

## PERIODIC VARIABILITY OF STRIPE 82 QUASAR LIGHT CURVES AND ASSOCIATED CHANGES IN Mg II EMISSION LINE PROFILES

M. Fatović<sup>1</sup>, L. Palaversa<sup>1</sup>, K. Tisanić<sup>1</sup>, K. Thanjavur<sup>2</sup>, Ž. Ivezić<sup>3</sup>,  
A. Kovačević<sup>4,5</sup>, D. Ilić<sup>4,6</sup>, L. Č. Popović<sup>4,5,7</sup> and M. Yue<sup>8</sup>

<sup>1</sup>*Institute Ruder Bošković, Bijenička cesta 54, HR-10000 Zagreb, Croatia*

<sup>2</sup>*Department of Physics & Astronomy, University of Victoria,  
3800 Finnerty Road, Victoria, BC V8P 5C2, Canada*

<sup>3</sup>*Department of Astronomy and the DiRAC Institute, University of Washington,  
3910 15th Avenue NE, Seattle, WA 98195, USA*

<sup>4</sup>*Department of Astronomy, University of Belgrade, Studentski trg 16,  
11000 Belgrade, Serbia*

<sup>5</sup>*PIFI Research Fellow, Key Laboratory for Particle Astrophysics,  
Institute of High Energy Physics, Chinese Academy of Sciences,  
19B Yuquan Road, 100049 Beijing, People's Republic of China*

<sup>6</sup>*Humboldt Research Fellow, Hamburger Sternwarte, Universität Hamburg,  
Gojenbergsweg 112, D-21029 Hamburg, Germany*

<sup>7</sup>*Astronomical Observatory, Volgina 7, 11060 Belgrade, Serbia*

<sup>8</sup>*Steward Observatory, University of Arizona, 933 North Cherry Avenue,  
Tucson, AZ 85721, USA*

*E-mail: mfatovic@irb.hr*

A search was conducted for long-period ( $100 < P[\text{days}] < 600$ ) variability in the SDSS Stripe 82 region, resulting in the discovery of five spectroscopically confirmed quasars with periodic light curves. In order to better constrain the cause of the apparent optical periodicity ( $P=278$  days) of our most likely periodic quasar candidate, we performed spectroscopic follow-up of Mg II emission line exhibiting a complex line profile. The results of the monitoring campaign are not disfavoring supermassive binary black hole scenario as an explanation of the cause of the variability.

The search utilized the precisely calibrated (1%-2%) Stripe 82 photometry in SDSS ugriz bands over approximately 6 years, and

Lomb-Scargle periodograms were used to identify the most likely candidates for periodically variable sources. These sources were then cross-matched with other surveys across the electromagnetic spectrum (photometry and spectroscopy) to confirm their variability and type. Time series data from Pan-STARRS and ZTF supported the analysis and extended the observational baseline to more than 20 years.

All the identified candidates were quasars, with the highest-ranked one flagged as a variable source in the Chandra X-ray catalogue. Various explanations for the observed periodic behavior of quasars include radio jet precession, tilted or warped accretion disks, tidal disruption events, and other accretion-related effects.