ANALYSIS OF STAR-DISK INTERACTION IN T TAURI STARS THROUGH MG II LINES IN THE UV

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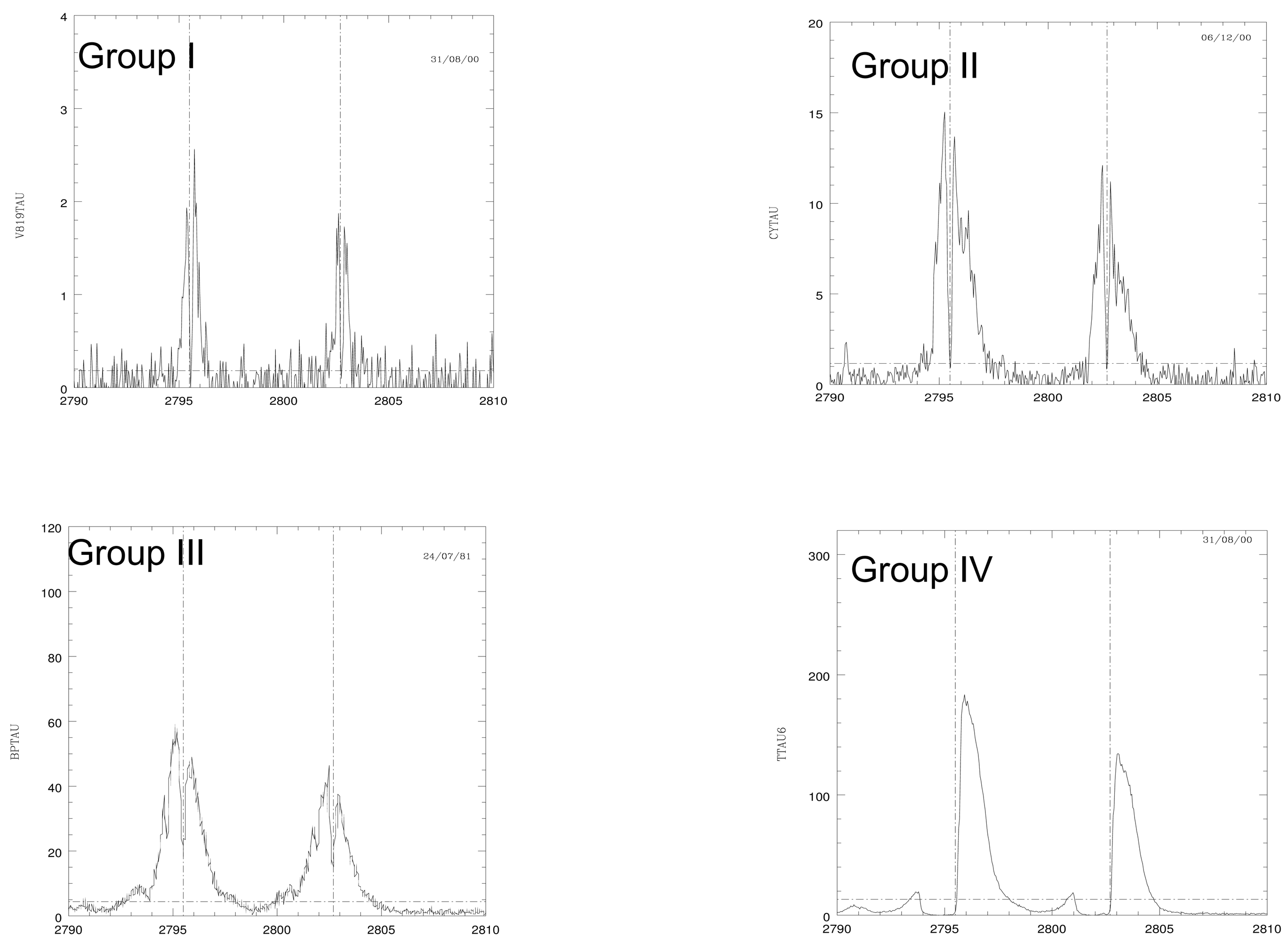
ABSTRACT: ***The Mg II lines are a fundamental tracer of T Tauri stars (TTSs) atmospheres and outflows. This tracer is the strongest feature in the near UV spectrum of TTSs. 123 observations (from the International Ultraviolet Explorer (IUE) and Hubble Space Telescope (HST) data archives) of Mg II lines in 42 TTSs are analyzed, having a very good sample to study the circumstellar environment of TTSs. The UV luminosities in TTSs exceed by one-two orders of magnitude those observed in Main Sequence stars of the same spectral types. This excess is caused by the presence of a circumstellar disk, remnant of the star formation process, that transports material onto the stellar surface enhancing the flux radiated in the magnetospheric/atmospheric tracers. Analysis of the properties of the outflows, atmospheres and the accretion process based on Mg II tracer are presented in this contribution.***

THE PROFILES OF THE SAMPLE

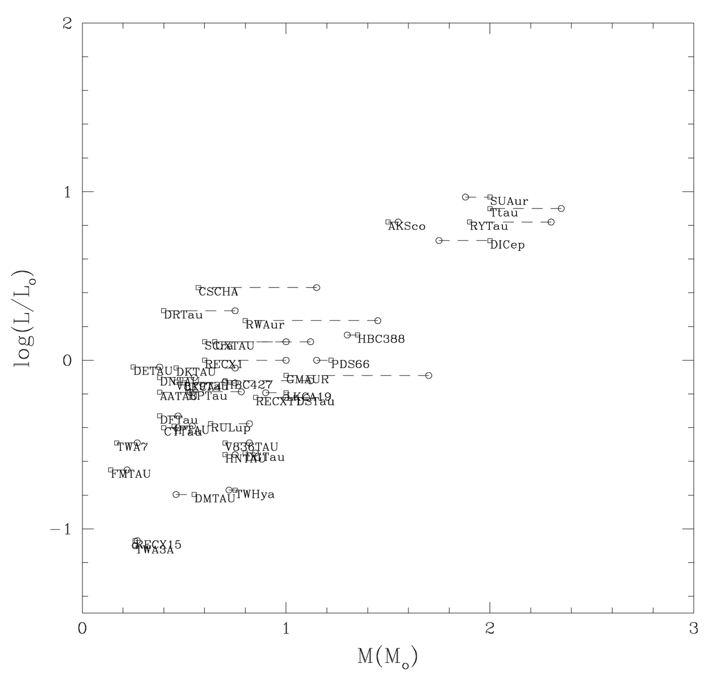
The Mg II profile can be described by a broad emission line with absorptions, either blueshifted or redshifted, overimposed on it. The profiles display a narrow central absorption produced by the circumstellar medium. Evidence of inclination dependent high velocity flows is found in the blue wing. Accretion flows are occasionally detected in the red wing. The profiles can be classified into four main groups (see below).

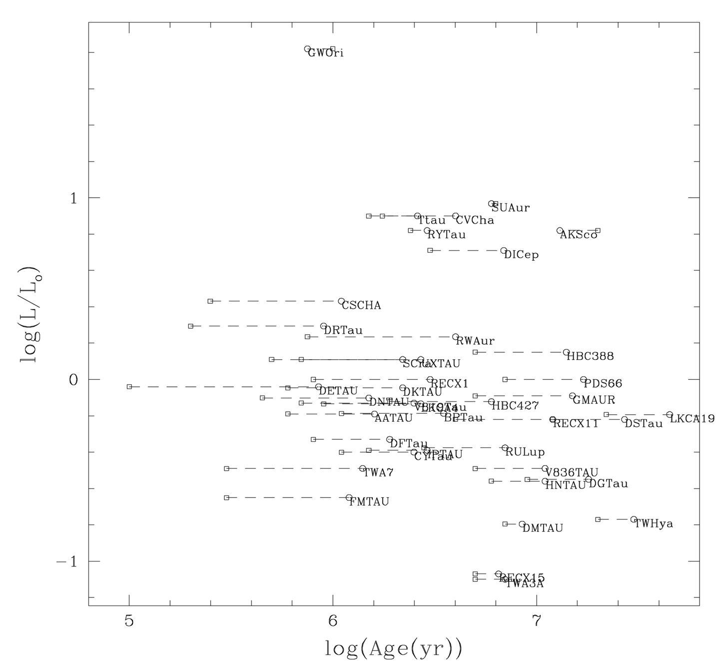


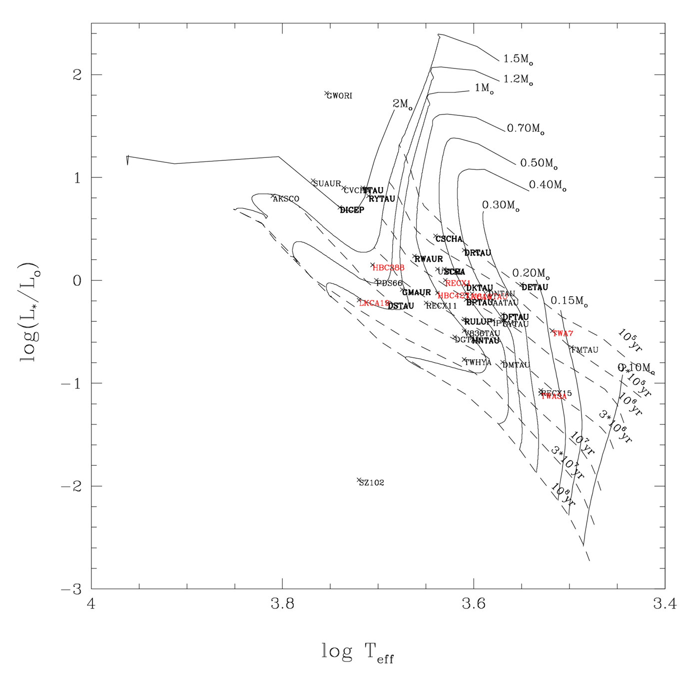
Group I: Weak line TTS (WTTSs) profiles, with narrow emission lines. Group II: intermediate sources. Group III: Classical TTSs with very broad profiles. Absorption components are overimpossed in the bluewards shifted wing. Group IV: Classical TTSs with a fully absorbed blue wing.

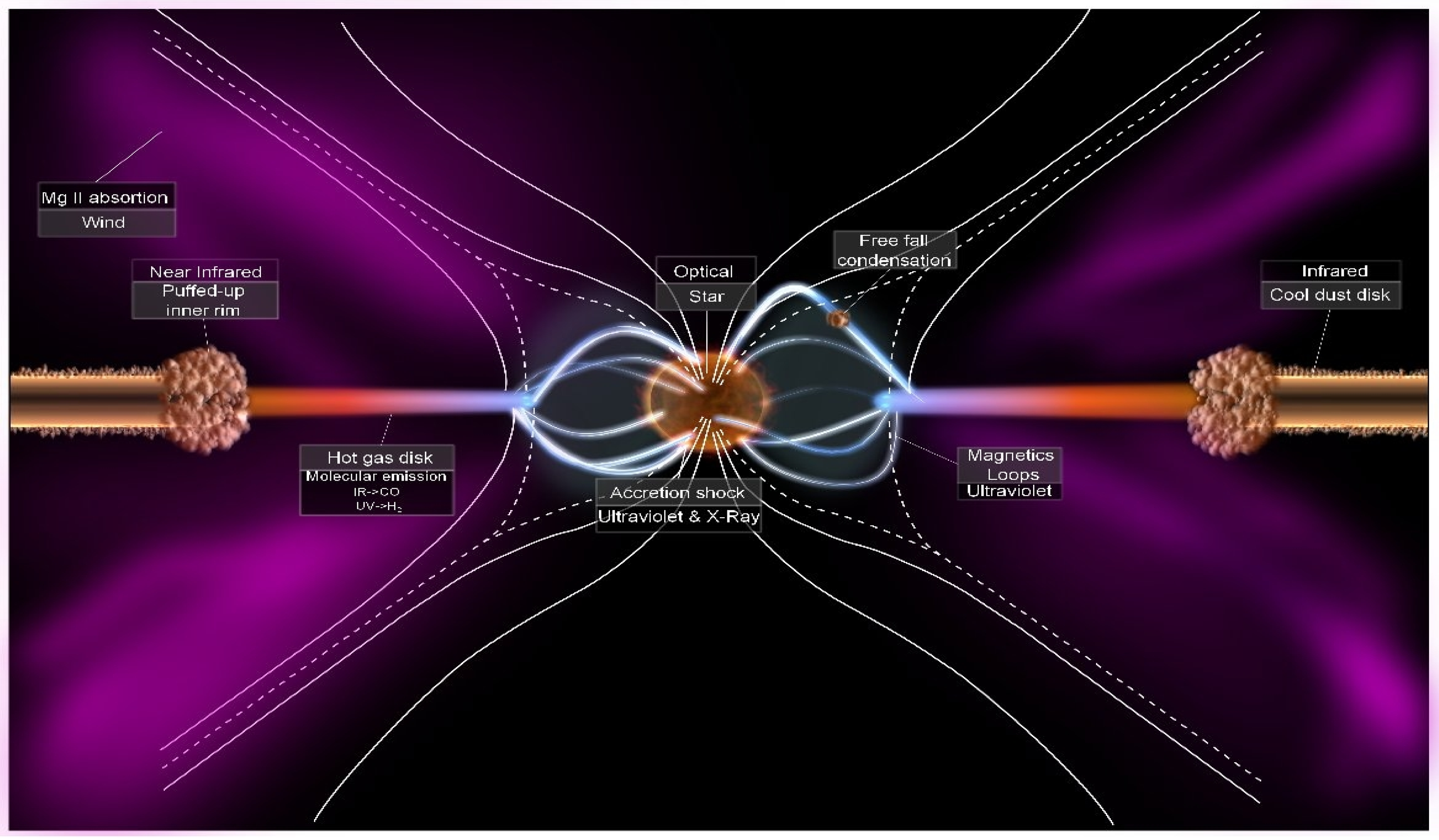
GENERAL PROPERTIES

- In many sources the presence of a warm wind is inferred by the blue wing absorption. Therefore, Mg II is an ideal tracer of the wind acceleration region.
- We have found that the wind is collimated already on sub-AU scales. Moreover there is evidence of cloudlets or episodic ejections associated with the wind in some sources, most prominently in RW Aur.
- Age and mass determination is uncertain. We have derived them from D'Antona & Mazzitelli (1994) evolutionary tracks. We have compared the masses and age estimated from D'Antona & Mazzitelli (1994) and Siess et al. (2000). Notice that while the mass discrepancy is rather small for most sources, the age estimates vary significantly depending on the model used.
- Mg II lines strength decreases as TTSs approach the main sequence, as the Hα line does.





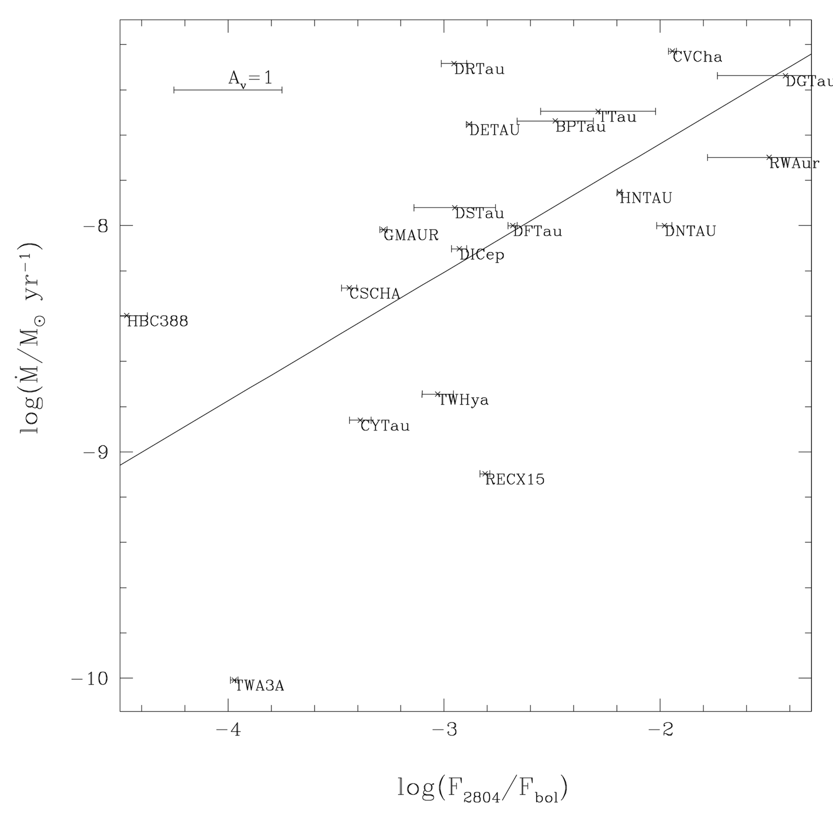


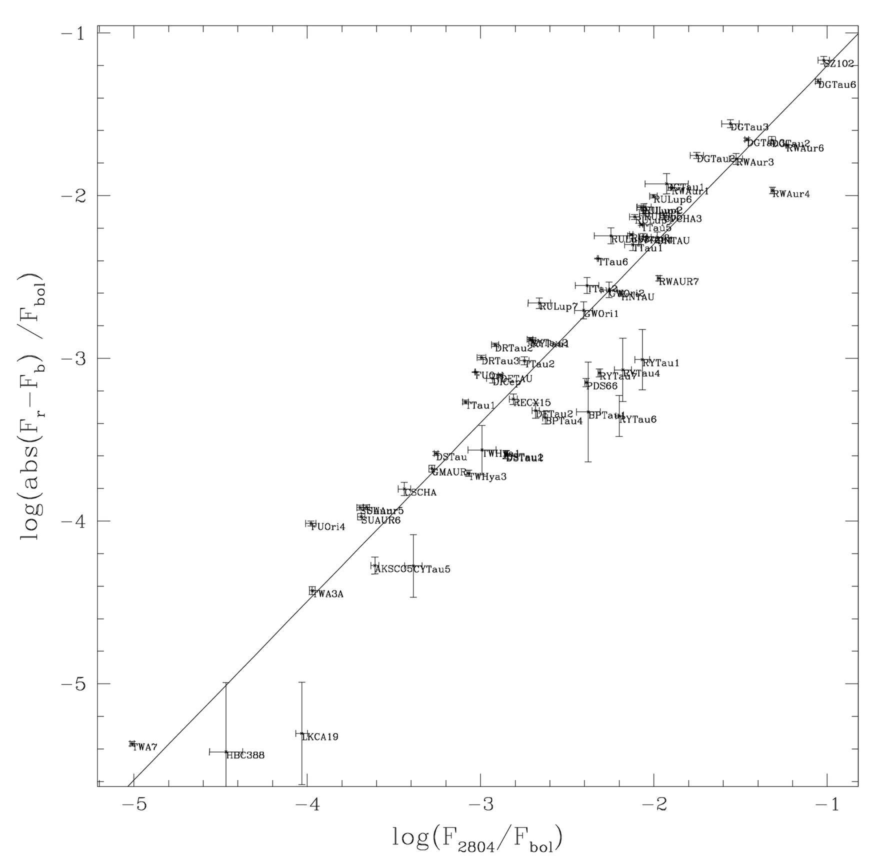


Sketch of the inner AU of a T Tauri star.

RESULTS

1.- On the one hand, the accretion rate correlates with the normalized Mg II flux with a Pearson correlation coefficient of 0.63.

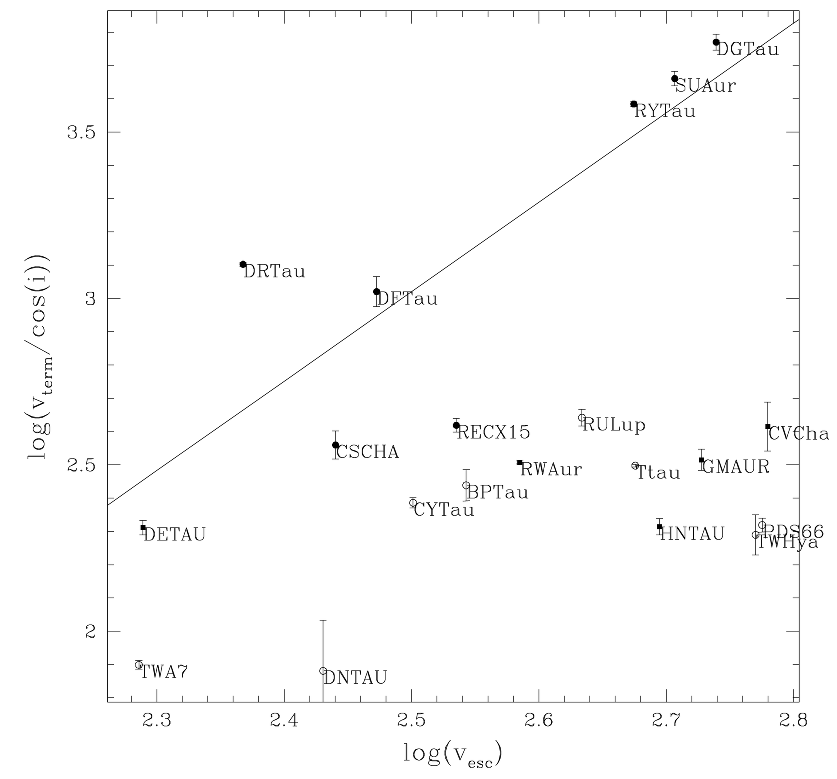




2.- On the other hand, the profile asymmetry increases with the normalized flux.

1. and 2. point out a connection between magnetospheric accretion and jet ejection.

3.- We have studied the relation between the escape velocity from stellar surface and terminal velocity of the wind, corrected from inclination effect. The figure suggests that the terminal velocity is proporcional to the escape velocity in the stars seen close to edge-on. This trend suggests an equatorial wind launching similar to the observed in the Sun.



Bibliography: D'antona & Mazzitelli (1994); Hartigan et al. (1995); Siess et al. (2000).