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Analysis of the physical properties of jets/outflows in T Tauri stars.

F. Lopez-Martinez[1] **and J.F. Gameiro**[1,2]

[1] Instituto de Astrofísica e Ciências do Espaço, Universidade do Porto, CAUP, Rua das Estrelas, PT4150-762 Porto, Portugal.
[2] Departamento de Física e Astronomia, Faculdade de Ciências, Universidade do Porto, Rua do Campo Alegre, 4150-762 Porto, Portugal.

Abstract

Jets and outflows from Young stellar objects are fundamental for the star formation process. Accretion has a significant impact on the evolution of low-mass stars by providing both mass and angular momentum. However, most of the actively accreting T Tauri stars rotate rather slowly. Outflows/jets are one of the mechanisms through which stars may lose angular momentum. The evolution and ultimate fate of jets/outflows and circumstellar accretion disks have become increasingly important issues since the discovery of extrasolar planetary systems. The optical forbidden [N II], [O I] and [S II] lines are good tracers of outflows and jets. They are optically thin providing us important information about the gas physics where they are formed. In many T Tauri stars these lines are characterized by two components: a high velocity component (HVC) and a low velocity component (LVC). In this work we derived the physical properties of the HVC and LVC emitting region where [N II], [O I] and [S II] lines are formed using their theoretical flux ratios. We analyzed these properties for DG Tau, SZ 102, CW Tau and RW Aur jets. We also studied the origin of the LVC, which is not yet fully understood. In addition, we calculated mass loss rates for all the observations. We found two well-defined ranges of temperatures and densities for the emitting region: one with $4.125 \leq \log T_{\rm e}({\rm K}) \leq 4.55$ and $2.25 \leq \log n_{\rm e}({\rm cm}^3) \leq 5.25$ and another one with $5.25 \leq \log T_{\rm e}({\rm K}) \leq 5.6$ and $5.25 \leq \log n_{\rm e}({\rm cm}^3) \leq 6.75$. For SZ 102 the LVC is formed in a region with low density and temperature, whereas for DG Tau and CW Tau the LVC is emitted in a hotter and denser region. Peak velocities and full width at half maximum of the LVC point out that its origin is from a MHD disk wind at 0.05-1.69 AU from the source and that the lines are broadened by Keplerian rotation. (See poster).