Massive pre-main-sequence stars in M17

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We obtained VLT/X-shooter spectra of twelve candidate young massive stars previously selected by Hanson *et al.* (1997) in the giant HII region M17. An analysis of their spectra using FASTWIND models (Puls *et al.* 2005) shows that they span a mass range of 6 - 20 $M_\odot$. We identify the presence of gaseous and dusty disks around six sources based on emission lines in the spectrum and infrared continuum excess. By comparing their position in the HRD with theoretical PMS tracks we conclude that these are genuine pre-main-sequence (PMS) stars contracting towards the main sequence after having experienced high mass-accretion ($M_{acc} \sim 10^{-4} - 10^{-3}$ $M_\odot\,yr^{-1}$). Three sources are close to the ZAMS, for two objects we did not detect a gaseous disk, and one object might be a PMS star without a disk. Though the sample is small, it does allow for a first analysis of statistical properties of a massive PMS star population (Ramírez-Tannus *et al.* 2017, A&A, in press). We find a strikingly small radial velocity dispersion, which is at odds with similar distributions of few-Myr-old OB star populations. This may either point to M17 having a low binary fraction ($f_{bin} = 0.12$) or to a lack of short period binaries (in our sample $P_{cutoff} > 9$ months) relative to these older populations (Sana *et al.* 2017), characterised by $f_{bin} = 0.7$ and $P_{cutoff} > 1.4$ days (Sana *et al.* 2012).
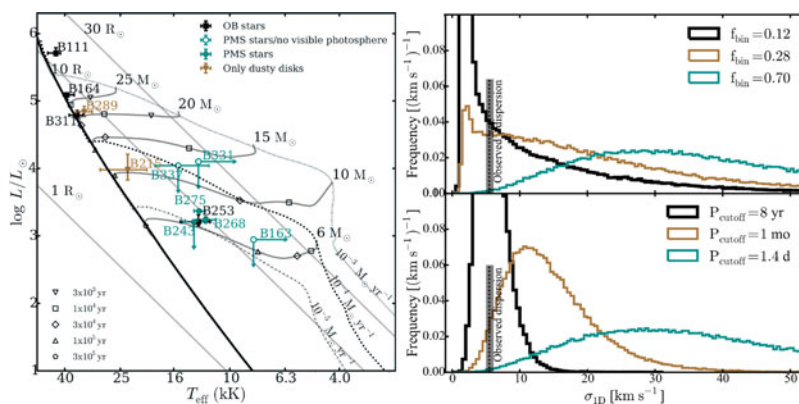
Figure 1. *Left:* HRD for our sources in M17. The light-blue dots show the PMS stars surrounded by gaseous and dusty disks, the black squares the OB stars, the brown triangles objects surrounded by dusty disks. The filled symbols represent the stars that we modelled with FAST-WIND and the open symbols represent the objects for which we derived T_{eff} and $L/L_\odot$ from their spectral type (from Ramírez-Tannus *et al.* 2017). *Right:* Simulated σ_{1D}: Top: For different binary fractions, we discard $f_{bin} > 0.34$ and > 42 at the 10 and 5% level, respectively. Bottom: For different cutoff periods, we discard $P_{cutoff} < 131$ and < 47 days at the 10 and 5% level, respectively. The vertical line represents the observed σ_{1D} and the associated error for our M17 stars (from Sana *et al.* 2017).

References

Hanson, M. M., Howarth, I. D., & Conti, P. S. 1997, *ApJ*, 489, 698
Hosokawa, T. & Omukai, K. 2009, *ApJ*, 691, 823
Puls, J., Urbaneja, M. A., Venero, R., *et al.* 2005, *A&A*, 435, 669
Sana, H., de Mink, S. E., de Koter, A., *et al.* 2012, *Science*, 337, 444
Sana, H., Ramirez-Tannus, M., de Koter, A., & Kaper, L., *et al.* 2017, `ArXiv:1702.02153`