

ATOMIC AND MOLECULAR PROCESSES IN ACCRETION FLOWS OF CATAclysmic VARIABLE STARS

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ABSTRACT

Besides the accretion disks in the case of AGN, analogous, but of course much smaller accretion disks can be found in interacting binary star systems as are for example cataclysmic variables (CVs). There, matter is transferred from a main-sequence donor to a white dwarf through Roche lobe overflow, often forming an accretion disc. These systems provide an excellent laboratory for studying accretion dynamics and related atomic and molecular (A&M) processes in astrophysical plasmas, which may be of interest and for AGN. CVs are often treated as scaled-down laboratories of AGN accretion physics, allowing accretion processes to be studied on much shorter timescales (seconds–days instead of years–centuries). Variability in their light curves appears in forms such as bursts, flickering, and superhumps, which differ in amplitude and characteristic timescales and are closely connected to instabilities in the accretion flow and angular momentum transport in the disc.

Atomic and molecular processes in the accretion disc and boundary layer strongly influence the observed spectra of CVs. Emission and absorption lines from ionized elements (e.g., H, He, C, N, O, Fe) arise through radiative recombination and collisional excitation, while Doppler broadening reflect the dynamic plasma conditions and Stark broadening provides possibilities for determination of plasma parameters and its modelling. These spectral

diagnostics provide key information about temperature, density, velocity fields, and mass accretion rates.

Despite significant progress, the mechanisms responsible for brightness variability such as flickering and bursts are not yet fully understood. Further investigation of A&M processes in accretion flows is therefore essential for explaining the microphysical origins of variability in interacting binary stars.

In this contribution we will present and discuss some of A&M processes and their influence on spectral lines, of interest for physics of accretion disks. **Acknowledgements.** The authors acknowledge the bilateral SANU-BAN joint research project, IC-RS/12/2026-2028: "Observational effects and accretion processes in selected binary stars".