN AVERAGE SYMBIOTIC BINARY - STHA 169

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We propose to determine whether or not the symbiotic star StHA 169 contains a hidden accretion disk by studying its sub-mmag-level flickering properties that only Kepler has the sensitivity to detect. Symbiotic stars are wide binaries in which a white dwarf (WD) accretes from a red-giant companion. It has proved difficult to determine exactly how mass is lost by the red giant (Roche-lobe overflow, spherical wind, or "focused wind"?) and how it is accreted by the white dwarf (via an accretion disk or direct impact?). Most cataclysmic variables (CVs, in which the mass donor is a Roche-lobe filling main-sequence star), on the other hand, are known to accrete via a disk. A variety of observational techniques (including eclipse mapping and Doppler tomography) have not only confirmed the presence of the disk beyond a shadow of a doubt in non-magnetic CVs, but also revealed the detailed physics of the disk. For symbiotic stars, ground-based fast optical photometry has revealed stochastic brightness variations (termed "flickering") at tens of percent level in a few objects. This phenomenon, which is routinely observed in CVs, is a well-known signature of the accretion disk; the power spectrum of this disk flickering has a characteristic steep powerlaw shape at high frequencies. However, this successful determination that accretion proceeds via an accretion disk has been limited to a small subset of symbiotic stars. In the vast majority, no flickering is seen with a typical upper limit of about a few tenth of a percent. Does this mean that the majority of symbiotics do not actually contain disks, contrary to simple expectations ? Another possibility is that symbiotic stars do contain disks, but that the amplitude of disk flickering is reduced due to the presence of some other constant source of light. In other words, the disks are hidden. We can distinguish between these possibilities by using the phenomenal sensitivity of Kepler to detect mmag-level and even sub-mmag-level flickering in an ordinary symbiotic star. Here we propose a one-month fast-cadence Kepler observation of an ordinary symbiotic star, StHA 169 (the only such system in the Kepler field-of-view), to detect and characterize its flickering. The Kepler sensitivity is sufficiently high that a non-detection flickering with a steep powerlaw power spectrum will imply that a disk does not exist in this system, and perhaps in many other ordinary symbiotic stars. Since symbiotic stars are known to be the progenitors of at least some type Ia supernovae, understanding how they accrete could also shed light on the generation of cosmologically important supernovae.