K2 Campaign 2&3 Proposal for Monitoring Cataclysmic Variables

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The original Kepler field had 27 cataclysmic variables (CVs:close binaries with mass transfer from a late main-sequence star to a white dwarf). Kepler monitored 15 of these systems (Howell et al. 2013; Scaringi et al. 2013a,b). The detailed coverage enabled unique studies of quiescent orbital and sporadic variability as well as the changes in the disk and stream impact area during short and long dwarf nova outbursts. Short cadence observations revealed superhumps that were used to test accretion disk dynamics and precession (Wood et al. 2011). Analysis of the phase and width of eclipses (Ramsay et al. 2012, Scaringi et al. 2013b) showed evidence for radial increases of the disks during outburst.

We are using the K2 campaigns to provide a much larger CV database of long-cadence, high time resolution observations for shorter intervals of months rather than years. The cadence of the current sky surveys (CRTS, ASAS, PanSTARRS) is ∼1-2 obs/24 hrs at best (assuming no weather interruptions). Since the orbital periods of most CVs are 1.5-3 hrs, these surveys provide some information on outbursts but little on orbital timescale variability during quiescence and outburst.

For K2-0, we searched the RK Cat (Ritter & Kolb 2003), SIMBAD, the Downes web catalog, ASAS, the CRTS database (Drake et al. 2009), and the SDSS database (Szkody et al. 2011) for all known CVs, finding 12 systems, of which 6 are now under observation (GO0025). The same searches for the K2-1 pointing resulted in our input of 10 known objects, including 6 dwarf novae 1 possible intermediate polar (IP), 1 pre-CV and 2 peculiar CVs. The fields for K2-2,3 yield 4 and 5 objects respectively. K2-2 includes 2 interesting objects, U Sco and V893 Sco. U Sco is the prototype of recurrent novae with its last ouburst in 2010, has a long period of 29.6 hrs and a massive white dwarf (Schaefer et al. 2010). The eclipsing dwarf nova V893 Sco (Bruch et al. 2000), has a short orbital period of 1.8 hr, shows QPOs and is an X-ray source (Mukai et al. 2009). The other 2 CVs in K2-2 are dwarf novae from the CRTS. K2-3 includes FO Aqr, an IP with P_{orb}=5.1 hrs, P_{spin}=21 min, and 4 other CRTS faint sources. We request short cadence to follow the QPOs in V893 Sco and the spin in FO Aqr and long cadence for the CRTS objects.

Data on the known dwarf novae will extend the studies of accretion during quiescence and outburst that will advance the stringent tests of accretion dynamics that began with the original Kepler field. In an IP, accretion curtains rain material at the magnetic poles of the white dwarf, enabling a view of the spin; Kepler has yet to determine the short timescale variability of an accreting, magnetic white dwarf. If the short cadence is not possible for FO Aqr and V893 Sco, the long cadence will still be useful to follow the accretion variability over the 2.5 months.

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