W16a Investigating Spiral Structures in Accretion Disks of the Novalike Variable, UU Aqr, through Multicolor Eclipse Observations

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The mechanisms of mass accretion and angular momentum transport in accretion disk are not fully understood. Although magneto-rotational instability has been successful in theoretical models, obtaining direct observational evidence remains challenging. Numerical simulations have been predicted asymmetric spiral shock waves in disk, suggesting that material in the disk loses angular momentum after impacting the shock waves. Spiral structures have been observed during outbursts of dwarf novae and nova-likes, though their origin remain debated. They may not be shock waves, but rather tidal distortions in the disk. It is believed that if the structures are caused by shock waves, they would exhibit significantly higher temperatures than the surrounding disk. To investigate this, we conducted multi-wavelength eclipse observations of cataclysmic variables to analyze the temperature of spiral structures. A 3D accretion disk and Roche lobe model was constructed, incorporating spiral structures with adjusted temperature distributions. By fitting the model to observed light curves, the possible location and temperature can be inferred. We obtained eclipse light curves of UU Aqr through simultaneous V- and J-band observations using the Kanata telescope at Hiroshima University. In J-band, the magnitude of UU Aqr exhibits a significantly steeper decline at the onset of eclipse compared to the standard accretion disk model. In V-band, the eclipse depth is noticeably greater than that predicted by model, which may indicate the presence of an unknown high-temperature component within disk.