UNDERSTANDING BLAZAR VARIABILITY THROUGH KEPLER
Ann Wehrle
Space Science Institute
GO20018

We propose to monitor four flat spectrum radio quasars (blazars) and one powerful radio galaxy, Cygnus A, to search for variability on timescales comparable to the light crossing time of the accretion disk around the central supermassive black hole and the base of the relativistic jet. We want to see if some optical variability in quasars is due to a bright feature in the accretion disk as it approaches the last stable orbit, or if it is due to inhomogeneities in the jet, possibly in a helical structure. When the quasars are in quiescent, faint states, a quasi-periodic light curve indicates an accretion disk origin, and provides a dynamical means of measuring a lower limit to the mass of the supermassive black hole which may be compared to those derived by other methods, such as the shape of X-ray iron Kα lines and stellar velocity dispersions. When the quasars are in bright states, then long-lived quasi-periodic oscillations (QPOs) are very probably from helical features in the jets, but if several different short-lived QPOs are seen in one quasar, then the emission is probably coming from turbulence behind a shock. If during a faint state, instead of QPOs, we detect aperiodic variations, including high and low breaks in the power spectrum density (PSD), then we may obtain the physical scales of the inner and outer edges of accretion disks and hence the BH mass. Aperiodic variations during a high state, with breaks in the PSD, could yield the smallest and largest physical scales corresponding to light travel times, modulo the Doppler factor, in the relativistic jet. Kepler is ideally suited to the necessary measurements by delivering highly stable photometry continuously on timescales from minutes to days.