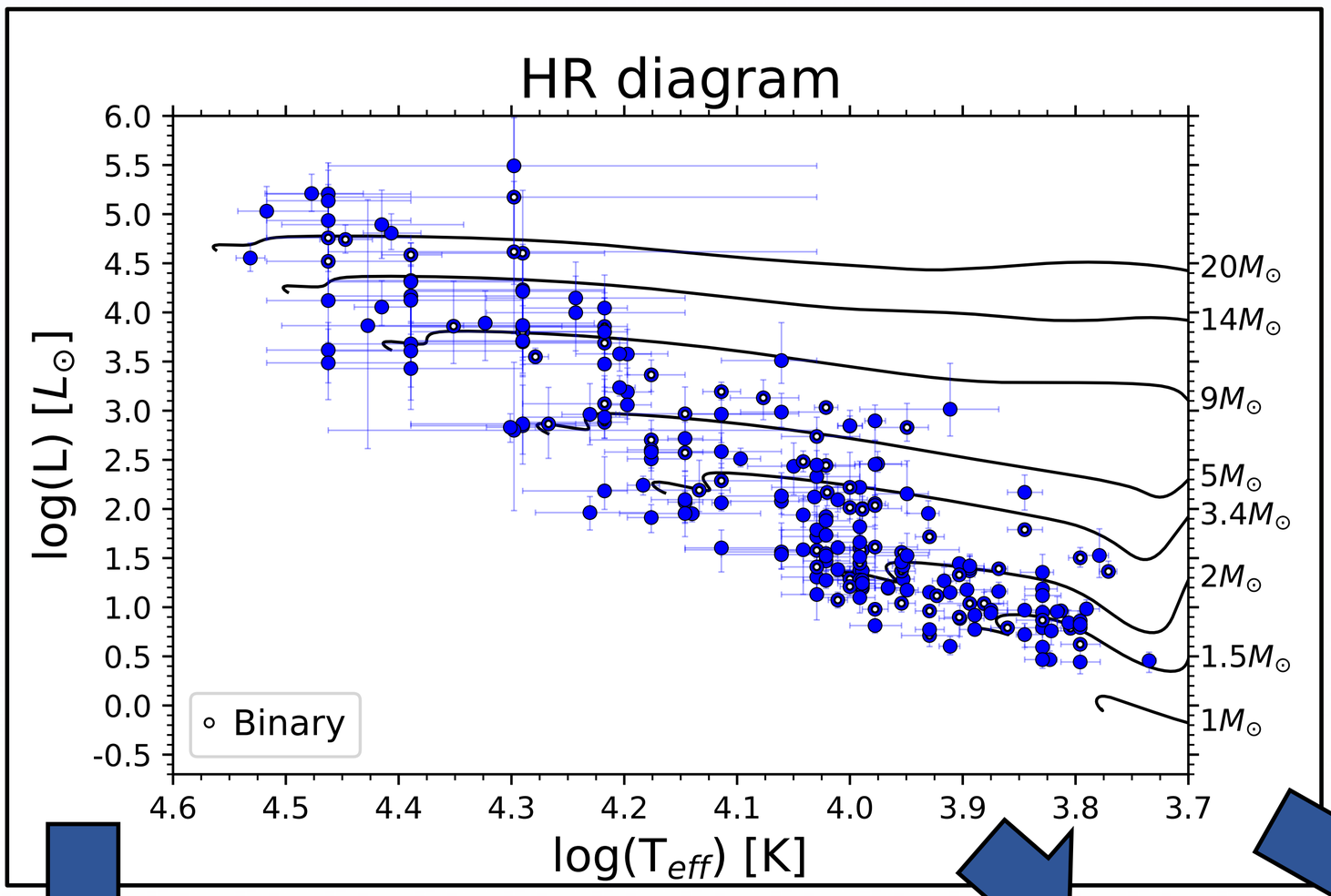
Gaia study on the formation of intermediate mass stars

Miguel Vioque* (University of Leeds/Isdefe, Madrid), René D. Oudmaijer (University of Leeds), Deborah Baines (Quasar, Madrid), Ignacio Mendigutía (CAB, Madrid), Ricardo Pérez-Martínez (Isdefe, Madrid).

*pymvdl@leeds.ac.uk

Introduction:

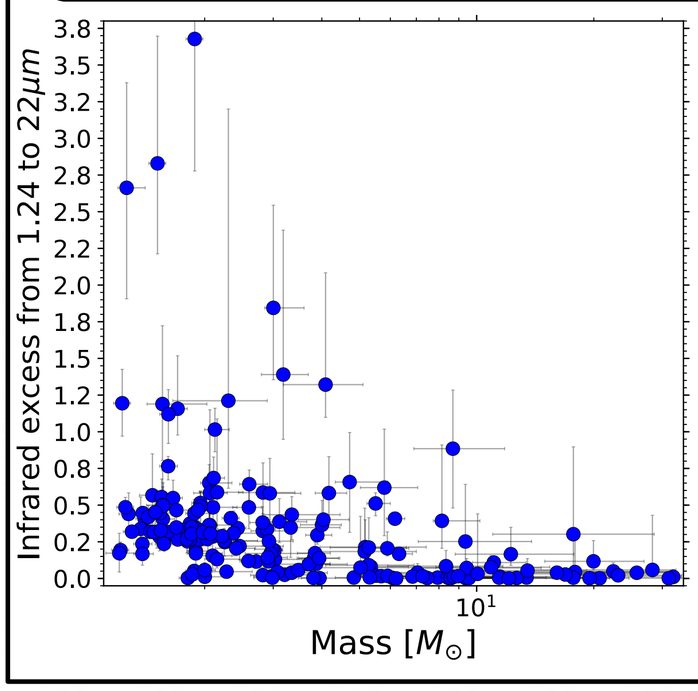
The intermediate mass Herbig Ae/Be stars are young stars approaching the Main Sequence and are key to understanding the differences in formation mechanisms between magnetic low mass stars and the non-magnetic high mass stars. Most known Herbig Ae/Be stars have Gaia parallaxes, which are used to place 218 of these objects in an HR diagram.



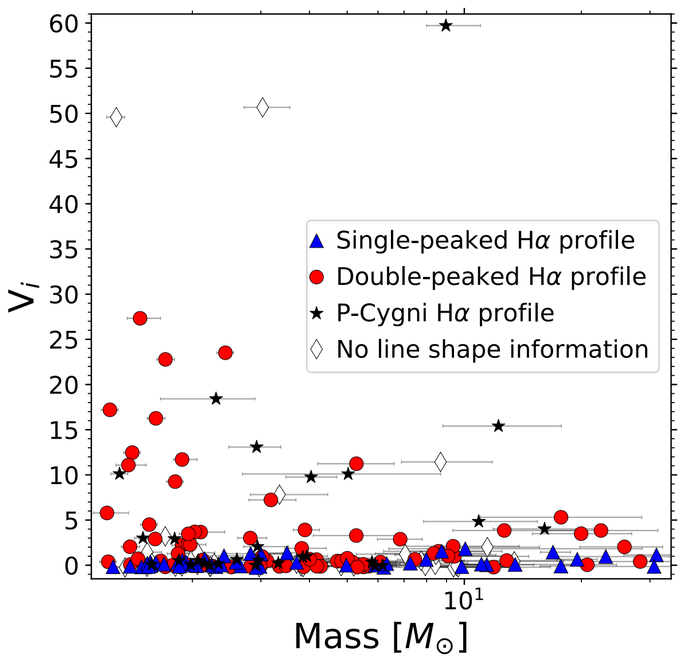
Summary:

- By locating the Herbig Ae/Be stars in the HR diagram we estimated masses and ages by means of Pre-Main Sequence tracks.
- By cross-matching with 2MASS and AllWISE catalogues we derived infrared excesses in the 1.24-22μm range.
- A photometric variability indicator (V_i) was derived for each source using Gaia's repeated observations.
- Hα line information was gathered from literature.

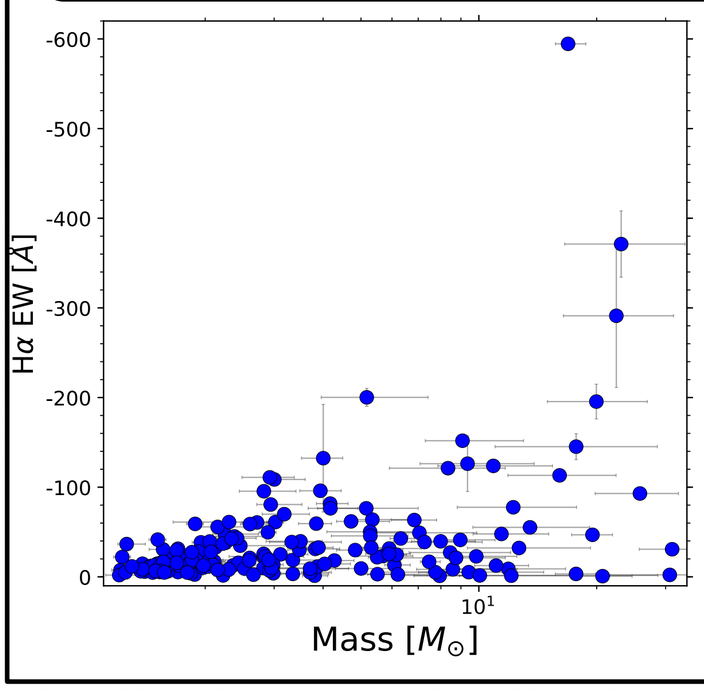
Infrared excess as a function of mass



Photometric variability as a function of mass



Hα equivalent width as a function of mass



Conclusions:

- We homogeneously derived luminosities, masses, ages, variabilities and infrared excesses for the most complete sample of Herbig Ae/Be stars to date.
- High mass stars do not display an infrared excess and show no strong variability. We do note that the break is around $\approx 7M_\odot$. This may be related to dusty disks which signpost a different or more efficient disk dispersal mechanism for high mass objects.
- 48/193 or ~25% of all Herbig Ae/Be stars are strongly variable. The photometrically variable objects present doubly peaked Hα profiles, suggestive of an edge-on disk-type orientation and structure.
- The fraction of strongly variable Herbig Ae/Be stars is close to that found for UX Ori type stars in Pre-Main Sequence samples. Indeed, the reported photometric variability of the UXORs in our sample is nicely traced by our variability indicator (V_i).

Acknowledgements:
This project has received funding from the European Union's Horizon 2020 research and innovation programme under MSCA ITN-EID grant agreement No 676036.