YSOs, T-Tauri stars, active stars

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Accretion rate of protostars

Is UV emission from protostars dominated by the emission from accretion shocks ?
Compare UV measurements with the model predictions
-> address question of heating mechanism,
-> strong constraints on the accretion rates;

Spitzer and Herschel spectra of low-mass protostars ->
High excitation (Eup/k > 4000 K) rotational transitions of CO & H2O !

Heating of gas by strong UV radiation released from the protostellar accretion which produce PDRs along the high density walls of the envelope cavities [to get 2000 K, need UV luminosity ~ 0.5 L_sun]

Need to identify "face-on protostars" targets [to minimize extinction], covering a wide range of luminosity & evolutionary stages
[use Spitzer and Herschel databases]

Quantifying accretion from H2 flourescence (FUV /Grating)

UVIT : FUV grating spectra of YSOs /T Tauris :

H2 florescence lines in FUV -> irradiation of UV on the disk, & Accretion rate etc

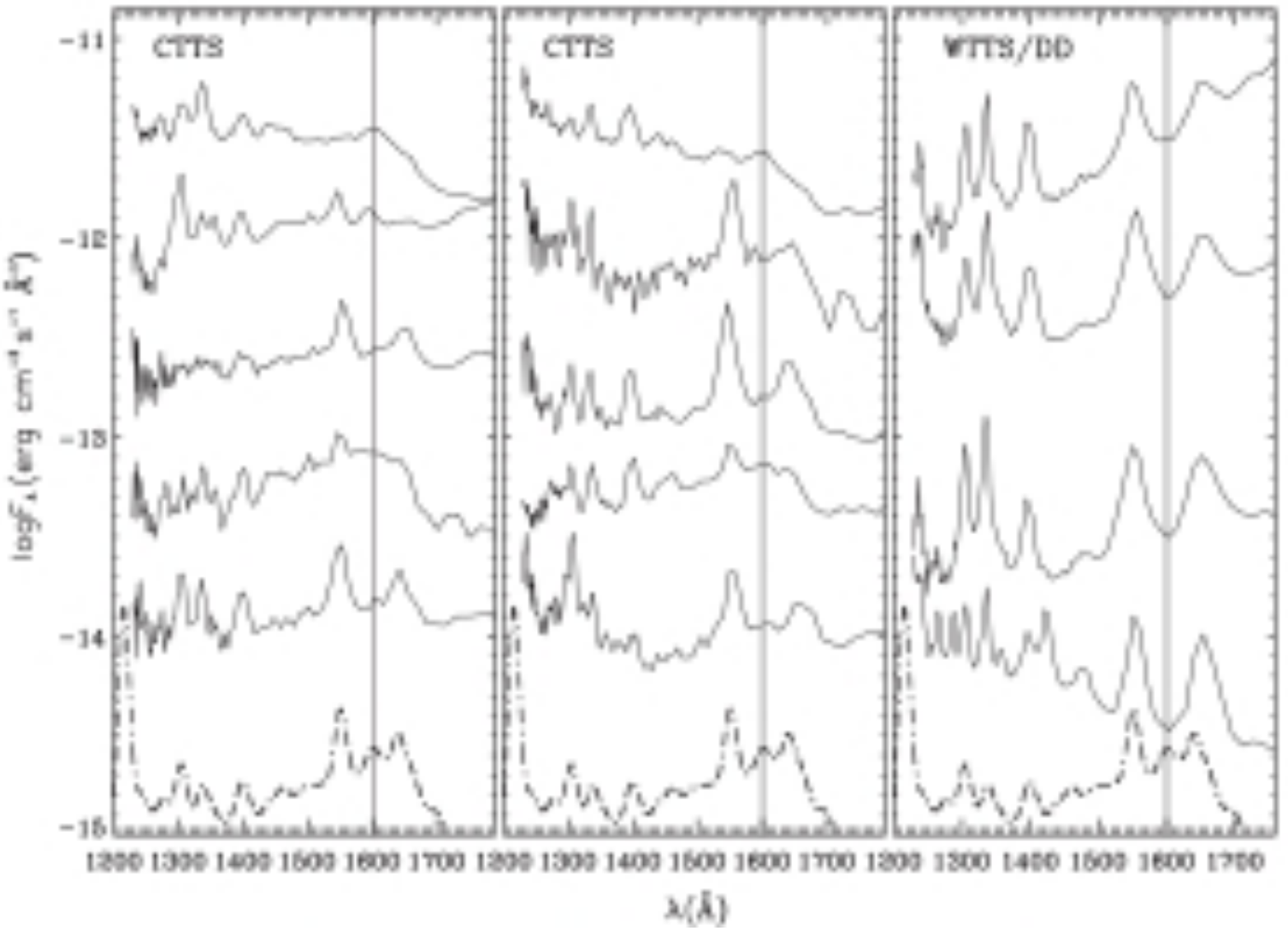
electron impact excitation of H2 : feature at 1600 A

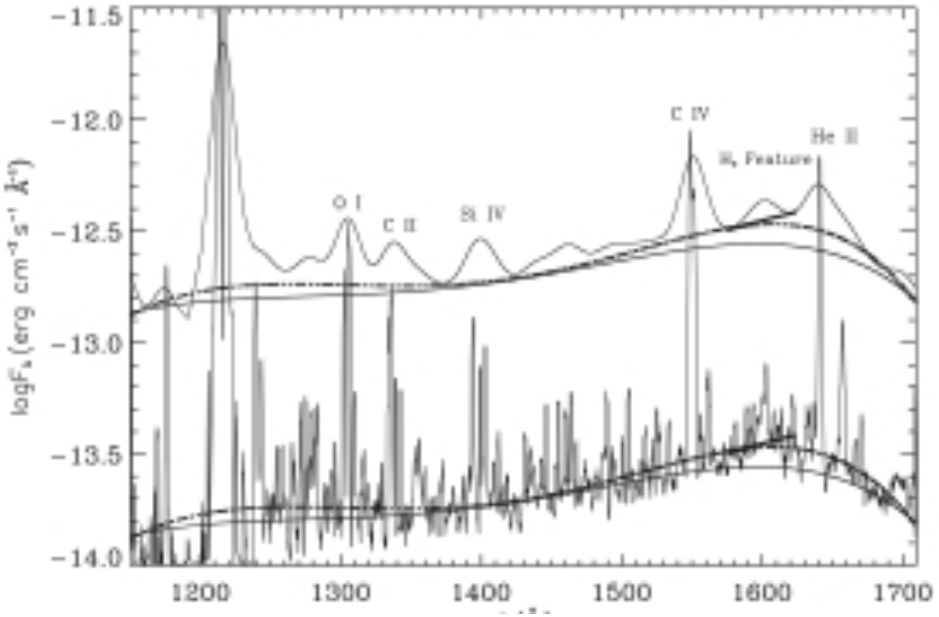
UV H2 emission ideal for probing the H2 gas in the innermost regions of circumstellar disks, regions which are difficult to access by other means.

study the evolution of the gas in the inner disk -> FUV detected & correlates with accretion luminosity [1-10 Myr];

No FUV from non-accreting sources surrounded by debris disks [10 and 125 Myr]

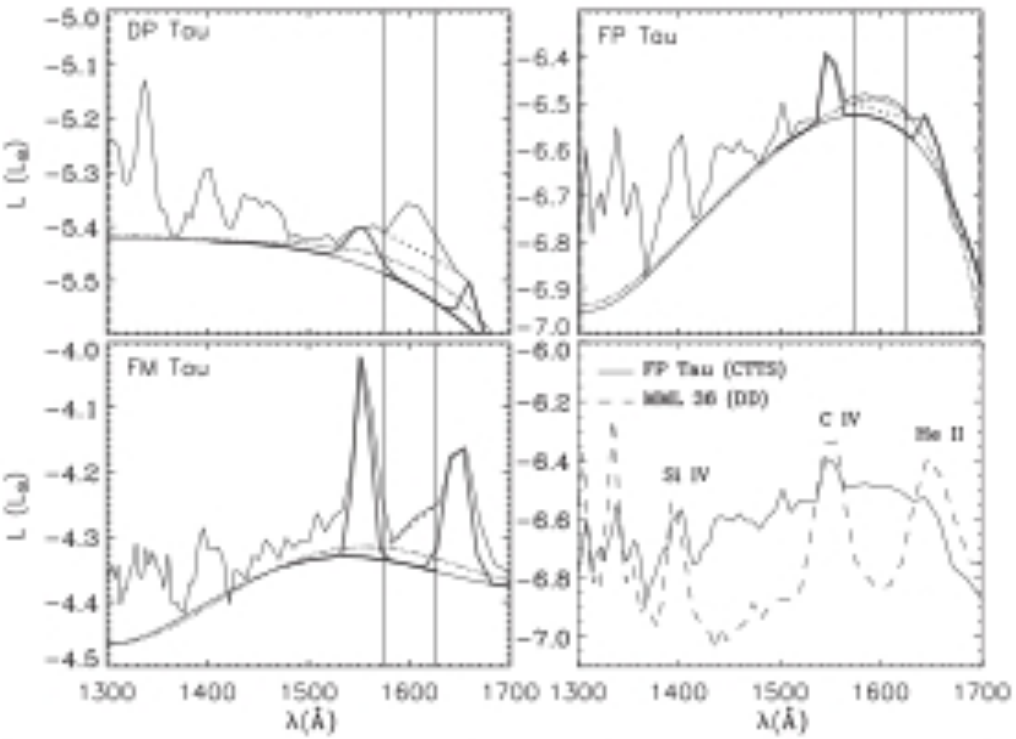
Advanced Camera for Surveys Solar Blind Channel (ACS/SBC) prism spectra of a fair number of accreting classical T Tauri stars (CTTS), non-accreting weak T Tauri stars (WTTS), and evolved debris disks (DD)





Observed (HST STIS; R ~ 10^5) & convolved (for HST ACS; R~ 80) spectra for TW Hya.

Note 'H2 feature' at 1600 A.



UVIT/FUV Grating mode good enough (targets very bright)

Comparison of accreting and non-accreting sources (with the same luminosity)

Accretion rates from UVIT/VIS channel

Accretion rate is a crucial parameter in all T-Tauri and YSO outburst source studies :

VIS (VIS1, B, VIS3) filters -> ratio of Balmer and Paschen continuum flux [3600 A / 4000 A]

Method of continuum accretion rate estimation requires only imaging -

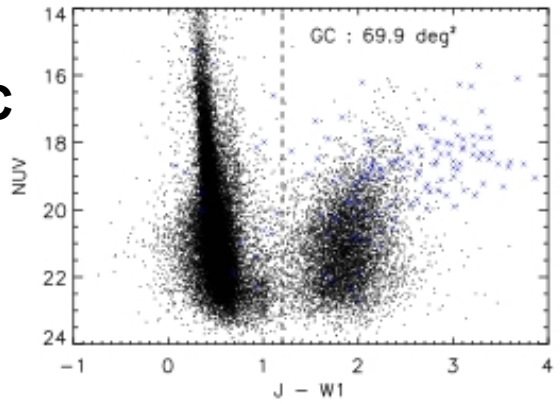
-> can be done for large number of YSOs in the FoV simultaneously;

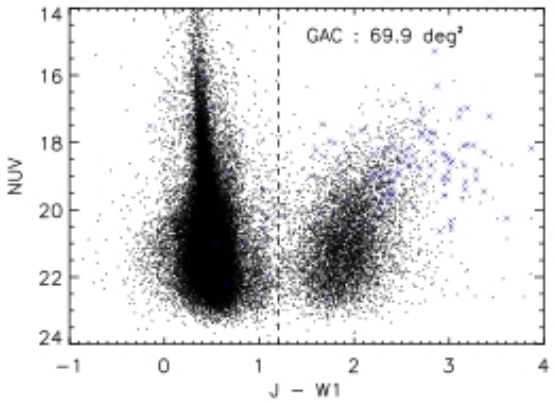
Galactic structure, stellar population :

UVIT's edge over GALEX :
(1) filter set (multiple colours ->
classification of stellar populations
thin disk, thick disk, bulge & halo),
(2) improved FUV+NUV coverage,

UV-IR [GALEX+WISE+2MASS] better than GALEX+SDSS to distinguish 'stars' from extragalactic objects !

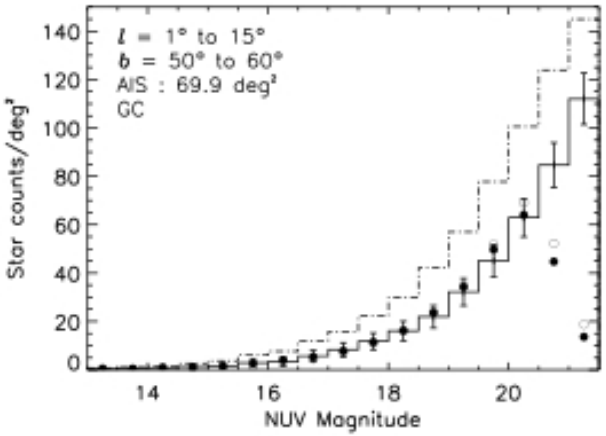
GC

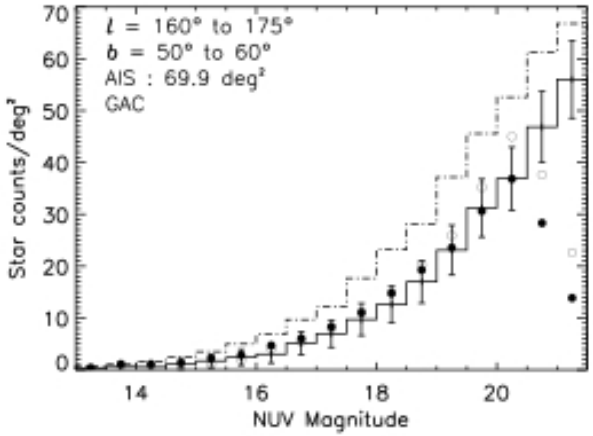




GAC

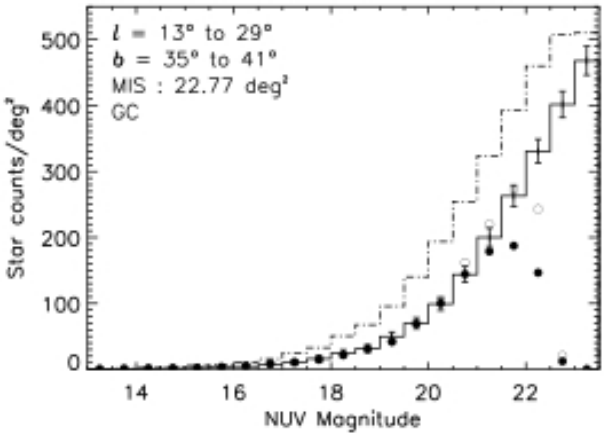
J(2MASS) - W1(WISE) versus NUV colour magnitude diagram for GALEX & WISE+2MASS cross-matched sources

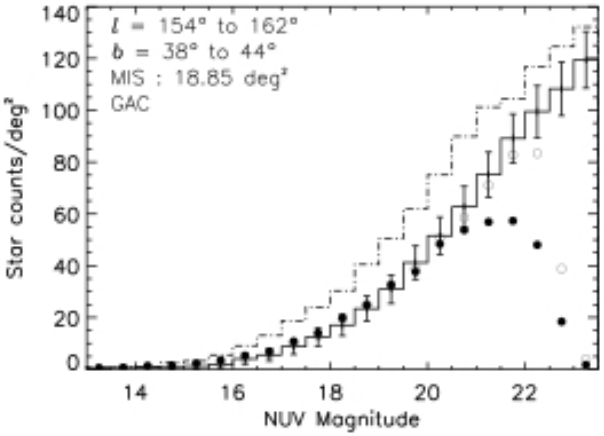




Better statistics expected from UVIT !

(b)



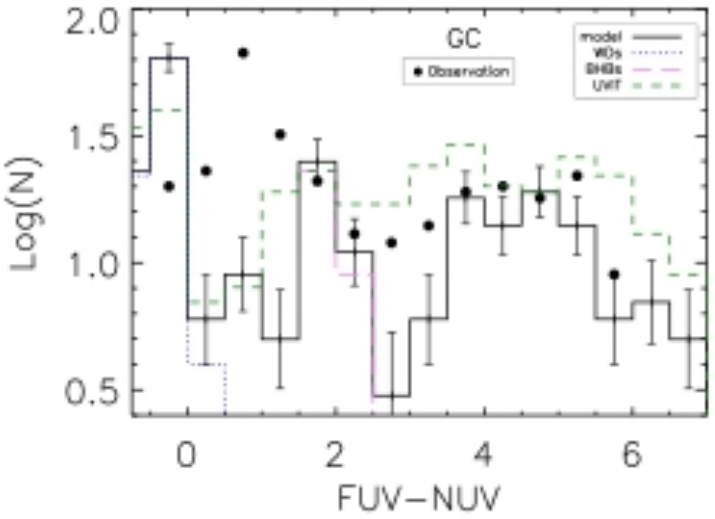


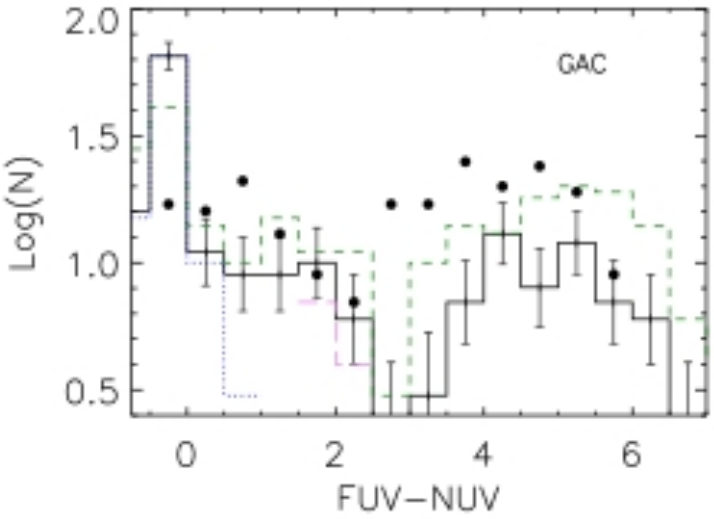
(c) (d)

Comparison of the model star counts (solid line) with the UV-IR [GALEX +WISE+2MASS] stars (solid circles) &[GALEX+SDSS] stars (open circles) ;

Dashed-dotted line → model simulated star counts for NUVB4 / UVIT

White dwarfs (WDs) of the disc and blue horizontal branch stars (BHBs) of the halo from (FUV – NUV) colour





Two groups : FUV -NUV > 2.5 red cool stars ; FUV -NUV < 2.5 are blue hot stars.

Blue stars exhibit a bimodal distribution indicating two populations :
- **peak at FUV-NUV ~ -0.5 hot WDs of the disc;**
- **peak at FUV-NUV ~ 2.0 are BHBs of the Galactic halo;**

UVIT (BaF2 - NUVB4) colour coverage is indicated by a dashed line