Accretion & Outflows in FULL and TRANSITIONAL disks: HELIUM lines analysis

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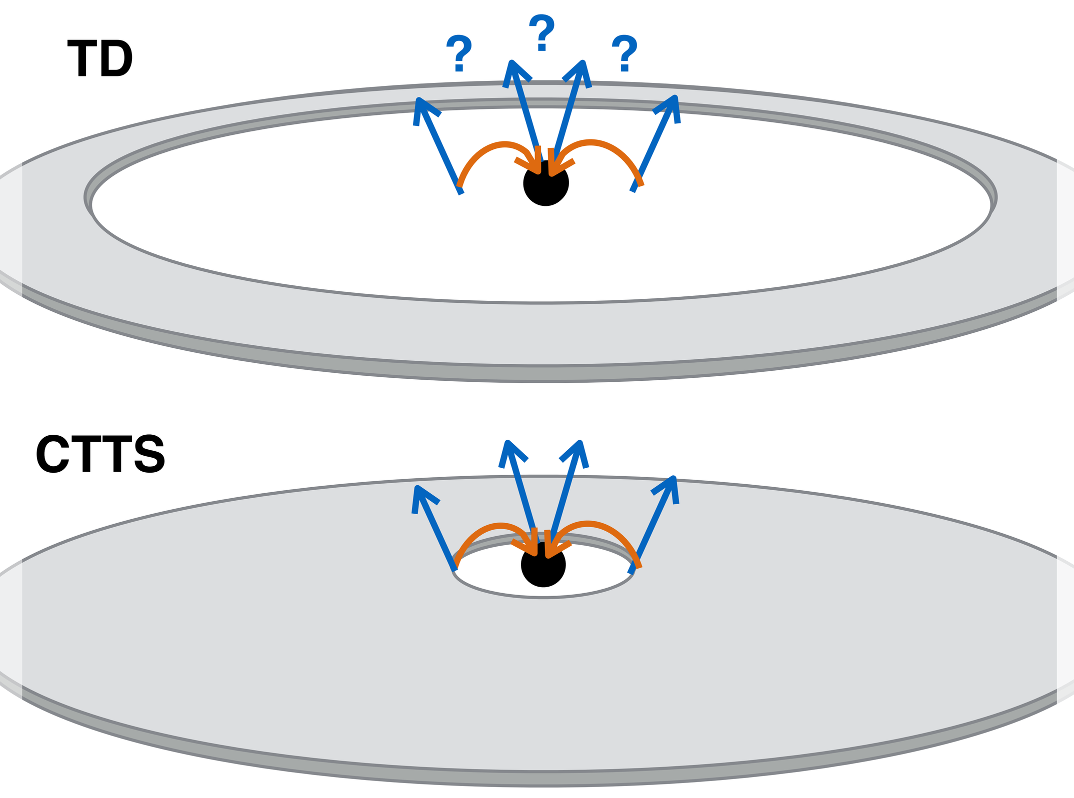


We investigate the proprieties of winds and accretion in objects at different evolutionary stages. We study the profiles of two helium lines (λ5876 Å and λ10830 Å) observed simultaneously with the VLT/X-Shooter instrument (R~10,000-20,000).
Our sample is composed by **66 Classical T Tauri Stars (CTTS)** and **25 transitional disks (TD)**. The CTTS are located in **Lupus** (32 objects, Alcalá et al. 2014), and in **Chamaeleon I** (34 objects, Manara et al. 2015), while the TD are located in different star forming regions (Manara et al. 2014).

He I λ10830 Å

The **blueshifted absorption** feature of this line is likely produced by the outflowing gas (Edwards et al. 2006). The profile of the absorption feature is related to the geometry of the wind, that can either be radially outflowing or launched from the inner ring of the disk (Kwan et al. 2007). Narrow low velocity absorption is expected from a disk wind (Edwards et al. 2006).
The **redshifted absorption** is due to infalling (accreting) gas (Edwards et al. 2006).

He I λ5876 Å

This line appears to be the sum of two components:
a **broad component** (BC) with peak velocities between –3 and 50 km/s and FWHM 80-200 km/s, probably emitted in a wind,
a **narrow component** (NC) with peak velocity between –4 and 12 km/s and FWHM 20-50 km/s, produced in the post-shock region at the base of the accretion column (Beristain et al. 2001).

He I λ10830 Å

Figure 1. He I λ10830 Å recurrent profiles

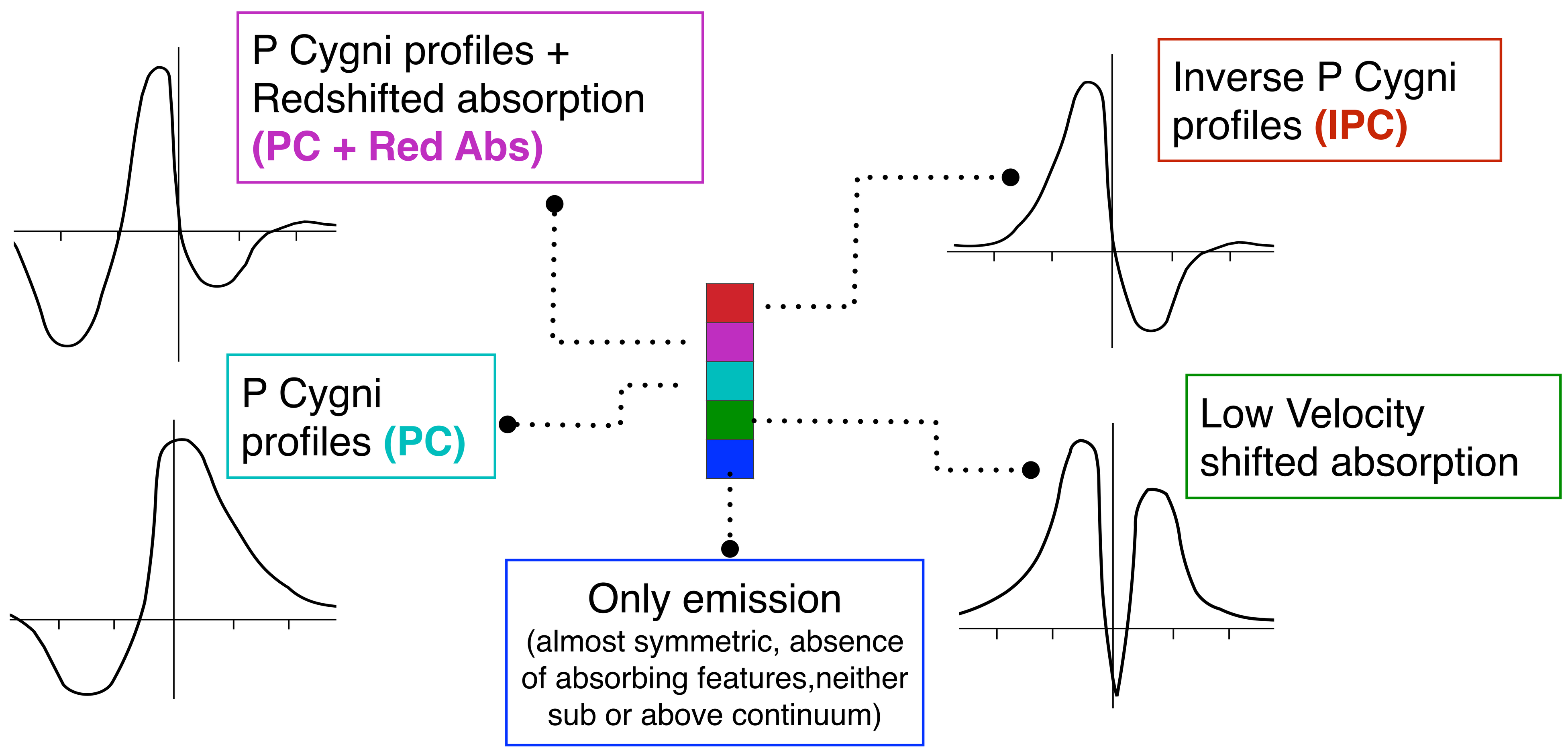


Figure 2. He I λ10830 Å profiles vs L_{acc}

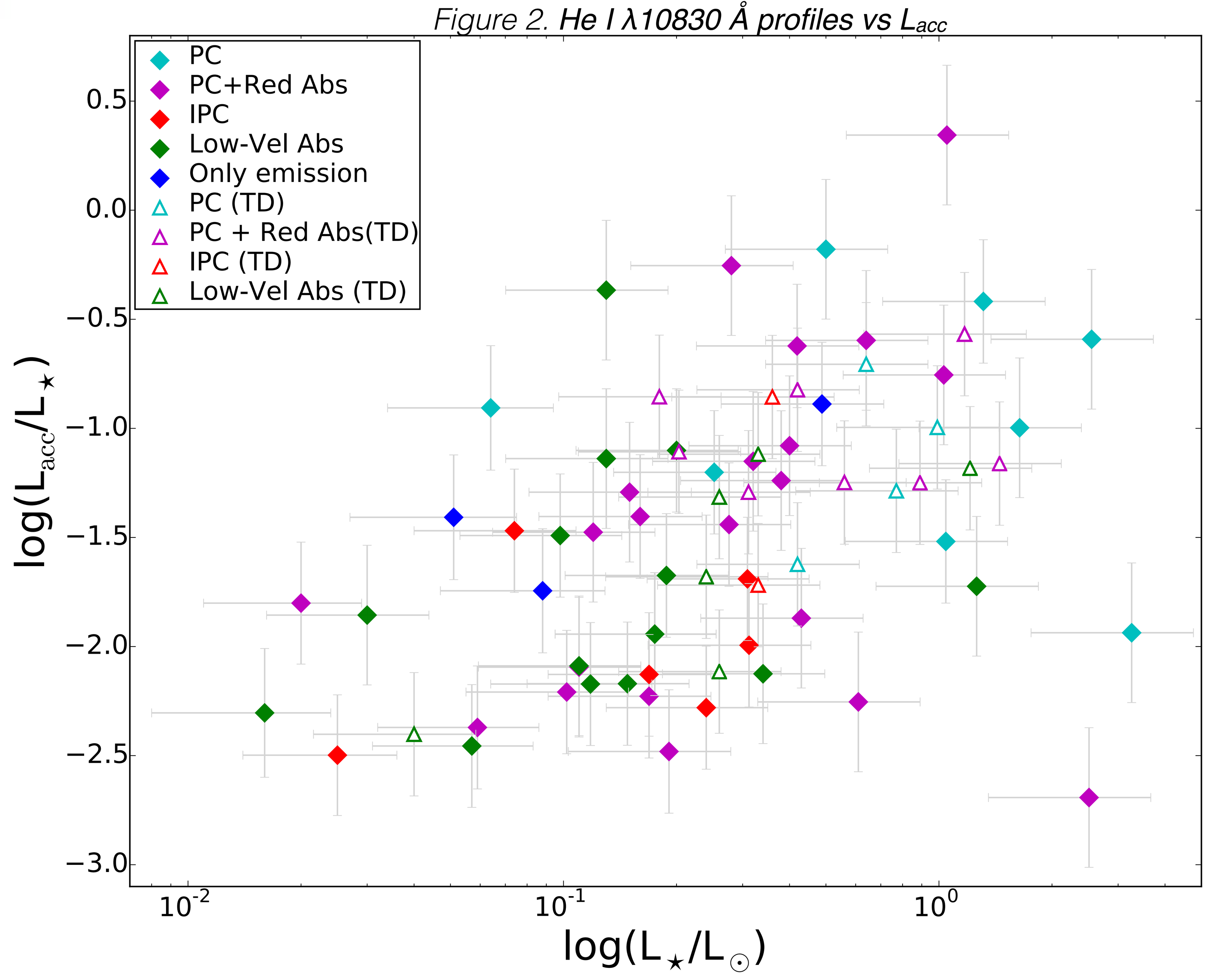


Figure 3. He I λ10830 Å profiles statistics

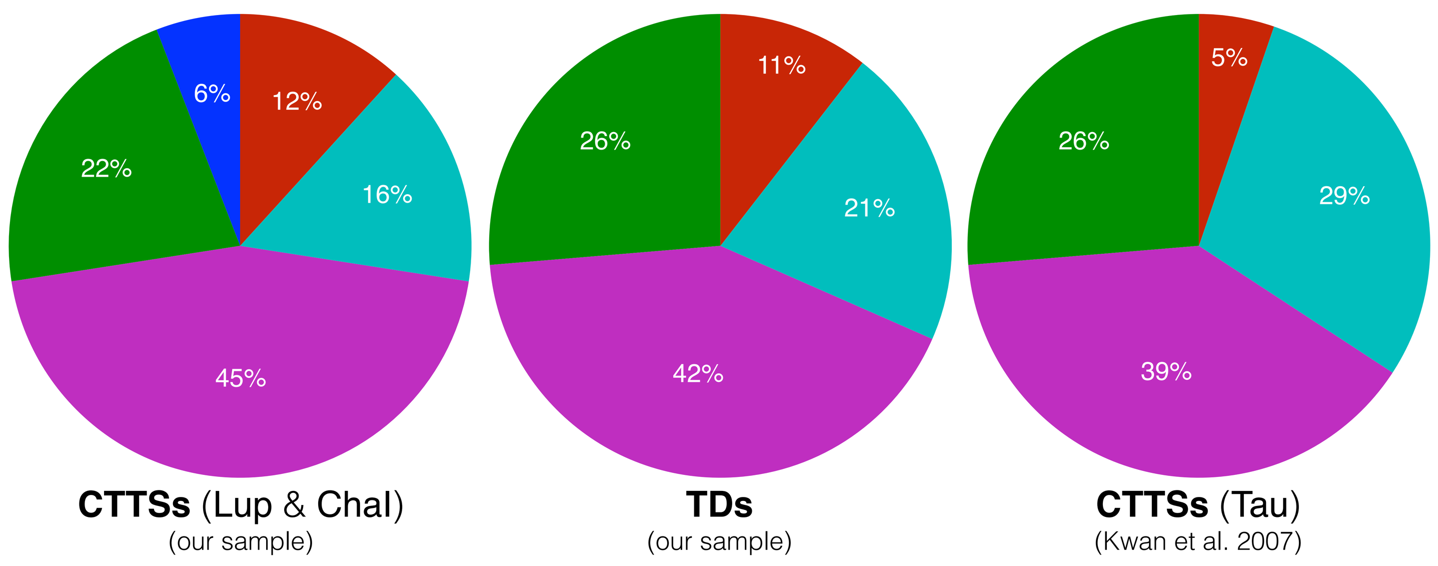
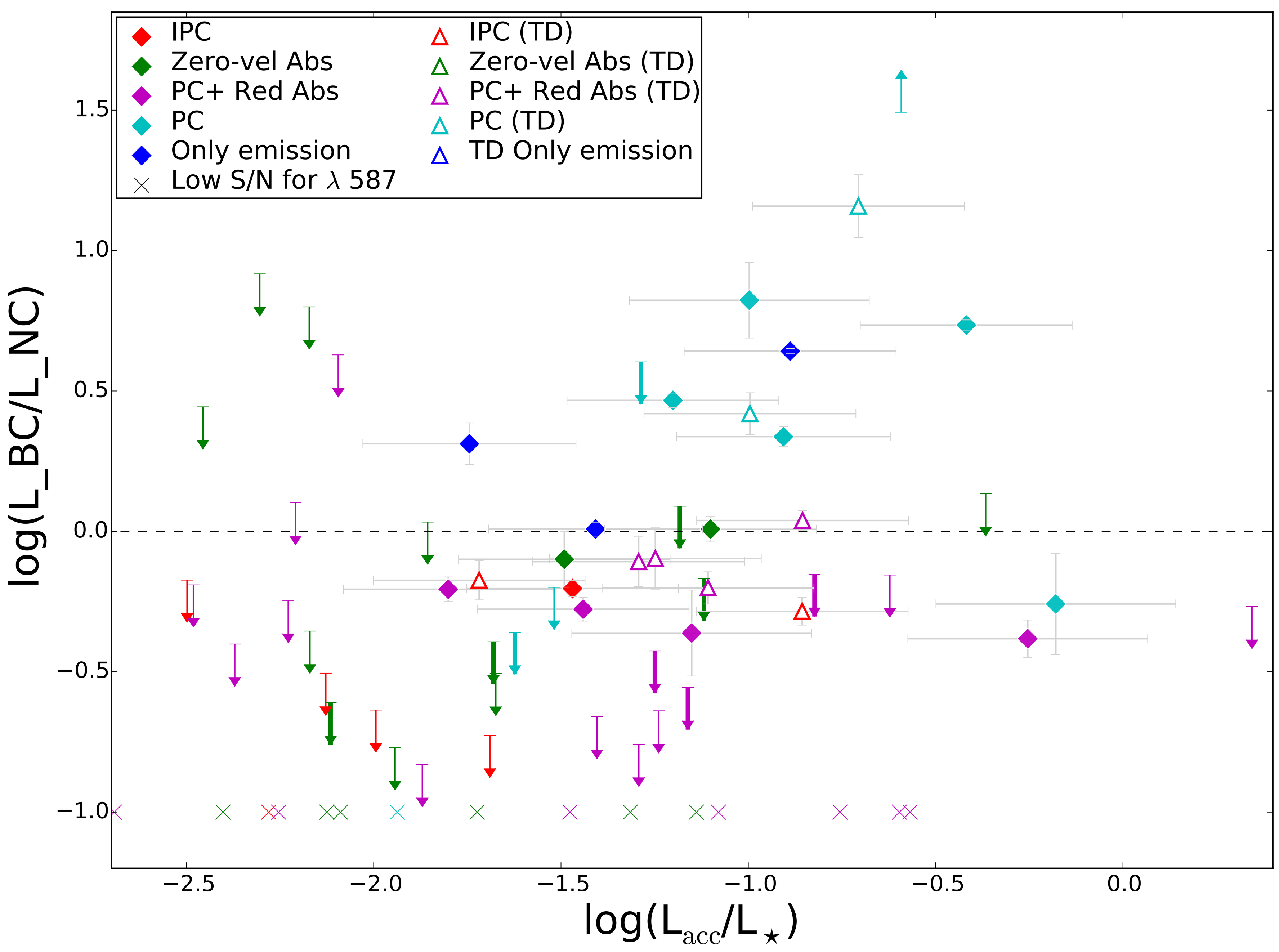


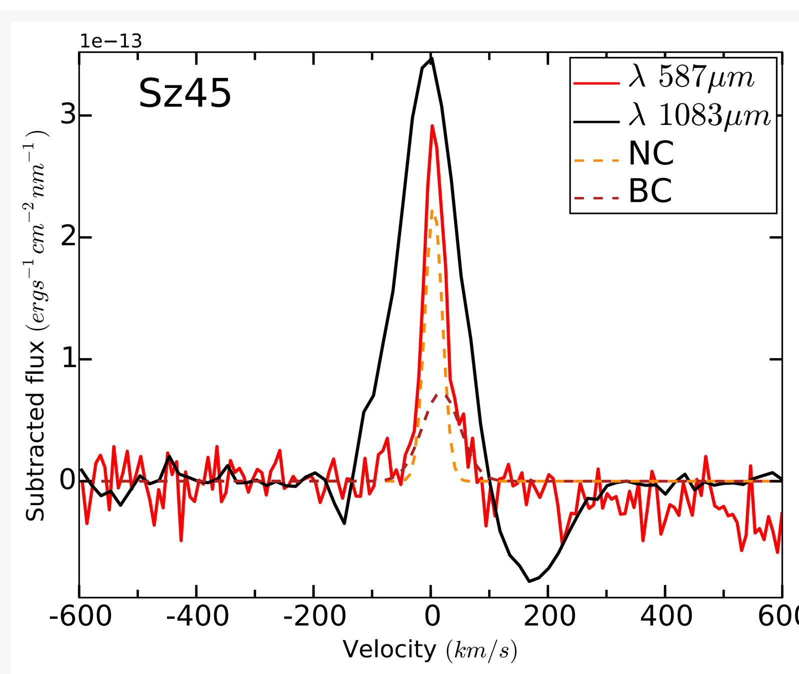
Figure 2 shows that **objects with only blueshifted absorption (PC) have generally higher accretion rates** and objects with only redshifted absorption (IPC) and low velocity absorption have mainly lower accretion rates.

From a statistical point of view (Fig. 3) we don't see significant differences between the three samples. The smaller percentage of IPC profiles in Taurus is probably due to the fact that this samples comprises more higher accreting objects than our samples.

He I λ10830 Å & λ5876 Å

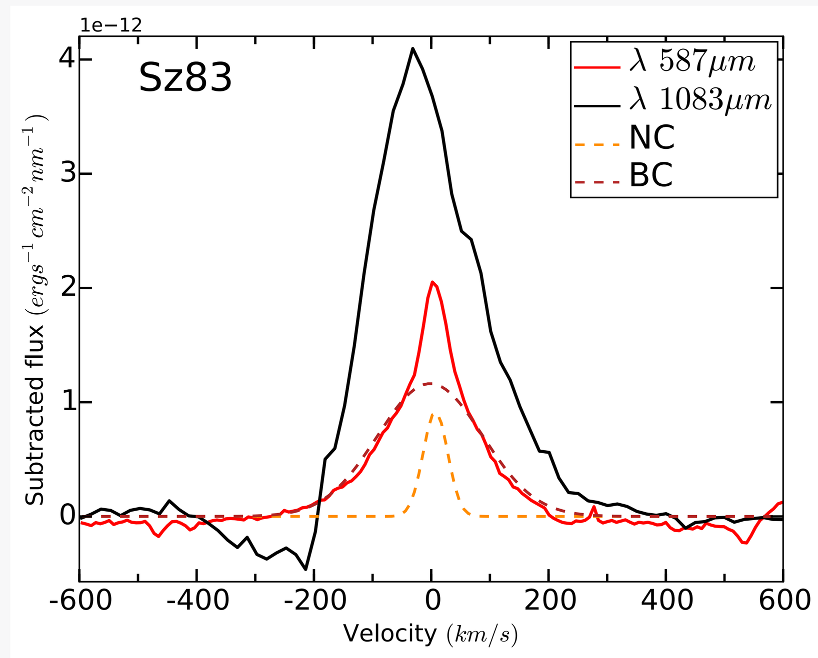
Figure 4. Flux ratio between of BC and NC of He λ5876 Å vs L_{acc}, color coded for He λ10830 Å profiles





'Weak-Wind' object
He λ10830 Å with a IPC profile He λ5876 Å line with a weak BC

'Strong-Wind' object
He λ10830 Å with a PC profile He λ5876 Å line with a strong BC



No differences between TDs and Full disks. From a statistical point of view TD sample is very similar to CTTS sample.
If we also look to Figure 2 we can notice that the distribution of TDs is similar to CTTS.

The flux ratio between BC and NC is shown in Fig. 4
- PC profiles and "Only emission" profiles have the strongest BC ('Strong-Wind' objects)
- IPC and "low velocity absorption" objects have all a weak BC ('Weak-Wind' objects)

Systems showing a broad He 5876 component also show strong wind signatures in the He 10830 line. On the other hand, the presence of accretion signatures does not correlate with accretion rate (see also Fig.2).