

Young A stars: The softest Youngsters

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Herbig AeBe stars

- young, pre-main-sequence objects
 - with disks
 - mass: 3-8 M_{sun}
- Are HAeBes the massive brothers of T Tauri stars?



HAeBe stars: X-ray properties

- **70 % detection rate with ROSAT** (Zinnecker & Preibisch 1994, A&A 292, 152) compared to 10-15% for A type field stars
- **80 % detection rate in Chandra archive** (Stelzer et al. 2006, A&A 457 , 223)
- **flares observed in binary V892 Tau** (Giardino et al. 2004, A&A 413, 669)
- **first RGS spectrum for AB Aur** (Telleschi et al. 2007, A&A 468, 541)



HAeBes: X-ray origin

The emission mechanism is unknown, several scenarios are discussed:

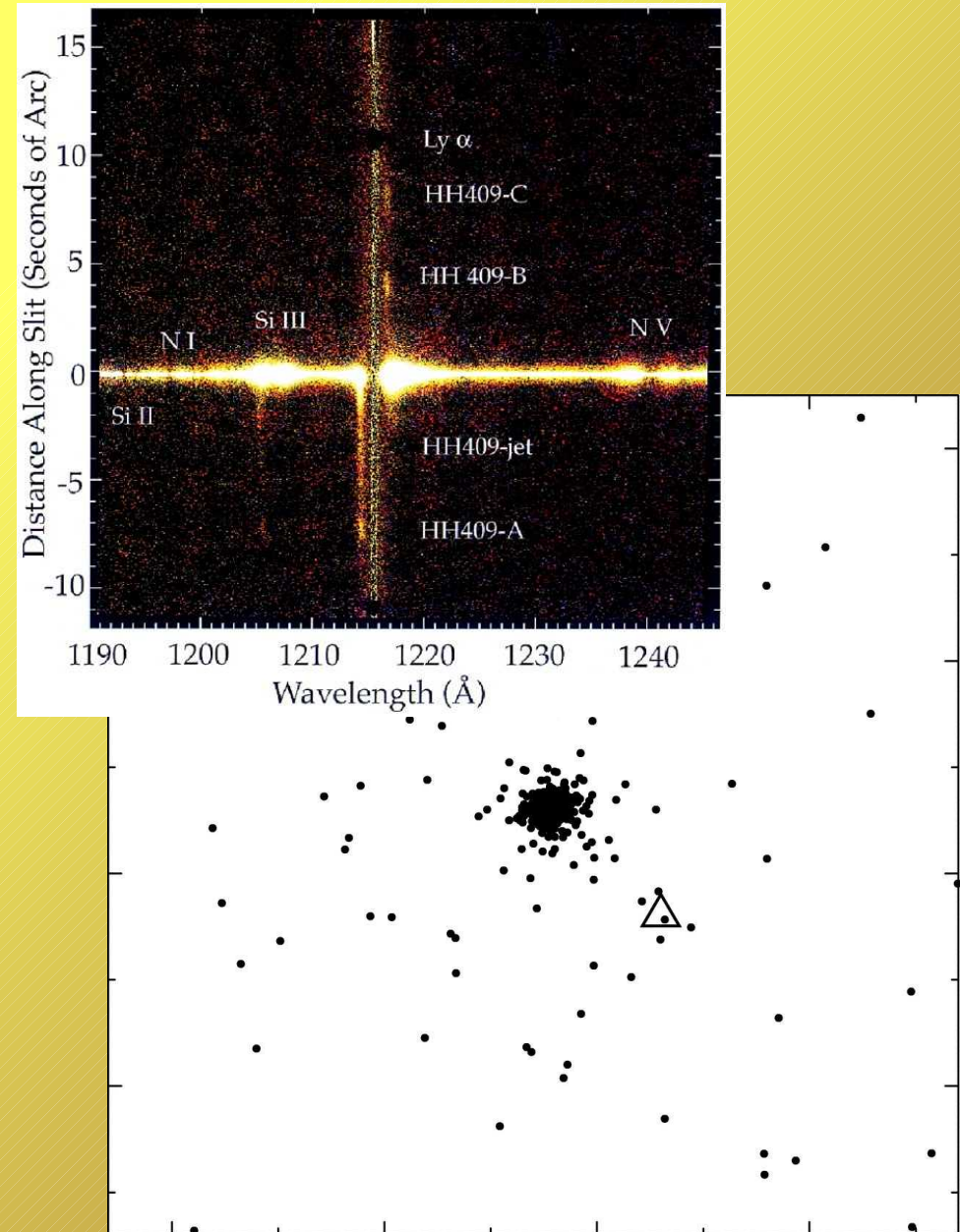
- late-type companion (T Tauri star)?
 - own corona (HAeBes as Ap progenitors)?
 - stellar accretion?
 - shocks in outflows?
- Obtain well exposed, high-resolution spectrum:

HD 163296 (120 ks)



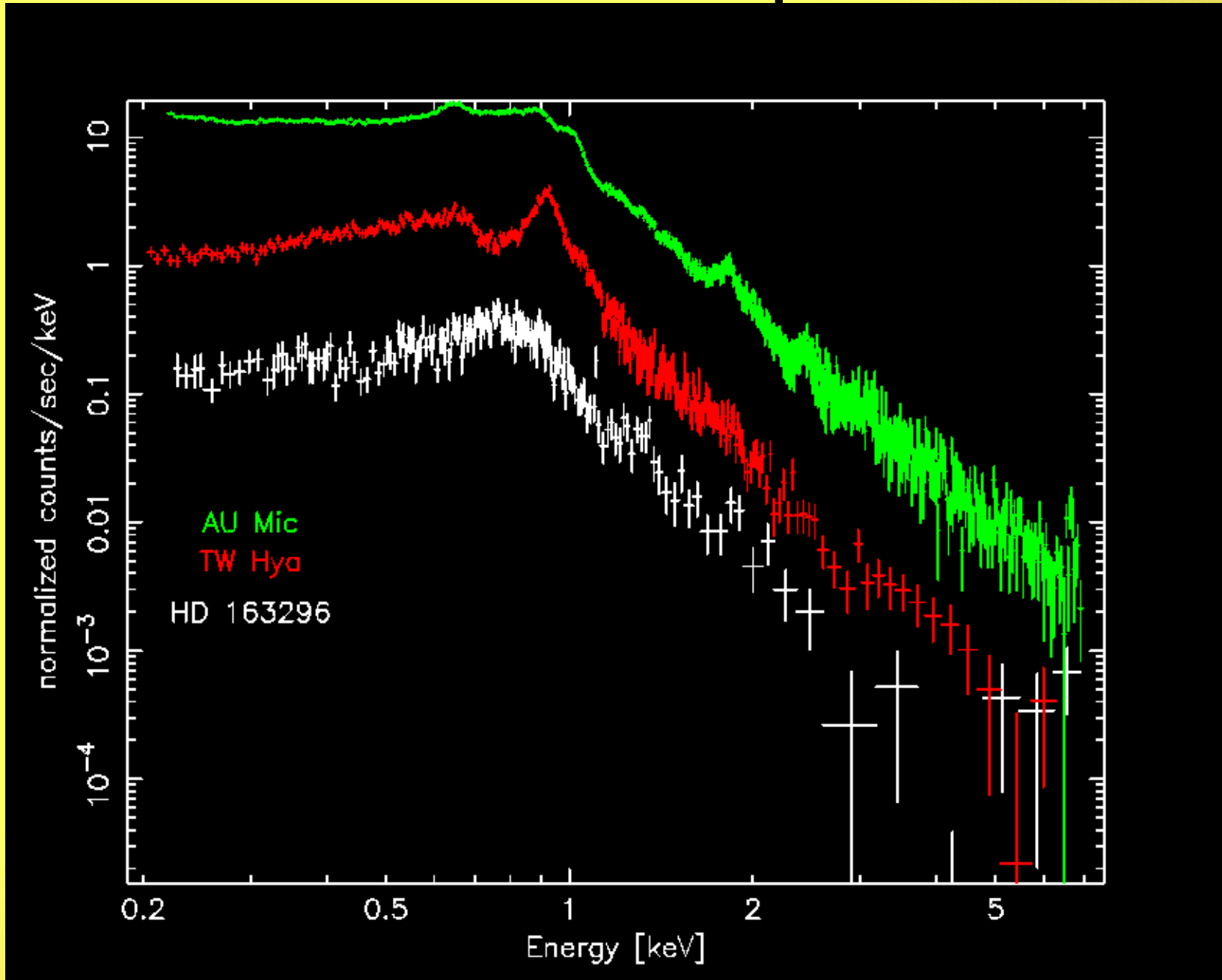
HD 163296

- disk detected in radio
(Isella et al. 2007, A&A 469, 213)
- optically detected jet
(Devine et al. 2000, ApJ 542, L115)
- very soft X-ray spectrum
- Chandra resolved jet emission
(Swartz et al. 2005, ApJ 628, 881)
- Outflow signatures in UV
(Deleuil et al. 2005, A&A 429, 247)



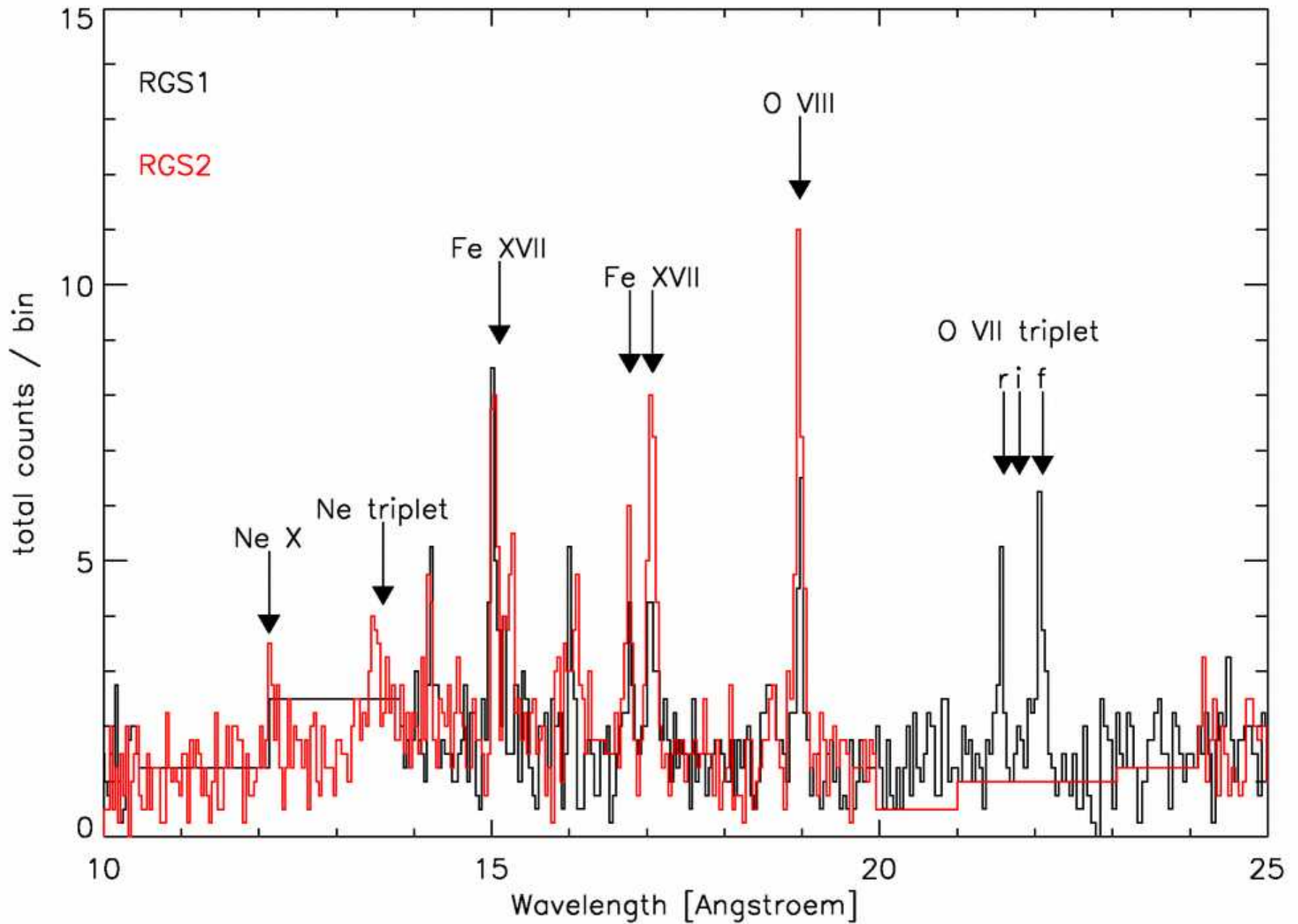


HD 163296: PN spectrum





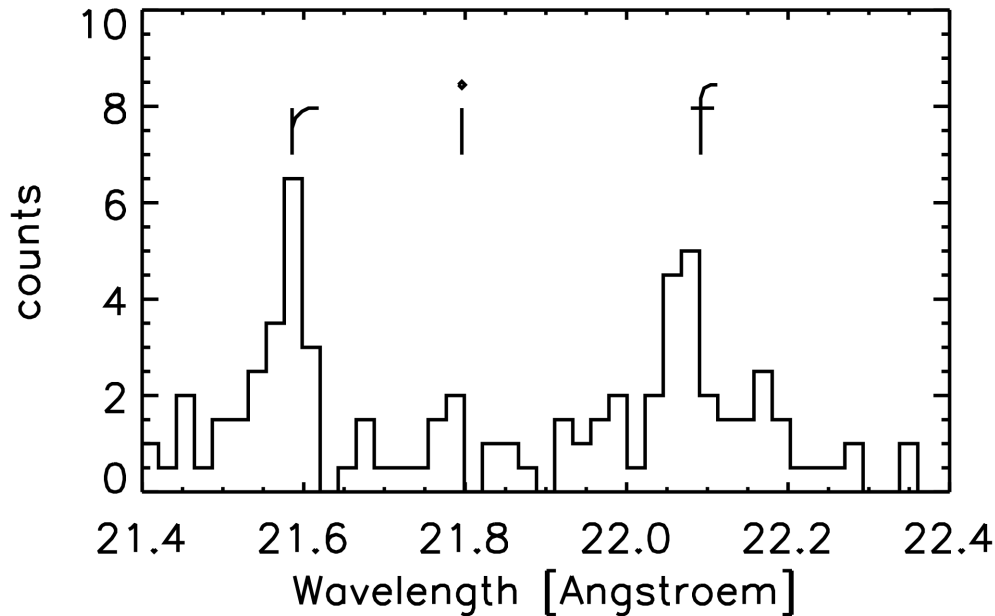
HD 163296: RGS spectrum



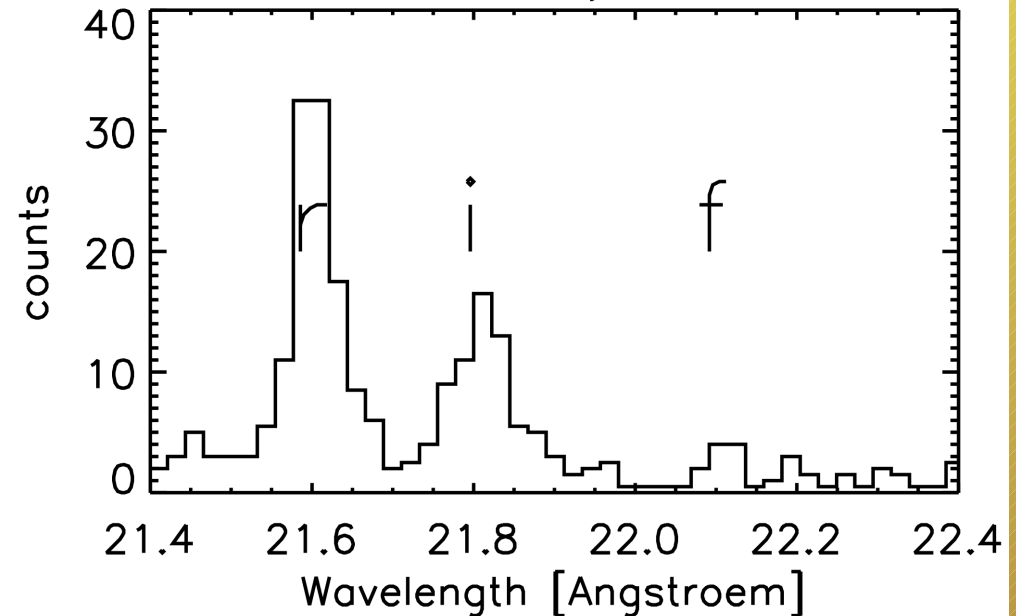


OVII He-like triplet

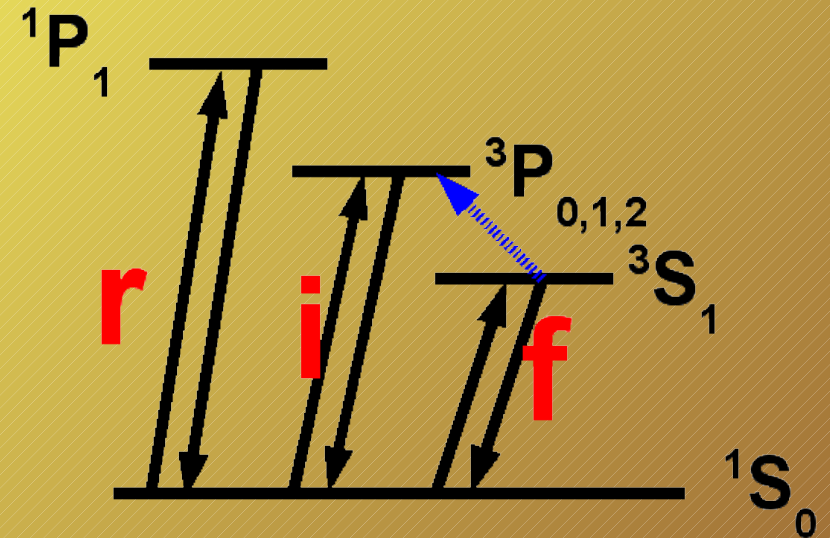
HD 163296



TW Hya

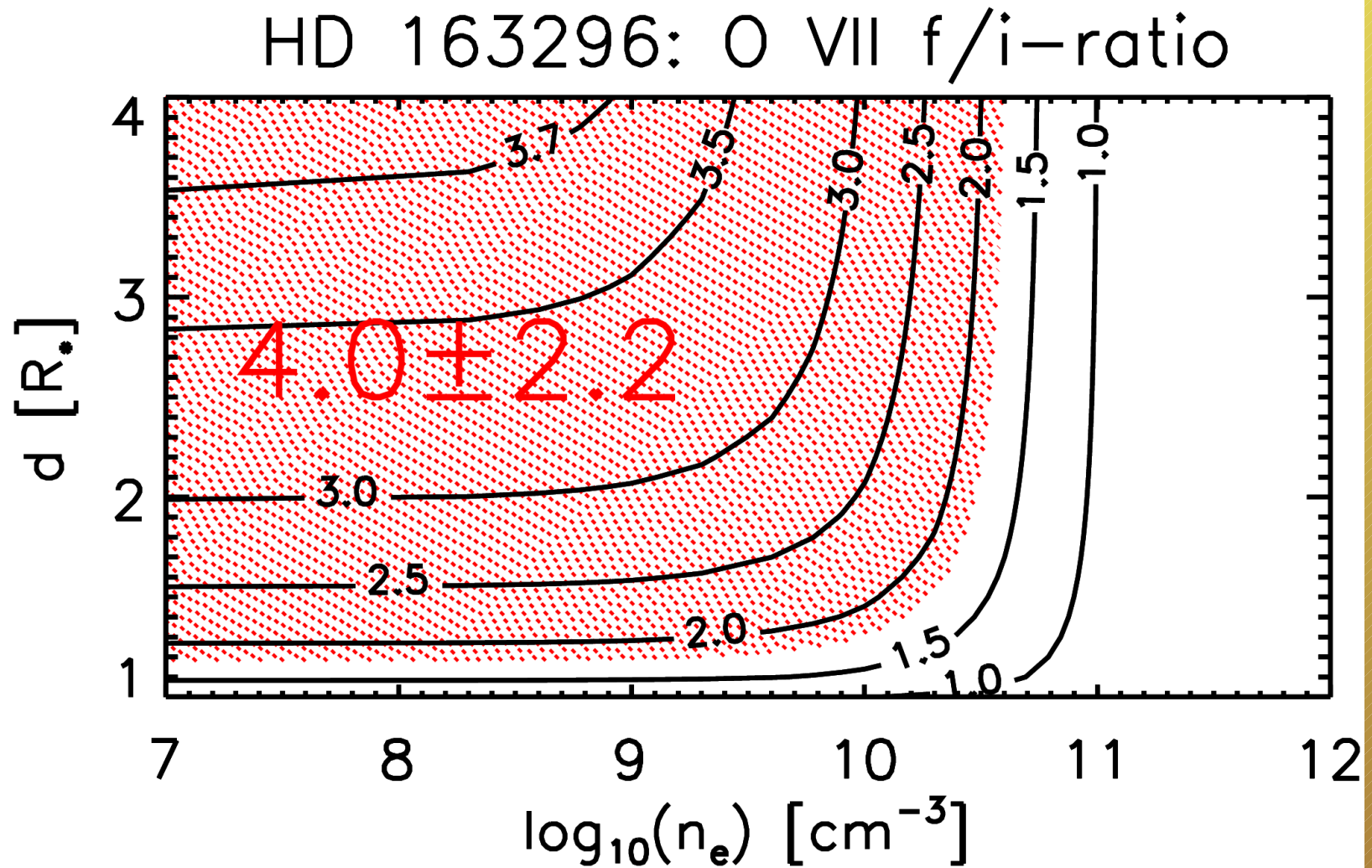


- density sensitive ($10^9 - 10^{12} \text{ cm}^{-3}$)
- UV sensitive (1630 Å)





O VII He-like triplet: results





Summary

- XMM-Newton allows high-resolution spectroscopy of HAeBe stars.
- ~~late-type companion?~~ (HST imaging)
- own corona? ($kT=0.6$ keV)
- ~~stellar accretion?~~ (f/i-ratio in O VII)
- shocks in outflows? ($kT=0.2$ keV)