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ACCRETION IN YOUNG LOW INTERMEDIATE MASS STARS

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RESUMEN

Presentamos resultados preliminars de un estudio de la evolución de tasas de acreción en algunos miembros jóvenes de los cúmulos abiertos NGC1502(1), NGC884(3), Trumpler37(2), Biurakan2(3) y Berkeley87(1). Las tasas de acreción se calcularon usando fotometría UVI y la relación de Gullbring. Además encontramos que las tasas de acreción de tres miembros de la asociación jóven MBM12 (∼2 Maños) están de acuerdo a los valores esperados para CTTS.

ABSTRACT

We present preliminary results of a study of the evolution of accretion rates in some young members of open clusters: NGC1502(1), NGC884(3), Trumpler37(2), Biurakan2(3), Berkeley87(1). Accretion rates were computed using UVI photometry and the Gullbring relation. In addition we found that accretion rates of three members of the MBM12 young association (∼2Myr) are in agreement with the expected values for CTTS.

Key Words: **STARS: PRE-MAIN SEQUENCE**

1. GENERAL

The UV excess emission from young stars can be observed in the optical (U-Band) via broad-band photometry or by the detection of veiling processes in the absorption lines of the spectrum shortwards of 420 nm (Hartmann 1998; Gullbring et al. 1998). Such excess are related with the disc accretion rate and have been successfully measured on T-Tauri stars with ages of 0.3 - 6 Myr following the theoretical predictions by Hartmann et al. 1998 quite nicely. However there are no studies in the literature for intermediate mass stars on these ages intervals. In addition, only sparse data exist covering the interesting region ≥6 Myr and literally no data, for objects older than 10 Myrs. New measurements therefore could fill this gap in the disc temporal accretion rate function providing information for the disc lifetimes at ages that are crucial for the prediction of planetary formation.

2. OBSERVATIONS

We present here, results of U-band photometry observations of targets in open clusters using the 0.8-m telescope of the LMU Munich on Mount Wendelstein between summer and autumn 2005. We have obtained U-band photometry of targets in open clusters having ages of 6 to 30 Myrs in order to detect the end of disc accretion (and thus the end of the disc lifetime) around T Tauri stars and post-T

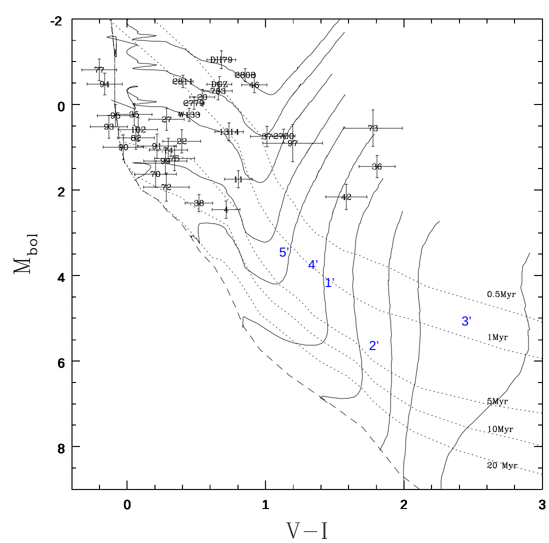

Fig. 1. H-R diagram for dereddened stars in MBM12 (blue) and in open clusters (numeric symbols with error). Isochrones and evolutionary tracks $0.4 \leq M \leq 4.0 M_{\odot}$.

Tauri stars. To complement our studies we also include high resolution spectra for eight members in the nearby MBM12A (Hearty 2005) young association (∼ 2Myr). That observational background will permit us to reconstruct, if possible, the accretion on stars history.

3. ACCRETION RATE COMPUTATIONS

To determine the accretion rate we will use two strategies. For the three members of MBM12 we determine the veiling of absorption lines caused by

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TABLE 1

COMPUTED PARAMETERS FOR THE SAMPLE OF YOUNG STARS IN CLUSTERS

ID	$(U-V)_0$	$(V-I)_0$	$T_{eff}(K)$	M($M_\odot$)	R($R_\odot$)	$L_U(L_\odot)$	$L_{acc}(L_\odot)$	log$dM/dt(M_\odot/yr)$
DH79	-0.568	0.680	6359	5.0	14.28	0.00197	0.01796	-6.21169
2808	0.495	0.853	5884	5.0	14.61	0.00066	0.00533	-6.84394
2700	0.322	1.131	5097	4.0	9.88	0.00351	0.02910	-6.76917
1314	-0.199	0.736	6250	3.0	6.92	0.00522	0.04526	-6.56219
783	0.190	0.657	6396	4.0	10.02	0.00084	0.00665	-6.99737
DGZ	-0.177	0.666	6379	4.0	10.86	0.0018	0.01525	-6.53745
4	0.440	0.714	6290	1.7	2.93	0.00496	0.03673	-7.51523
36	2.324	1.805	4172	1.3	9.35	0.00025	0.00153	-7.97836
42	2.227	1.58	4416	1.4	6.35	0.00066	0.00412	-7.98626
97	1.381	1.196	4962	3.5	9.61	0.00090	0.0065	-7.44511

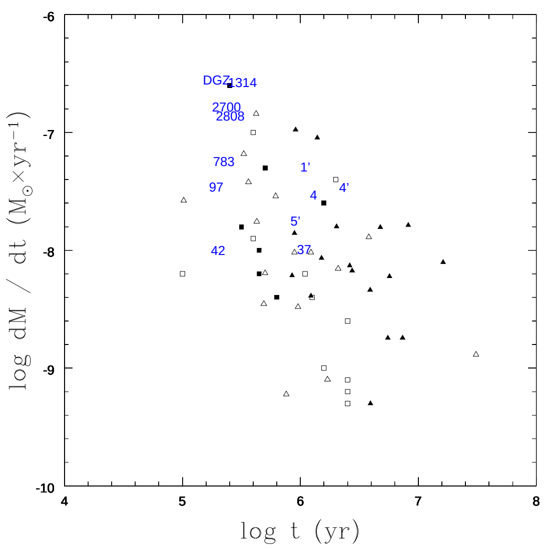

Fig. 2. Accretion rates. Numeric labels for our observatios, numeric labels with prime for MBM12, open triangles for stars in Taurus, filled triangles for PTTS in Tr37, open squares for Cha-I and filled squares for ρ Ophiucus.

TABLE 2

COMPUTED PARAMETERS FOR MBM12

ID	other name	veiling	Interval (Å)	L_{acc}/L_*
1'	RXJ0255.4+2005	0.70±0.17	6010-6800	1.10±0.11
4'	LkH_α264	0.55±0.11	6010-7500	0.87±0.09
5'	E02553+2018	0.69±0.11	4200-7000	1.09±0.07

excess flux from the hot spots of the accretion. Even though this flux is most dominant in the UV and the blue optical part of the SED it is still well traceable in the V and R band. For the stars in open clusters, we use the Gullbring relation. In figure 1 we show the H-R diagram containing the observations and evolutionary tracks and isochrones from Siess models (2000). Most of the stars in clusters are situated on the hot region, in the upper-left part of the diagram corresponding to O-B stars. In fact the observed clusters in Table 1 are localised near the OB Cygnus region. We select from Table 1 only stars with $V-I > 0.69$ (i.e. only stars later than G0) and compute for them the accretion rates using the Gullbring relation (Gullbring et al.1998). The selection criteria was made using the V-I vs. U-V diagram not shown here. We selected only stars with U-V greater than U-V for the main sequence of Kenyon and Hartmman (1995). For those stars we compute ages from the localisation in a H-R diagram (figure 1) and accretion rates using the Gullbring relation.

4. CONCLUSIONS

The behavior of the accretion with age is shown in Figure 2. Our points are in agreement with observations made for other authors. In Figure 2 we compare our measurements for both: stars in open clusters and in the MBM12 association with other groups very well known: Taurus (Gullbring et al. 1998), Tr37 (Sicilia-Aguilar et al. 2005), Cha-I and ρ Oph (Sicilia-Aguilar et al. 2005). A clear decay of the accretion is observed between young intermediate mass stars in clusters and low mass stars in the MBM12 asscociation.

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