



IRAS 20050+2720

Clustering of low mass stars



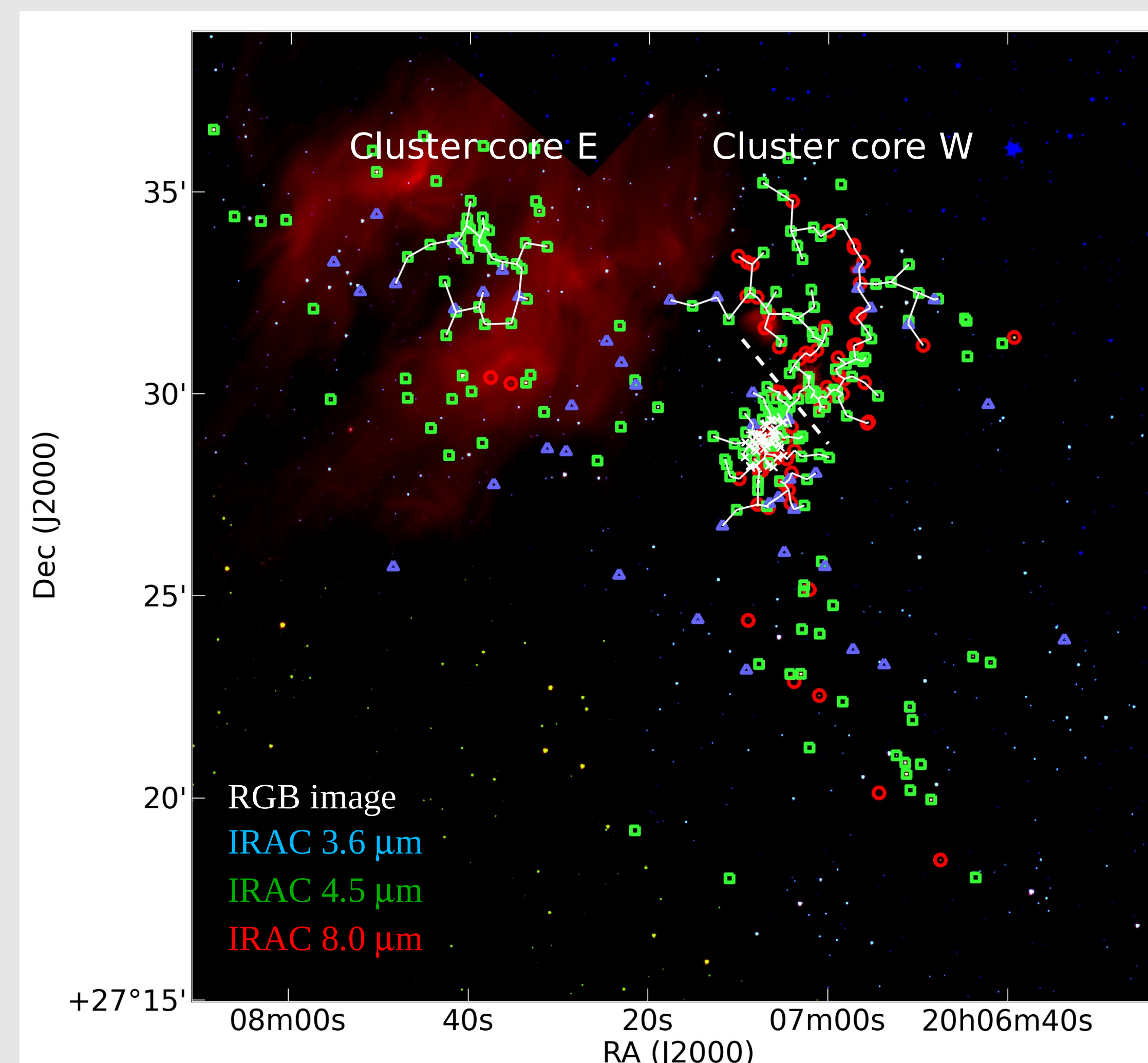
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IRAS 20050+2720 is young star forming region at a distance of 700 pc with a mass of 430 M_{\odot} , but without apparent high mass stars. We want to characterize the distribution of young stellar objects (YSOs) in this region, which lacks high UV flux, and compare evolutionary trends with other young star forming clusters. We present results of our multiwavelength study of IRAS 20050+2720 which includes observations by *Chandra*, *Spitzer*, and 2MASS and UBVRI photometry. In total, about 300 YSOs in

different evolutionary stages are found. We newly identify a second subcluster, which consists mostly of class II objects, about 2 pc from the center of the cloud. YSOs of earlier evolutionary stages are more clustered than more evolved objects. The X-ray luminosity function (XLF) of IRAS 20050+2720 is roughly lognormal, but steeper than the XLF of the more massive Orion nebula complex. The dust in IRAS 20050+2720 seems altered compared to the ISM.



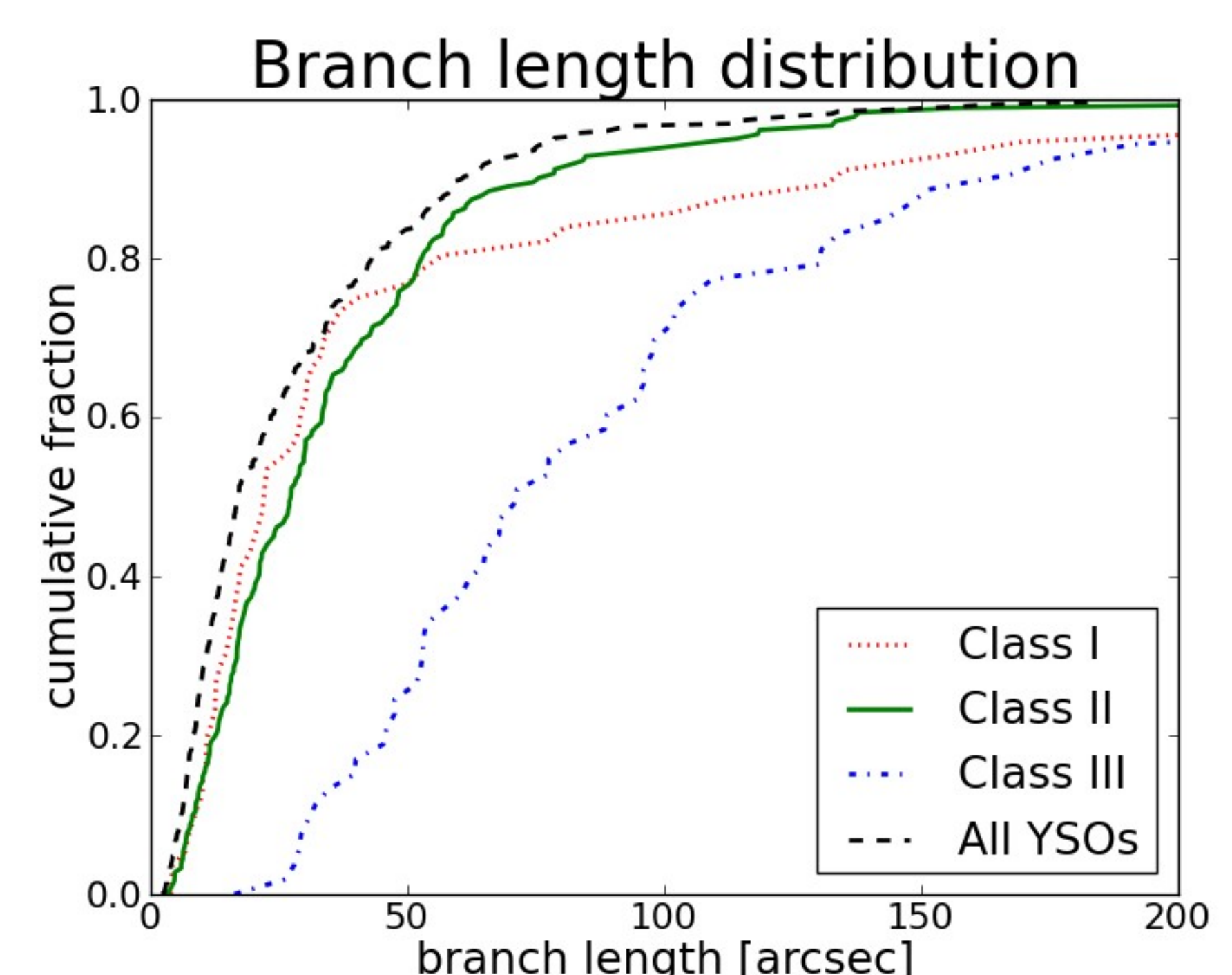
Class I and II sources are identified by their IRAC and MIPS colors (Gutermuth et al., 2009); class III sources by their X-ray emission.

O - Class I □ - Class II Δ - Class III X - YSO (X-ray detection only)

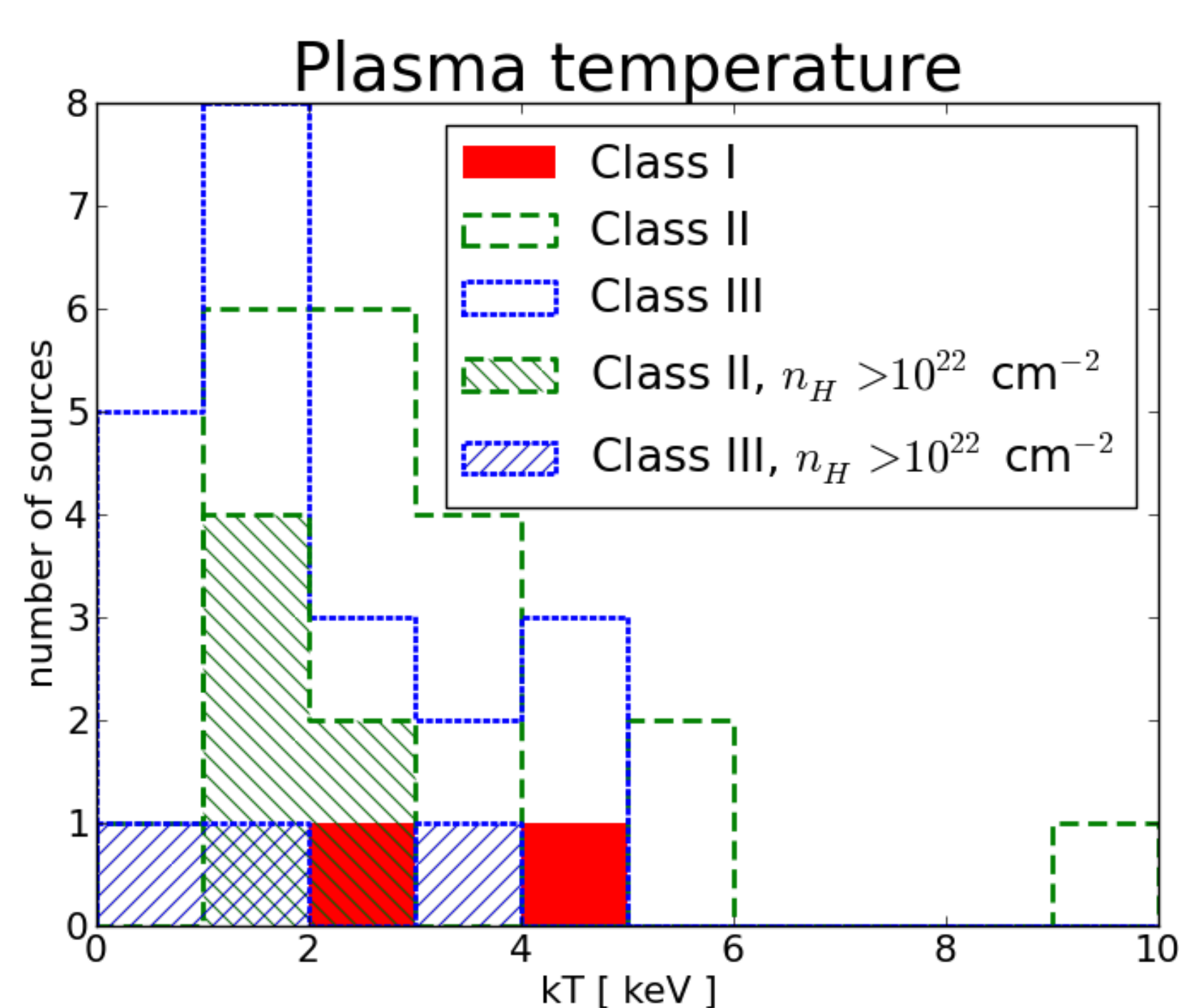
White lines mark out two cores that we identify with a minimum spanning tree (MST) analysis. The dashed white line shows a suggestive way to separate the western core into two parts (North: low stellar density and South: high stellar density).

Number of detected Class I, II and III sources

Class	I	II	III
subcore East	0	31	6
subcore West – North	21	41	12
subcore West – South	29	54	7
total	70	185	42



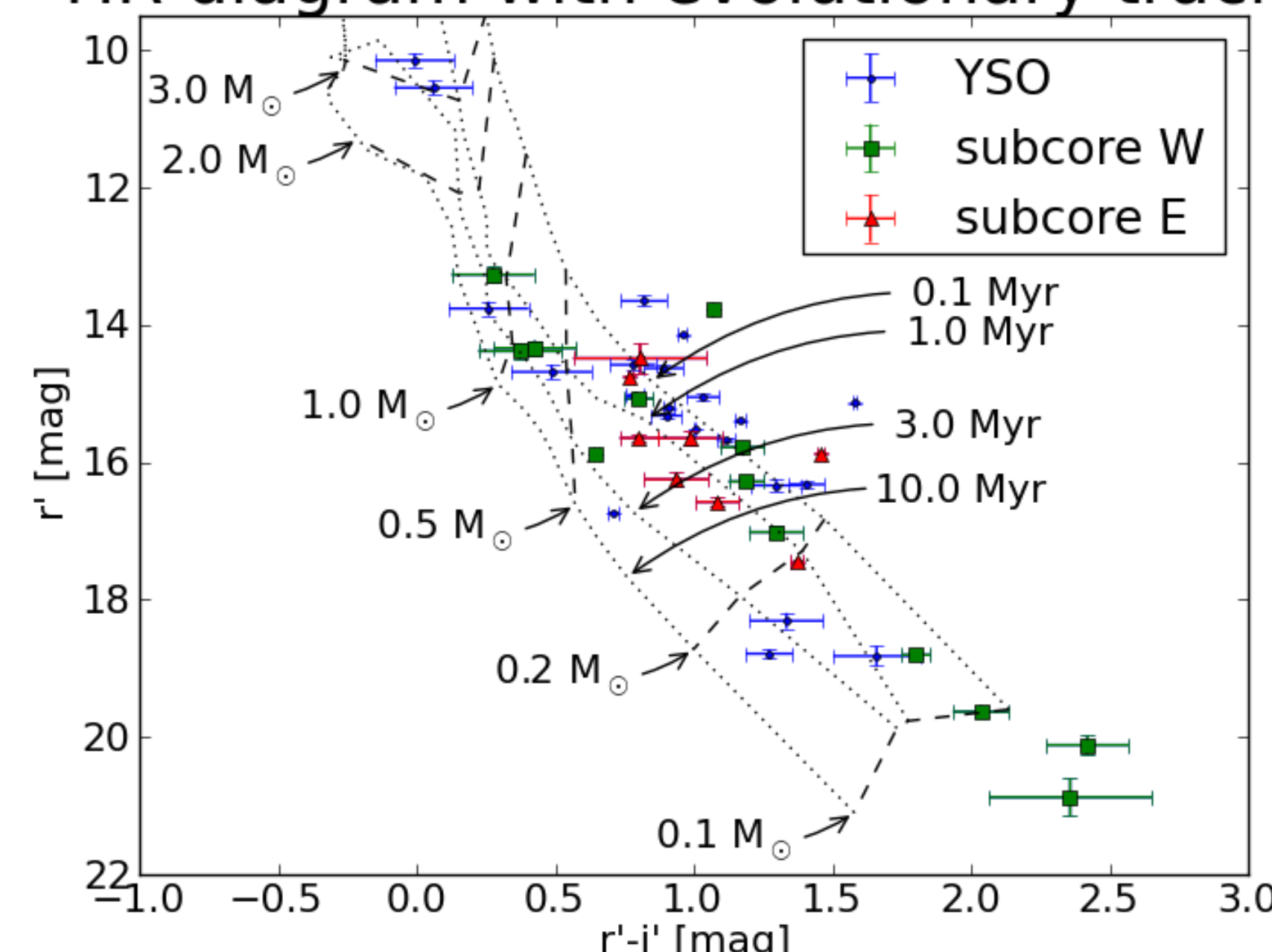
Branch length distribution for the minimum spanning tree (MST) of IRAS 20050+2720 as a whole and per class. An MST is the shortest graph that connects all points. Clearly, class I and II objects are more clustered than WTTs as their branch lengths are much shorter. 50 arcsec are 0.17 pc at the distance of IRAS 20050+2720.



Plasma temperature from single temperature APEC fits. Shaded histograms show sources with large absorbing column densities. Both class I sources fall in this category. For sources of low absorption we can see that class II sources are hotter than class III sources.

Due to the absorption, this does not necessarily apply to all plasma components, but it means that the hard component of the corona is hotter in class IIs.

HR diagram with evolutionary tracks

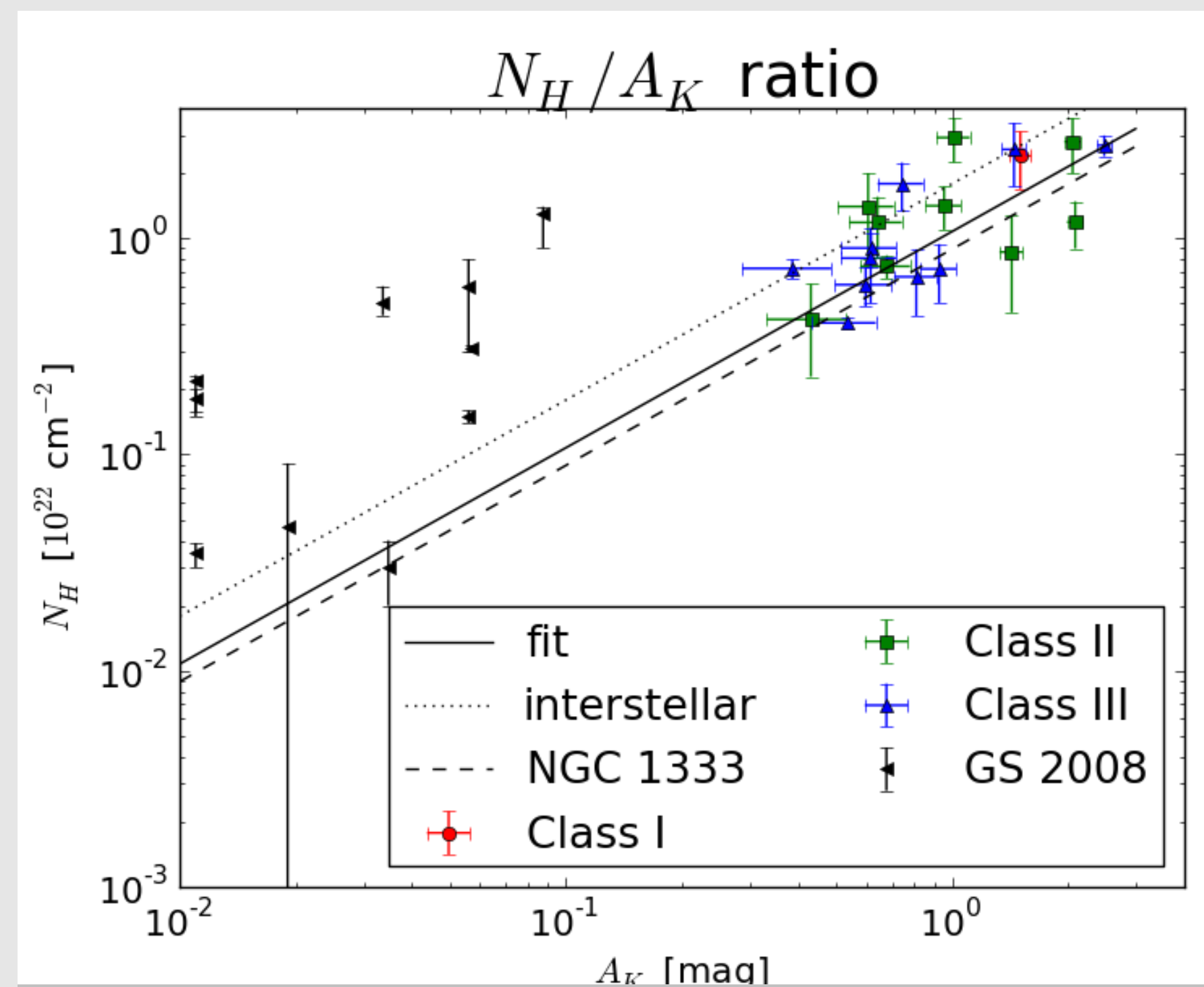


Optical color-magnitude diagram. The error bars show only the statistical uncertainty from the photometry. Pre-main sequence evolutionary tracks from Siess et al. (2000) are overplotted. The cluster age is < 3 Myr. Most of the scatter is caused by unresolved binaries, temporal variability and intrinsic differences in luminosity due to the individual accretion history of each star.

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References:

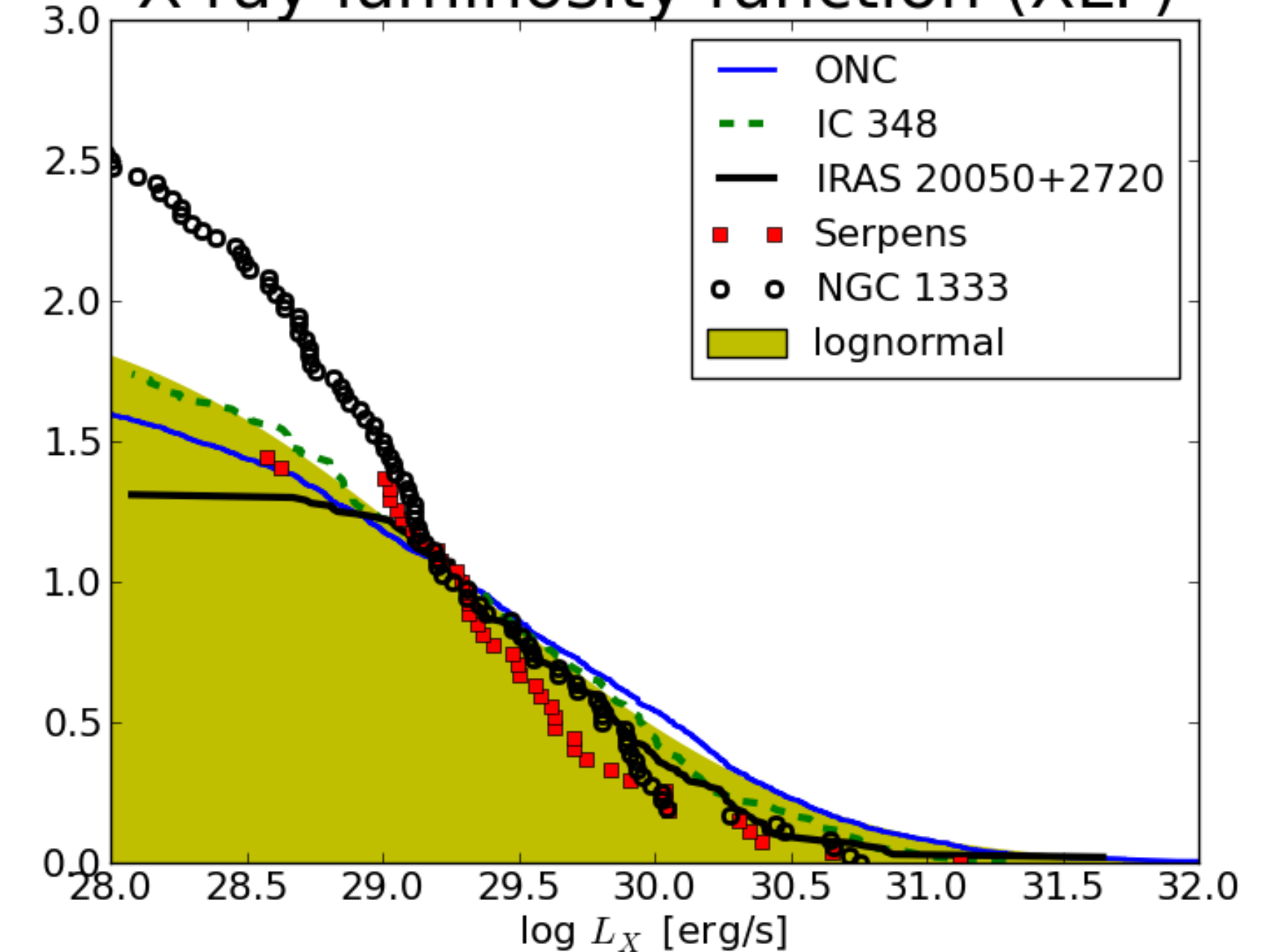
Feigelson et al. 2005, ApJS, 160, 379; Günther & Schmitt 2008, A&A, 481, 735 (GS08); Gutermuth et al. 2009, ApJSS, 184, 18; Siess et al. 2000, A&A, 358, 593



Ratio of X-ray absorption and IR reddening. Sources in IRAS 20050+2720 and also in NGC 1333, another young star forming region, are found below the canonical ISM ratio, while isolated nearby stars from the GS08 sample (mostly in TWA and Taurus) lie above it. The ratio is influenced by several factors, the most promising explanations are a change in the gas-to-dust ratio or in the grain properties.

Grain growth in the cloud material can explain the trend for IRAS 20050+2720, while the GS08 sources all have very little contribution from their natal cloud. They are dominated by absorption from the accretion funnels.

X-ray luminosity function (XLF)



X-ray luminosity function for IRAS 20050+2720 and other clusters from the literature. The XLF of IRAS 20050+2720 is complete to 29.8. The shaded area shows a lognormal distribution with the parameters suggested by Feigelson et al (2005).

While the ONC follows the lognormal distribution closely, the other regions are significantly different (98% confidence). Thus, we conclude that there is no universal XLF.