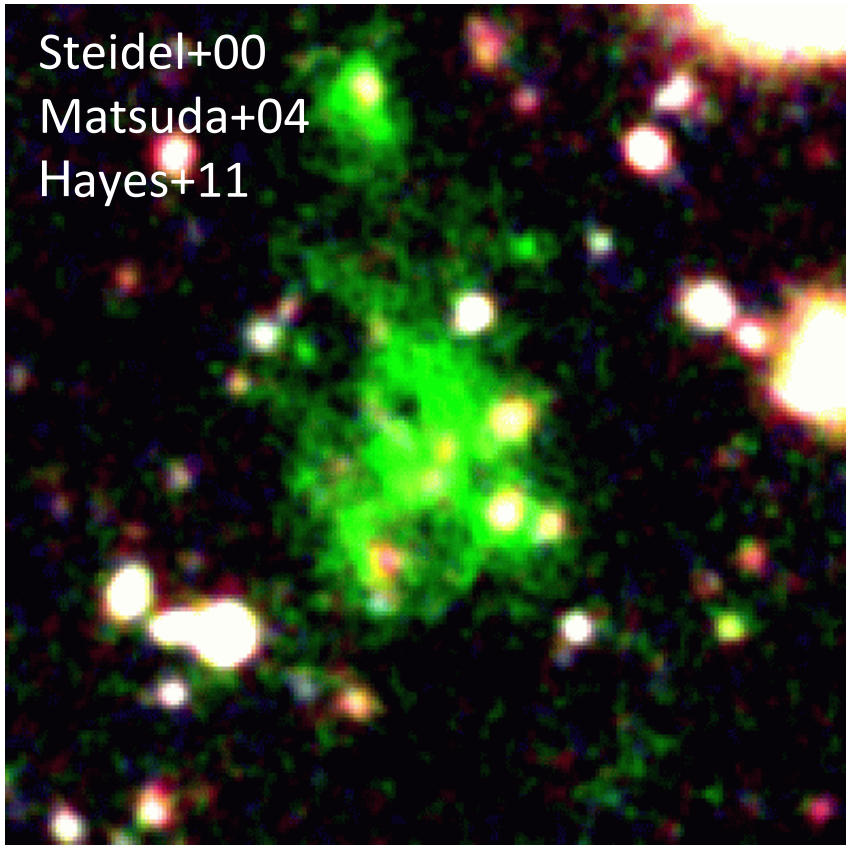
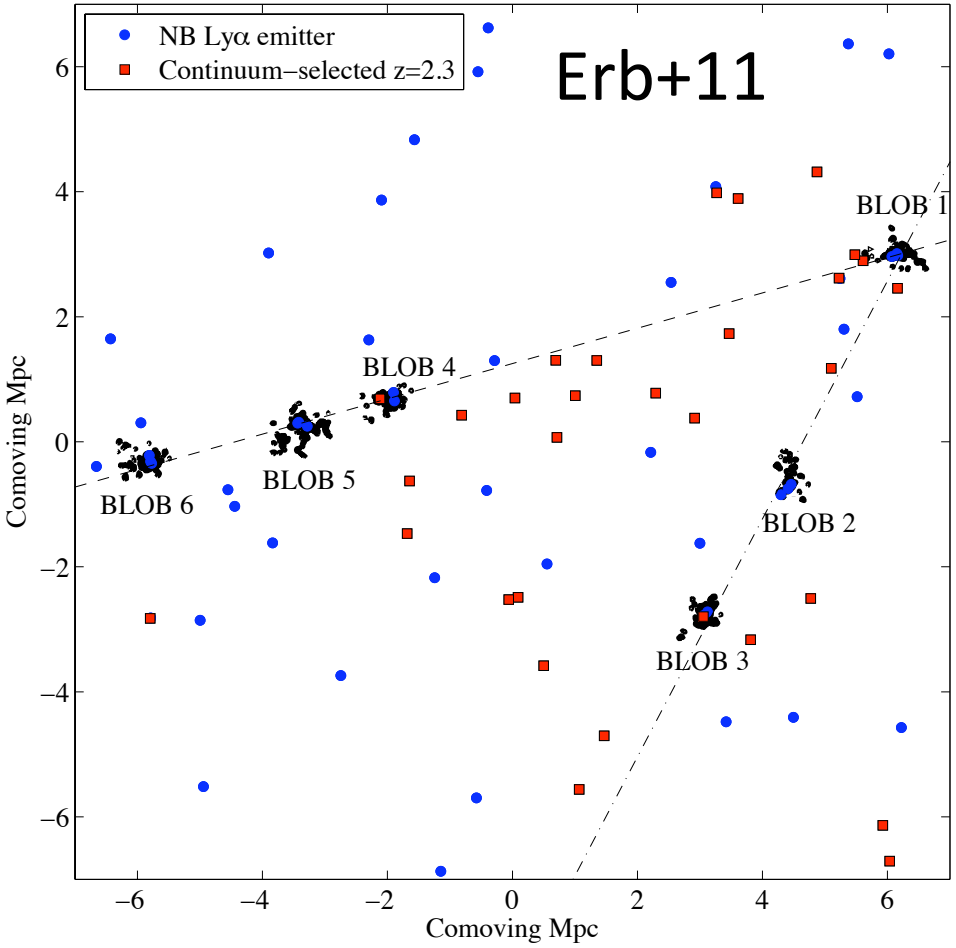
ALMA observations of Lyman alpha blobs at z=3.1

Yuichi Matsuda (NAOJ)

Lyman alpha blobs (LABs)

- Duration time-scale~0.1Gyr (1% of Cosmic time)?
- **Cosmic cherry blossoms (3 days per year – 1%)?**



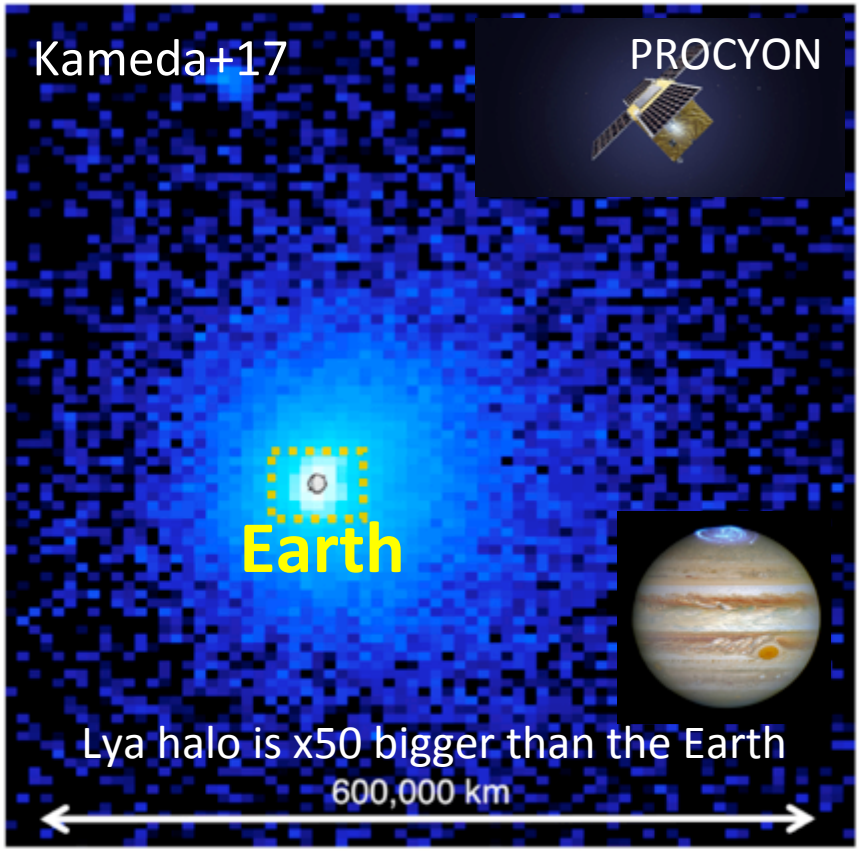


Summary

- **Lya halo is ubiquitous**
- **ALMA started to detect dusty sources in LABs**
- **One ALMA source in a filamentary LAB may be in transition phase from dusty starburst to passive galaxy**

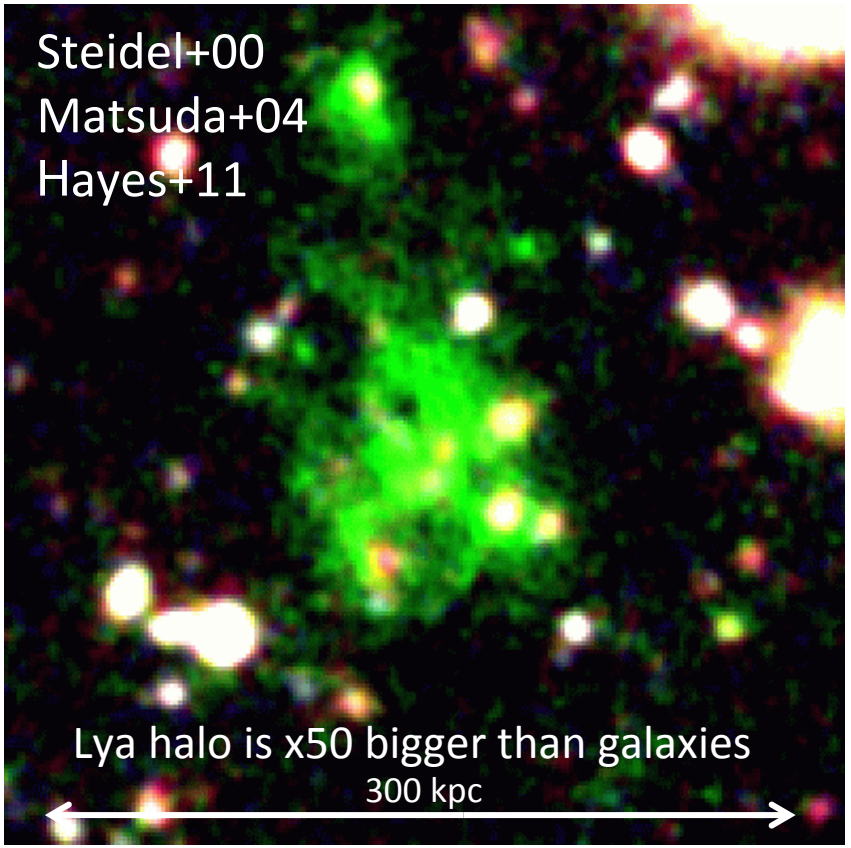
Lyman alpha halo is ubiquitous

Lya halo around the Earth



Apollo 16
[Carruthers et al., 1976]

Lya halo around distant galaxies



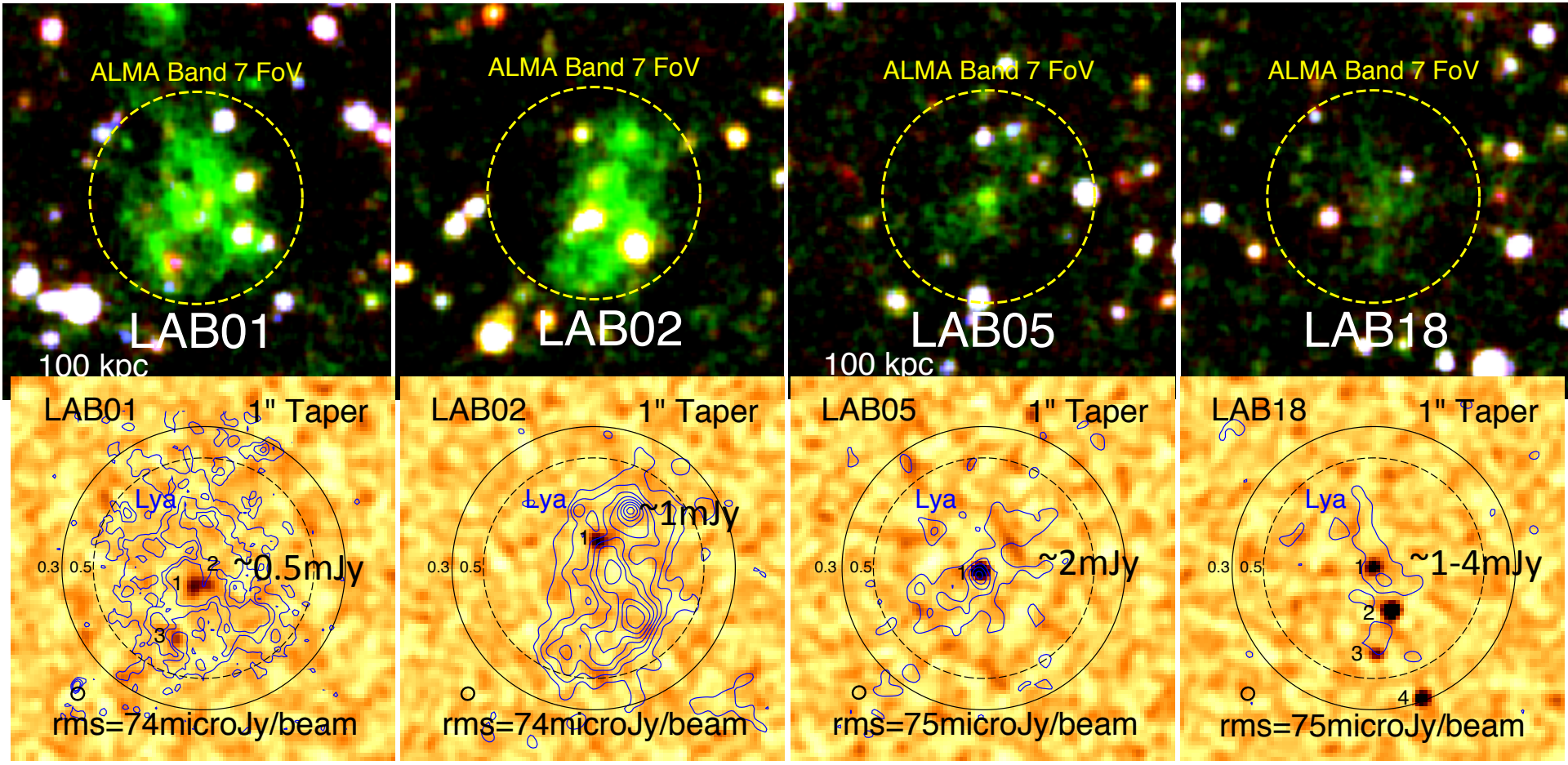
Size difference is 10^{13}

ALMA observations of LABs

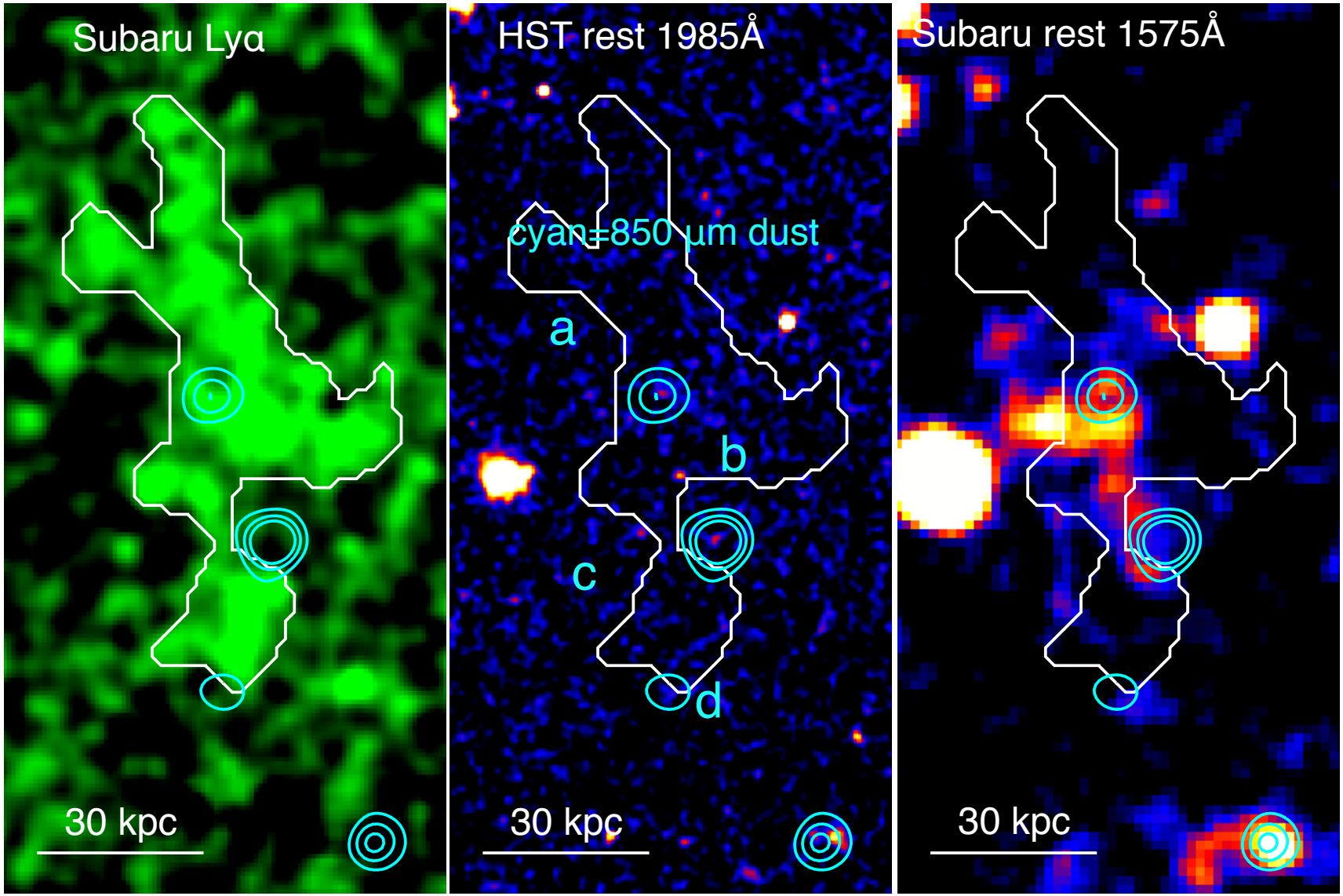
- ALMA Band 8 [CII] (Umehata+17)
- ALMA Band 7 cont + [NII] (Geach+16, Umehata+17, Ao+17, Matsuda+ in prep)

See also Yiping Ao's poster

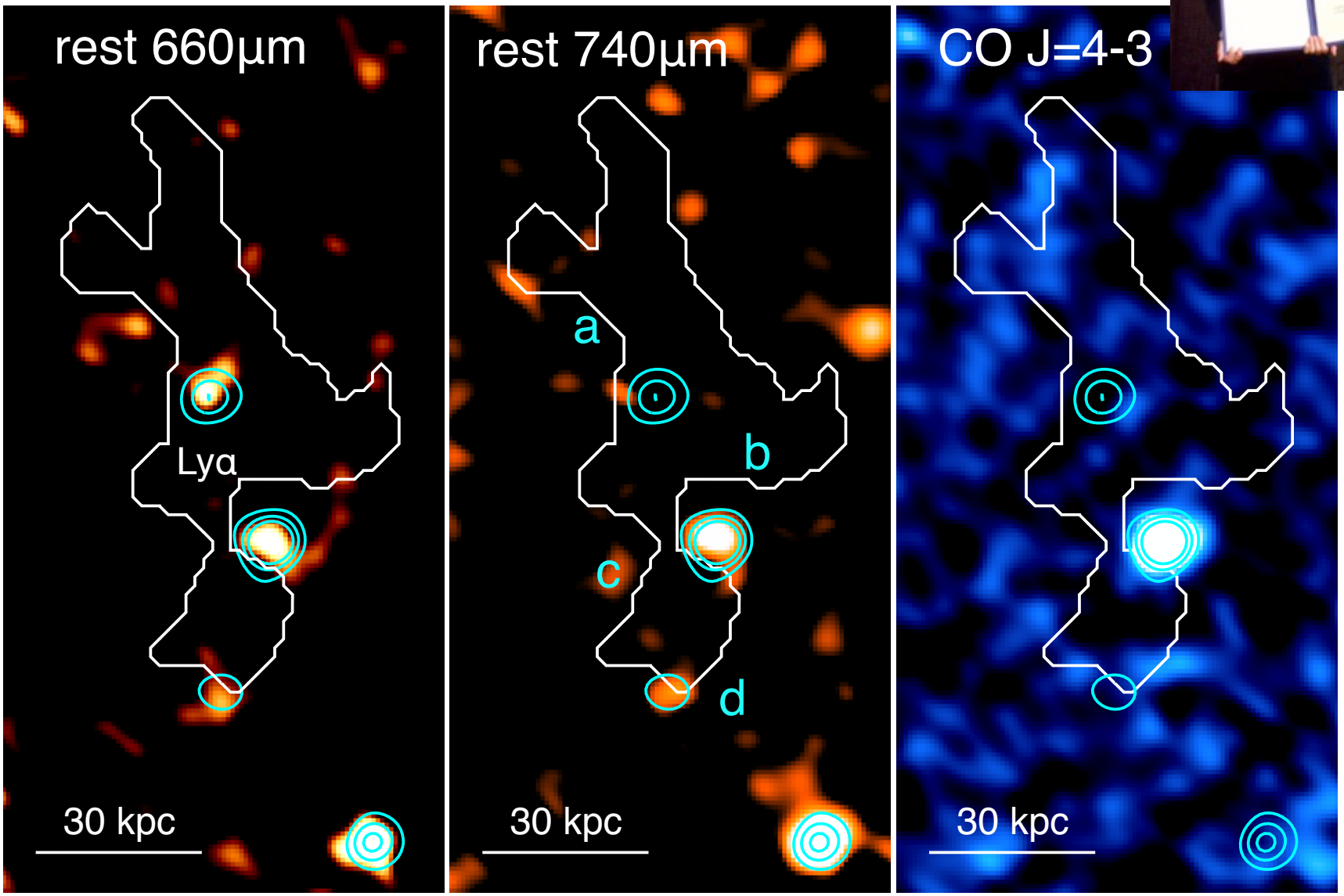
- ALMA Band 3 cont + CO(4-3) (Kato+ in prep)



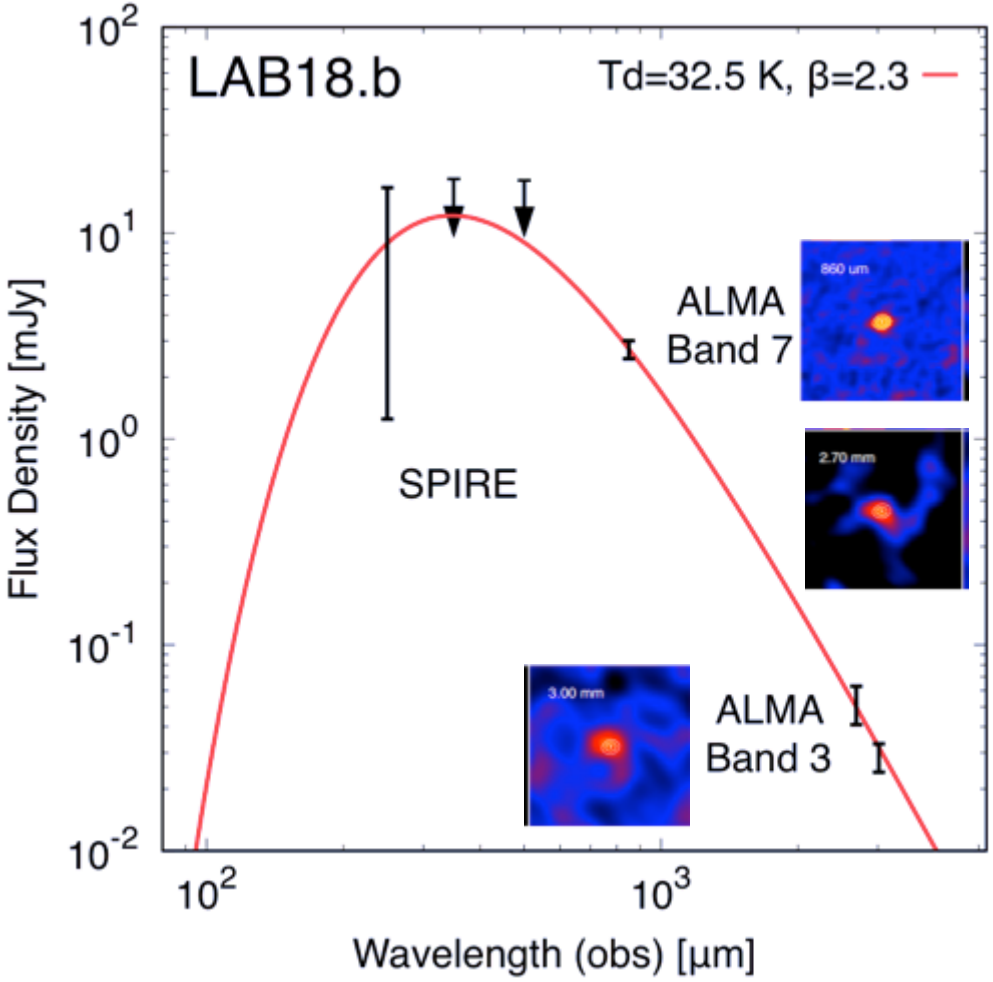
Filamentary LAB at z=3.1 (LAB18)

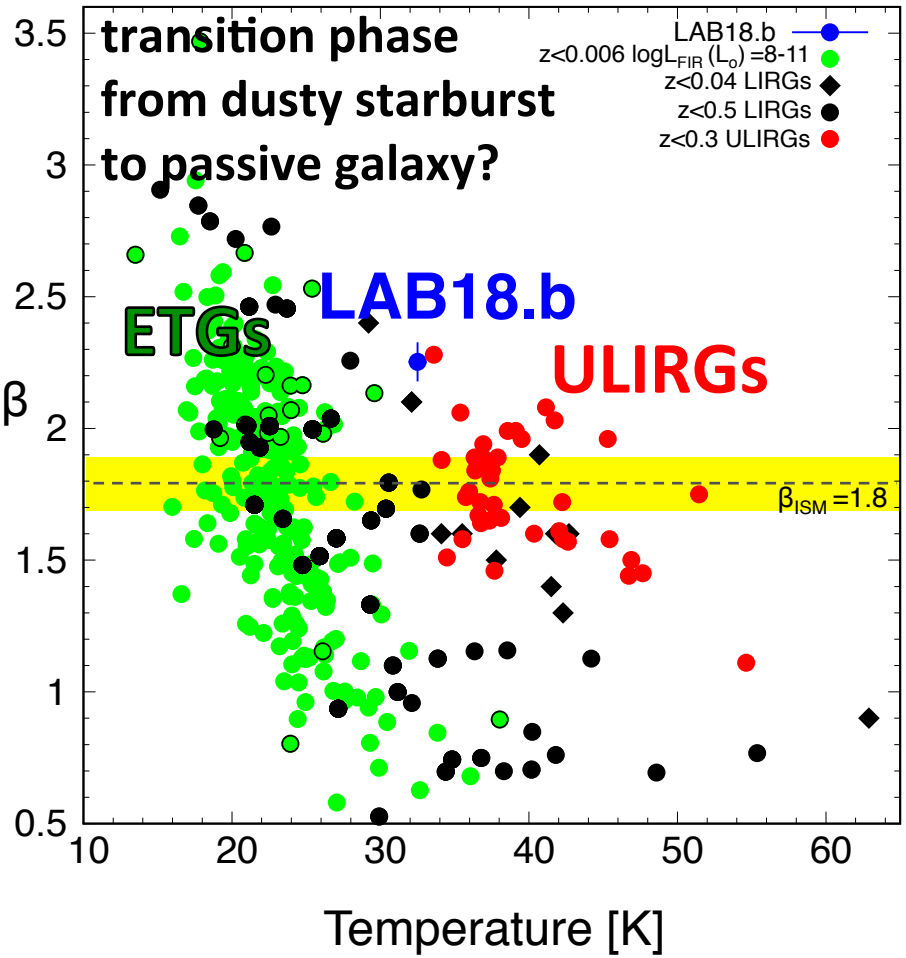


ALMA deep 3mm observations
5 hrs on-source (PI: Yuta Kato)



large dust emissivity index β=2.3

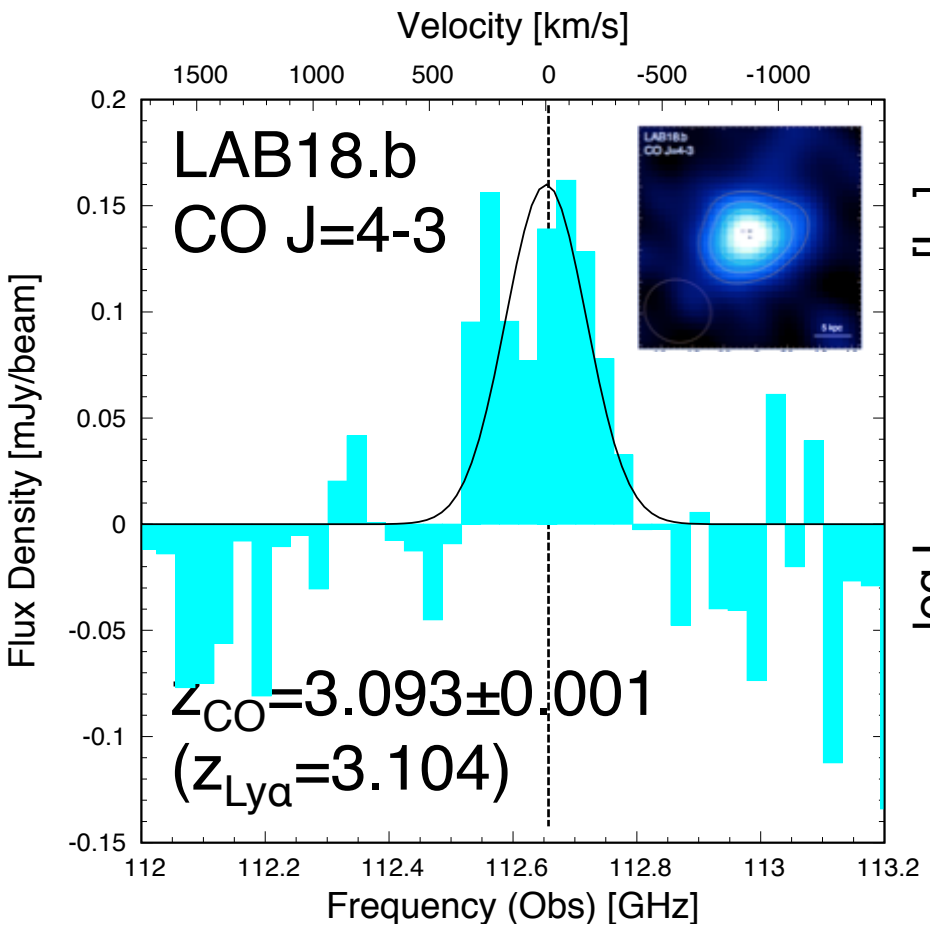


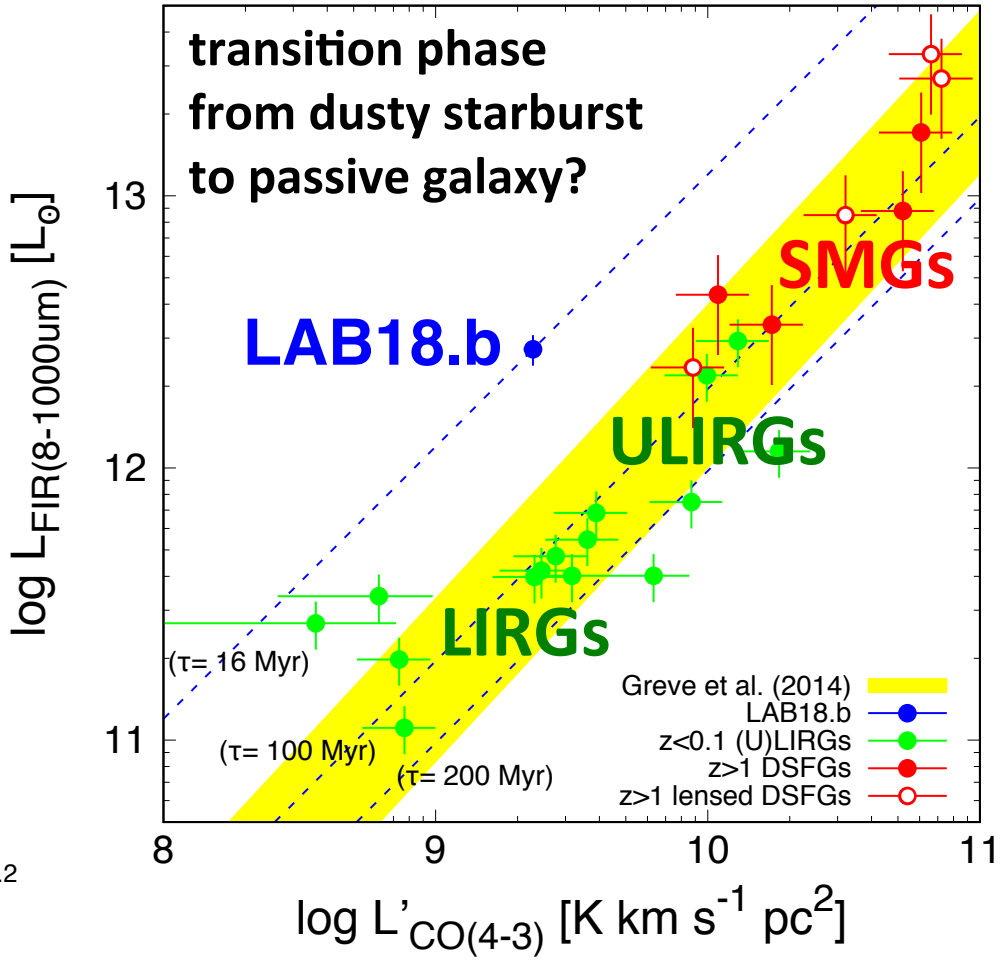


- $L_{IR(8\text{-}1000\mu m)} = (2.7 \pm 0.4)\times10^{12}\, L_o$ (T_d=32.5 ± 0.6 K、β=2.3 ± 0.1)

$$\kappa_d(\nu_{rest}) = \kappa_{850}(\nu/\nu_{850})^{\beta}$$

Short gas depletion time τ_{dep}=16Myr





- $M_{gas} = (4.4 \pm 0.3) \times 10^9\ M_o$ (r_{41} = 0.41, α=0.8)
- SFR = 273 ± 35 M_o/yr $\tau_{dep} = M_{gas}/SFR = 16 \pm 2$ Myr

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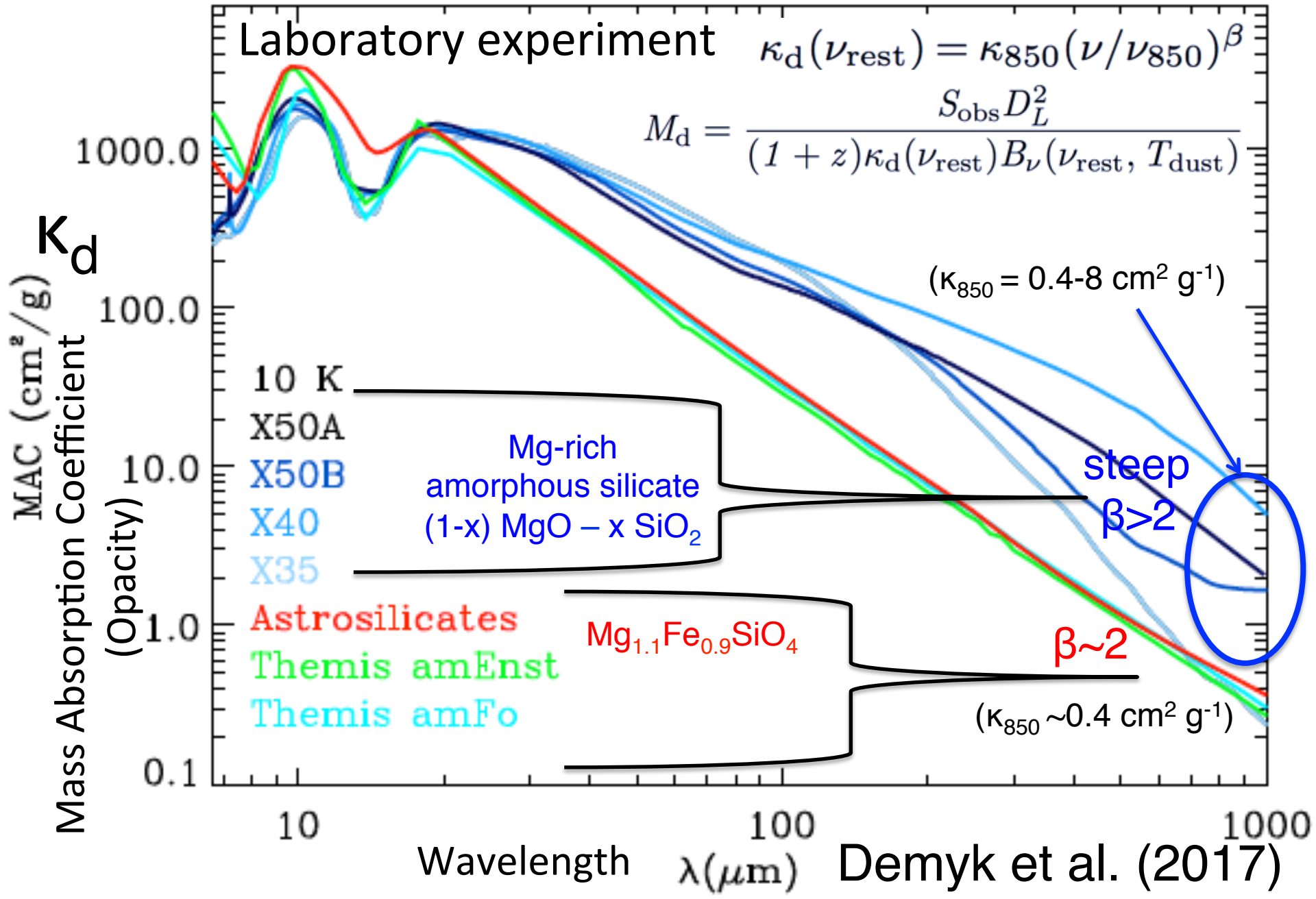
β reflects dust chemical composition



Demyk et al. (2017)