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Title: Photometric Monitoring of Quasars with Kepler
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Abstract: We used Kepler photometry to characterize variability in four radio-loud active galactic nuclei (three quasars and one object tentatively identified as a Seyfert 1.5 galaxy) on timescales from minutes to months, comparable to the light crossing time of the accretion disk around the central supermassive black hole or the base of the relativistic jet. Kepler's almost continuous observations provide much better temporal coverage than is possible from ground-based observations. We report the first such data analyzed for quasars, and briefly describe some of the challenges which required us to reduce data outside of the standard pipeline. We constructed power spectral densities using 8 Kepler quarters of long-cadence (30-minute) data for three AGN, 6 quarters for one AGN and 2 quarters of short-cadence (1-minute) data for all four AGN. On timescales longer than about 0.2–0.6 day, we find red noise with mean power-law slopes ranging from -1.8 to -1.2, consistent with the variability originating in turbulence either behind a shock or within an accretion disk. Each AGN has a range of red noise slopes which vary slightly by month and quarter of observation. No quasi-periodic oscillations of astrophysical origin were detected. We detected several days-long flares when brightness increased by 3% – 7% in two objects. No flares on timescales of minutes to hours were detected. Our observations imply that the duty cycle for enhanced activity in these radio-loud AGN is small.