

# MACS0416\_Y1

dust and carbon  
in the EoR

SAZERAC 2020

Questions?

Tom Bakx  
Nagoya University  
[www.tombak.xyz](http://www.tombak.xyz)

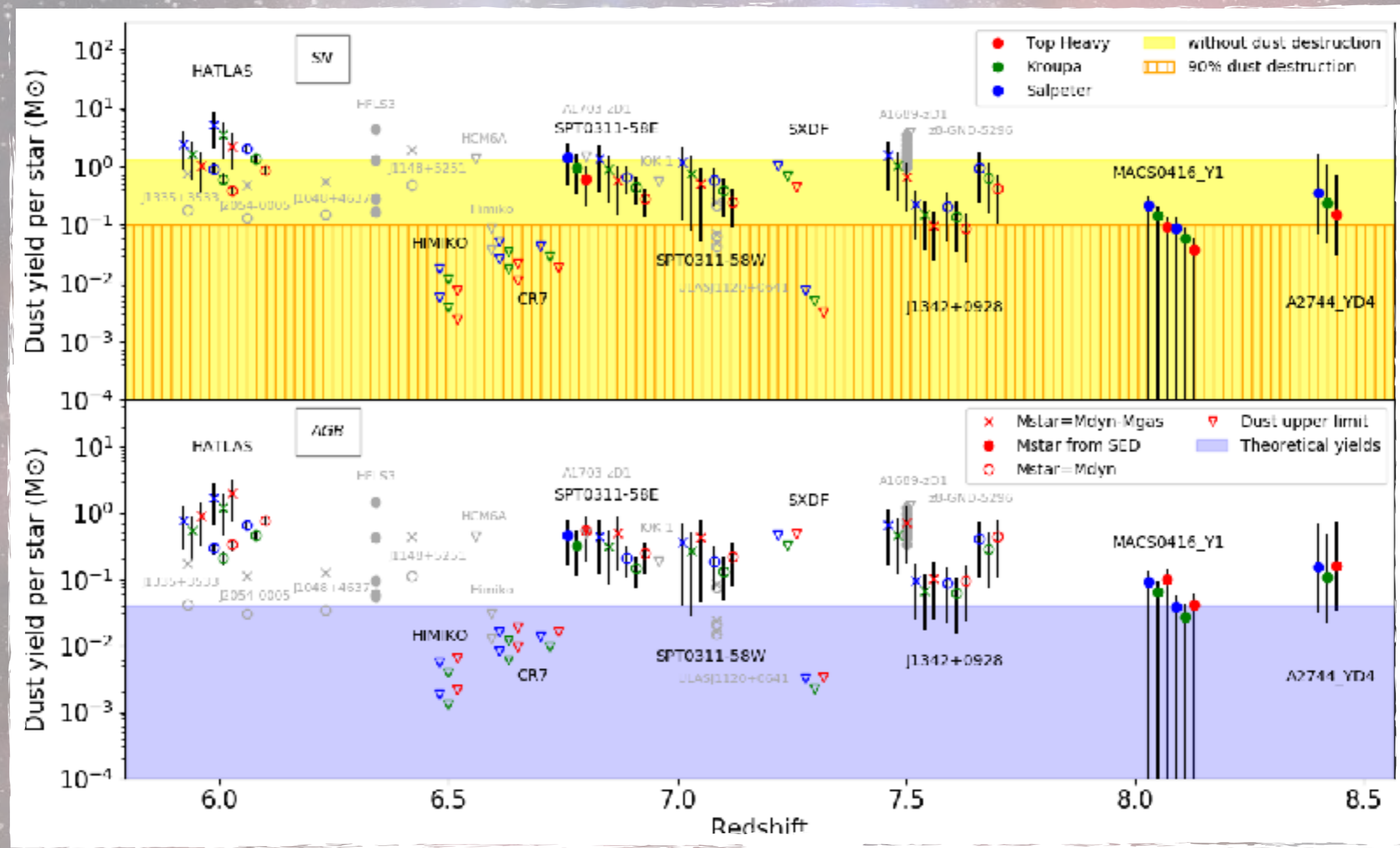


Credit: National Astronomical Observatory of Japan

# Dust Budget Crisis

SNe don't produce enough dust!

Leśniewska+19

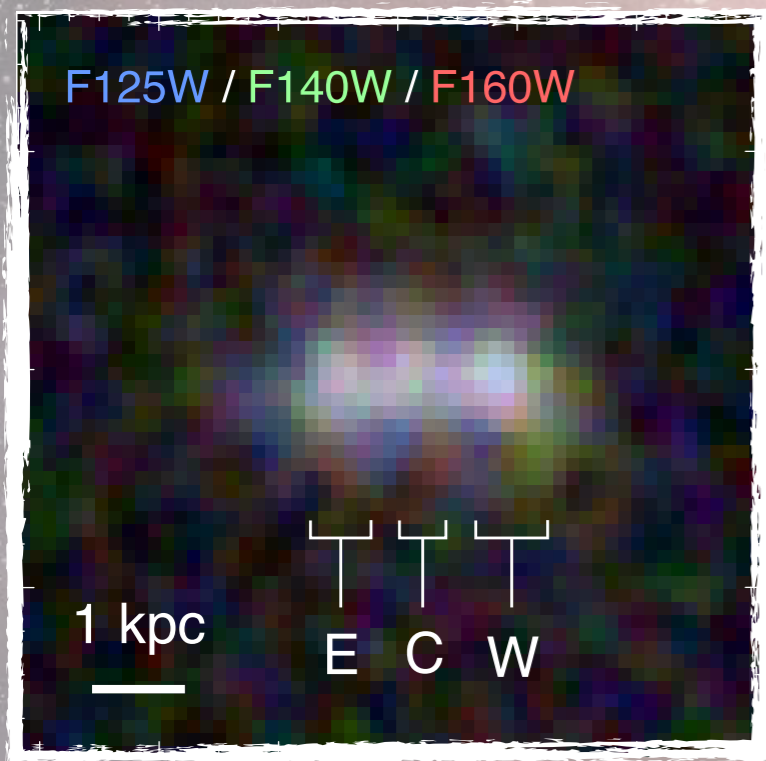


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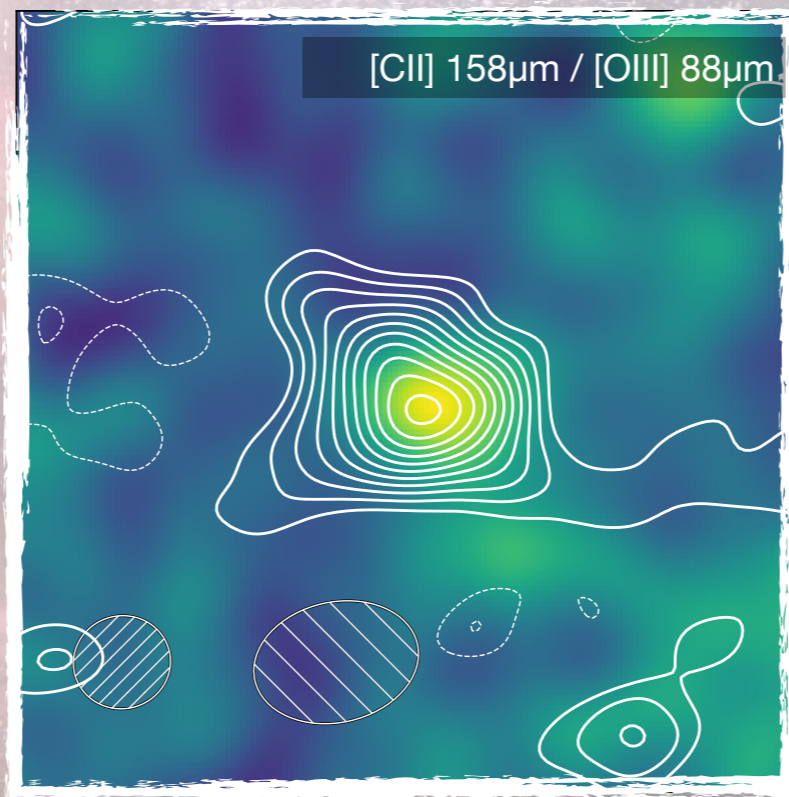
dust and carbon at  $z = 8.3$



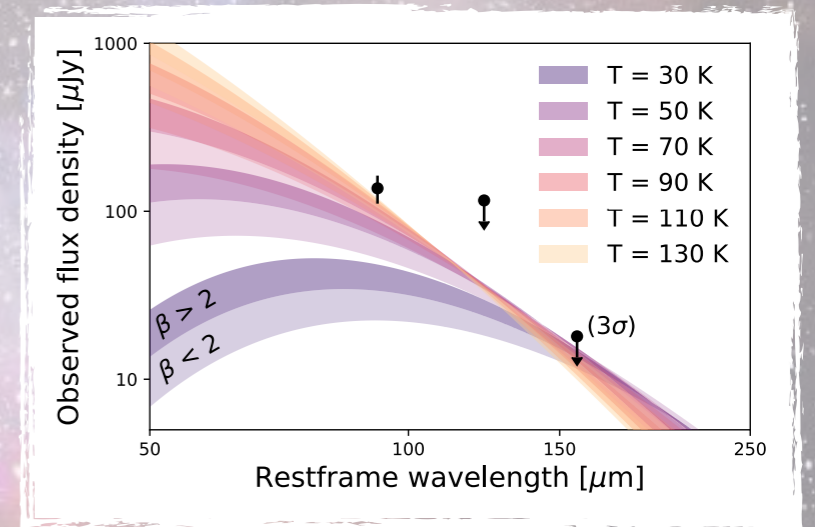
The source ...



... the lines ...



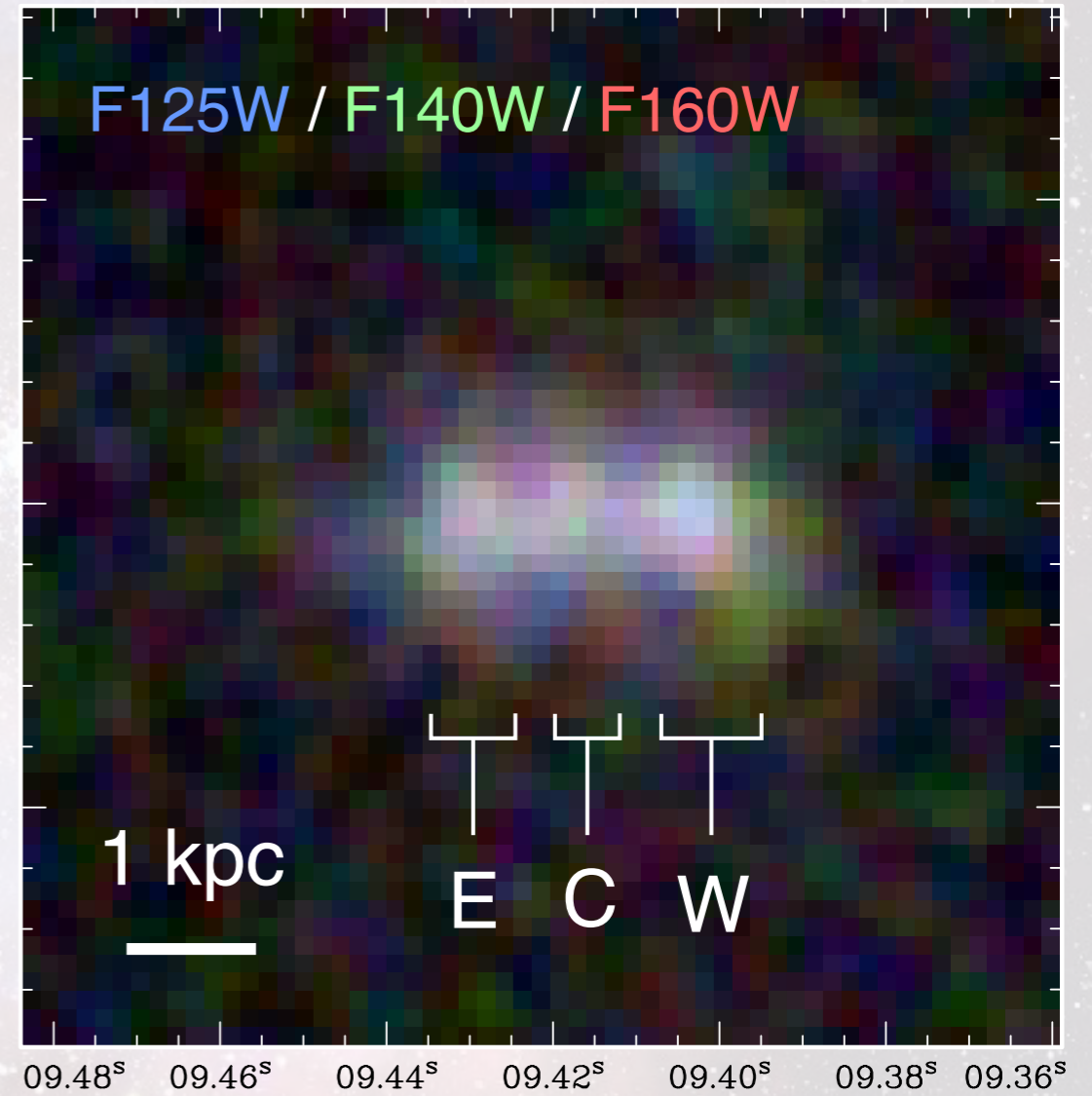
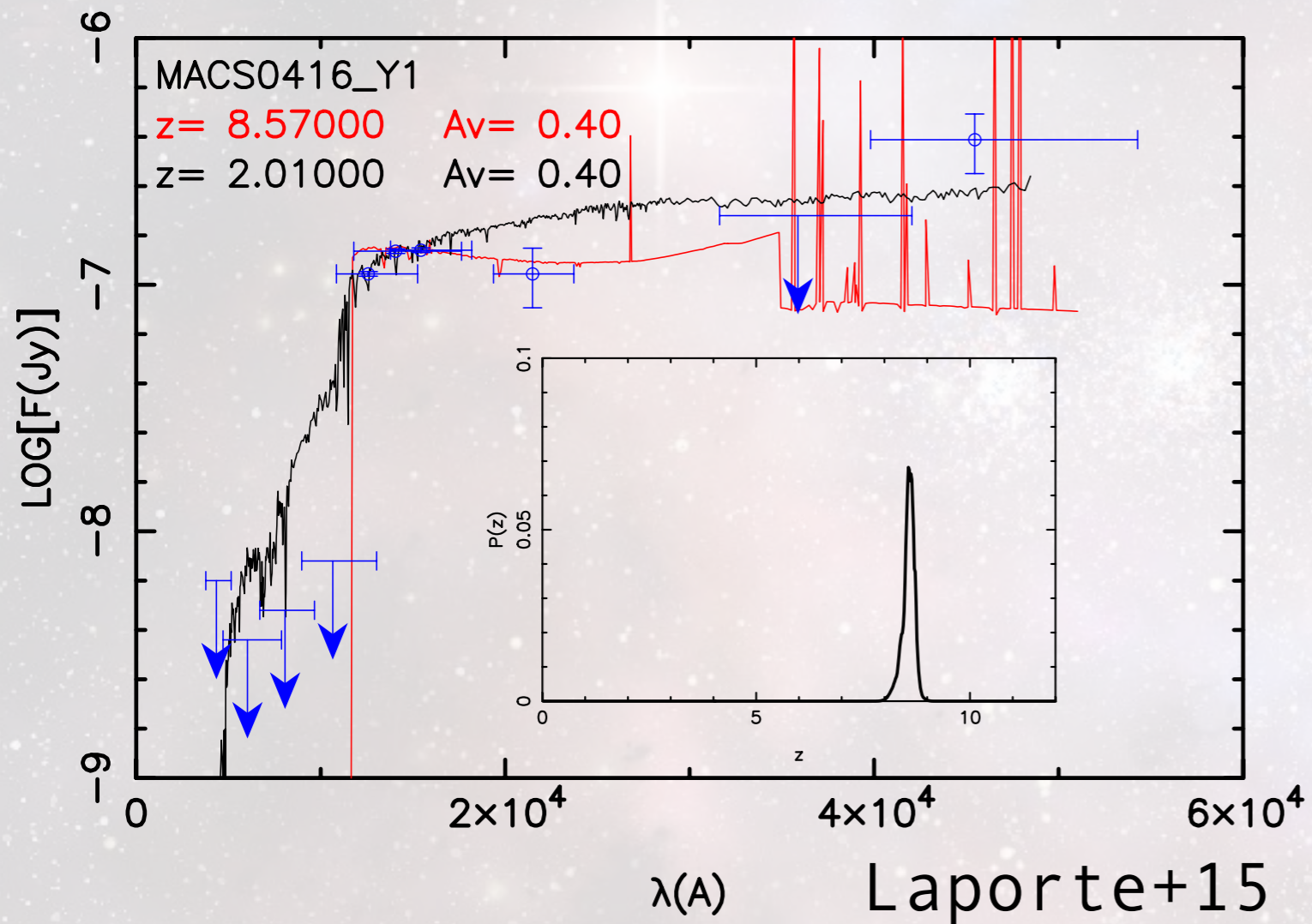
... and the spectrum!



Bakx+2020:  
2001.02812

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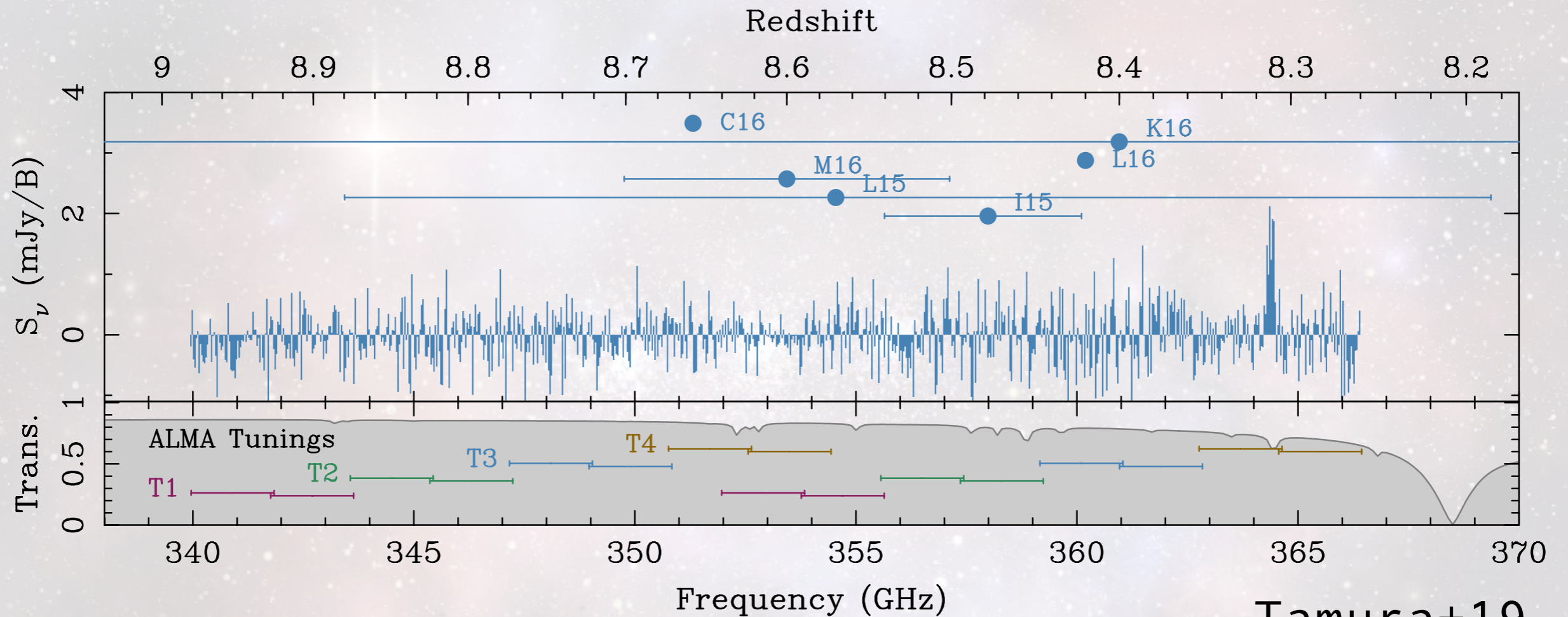
A Y-band drop-out LBG found behind the Hubble Frontier Field



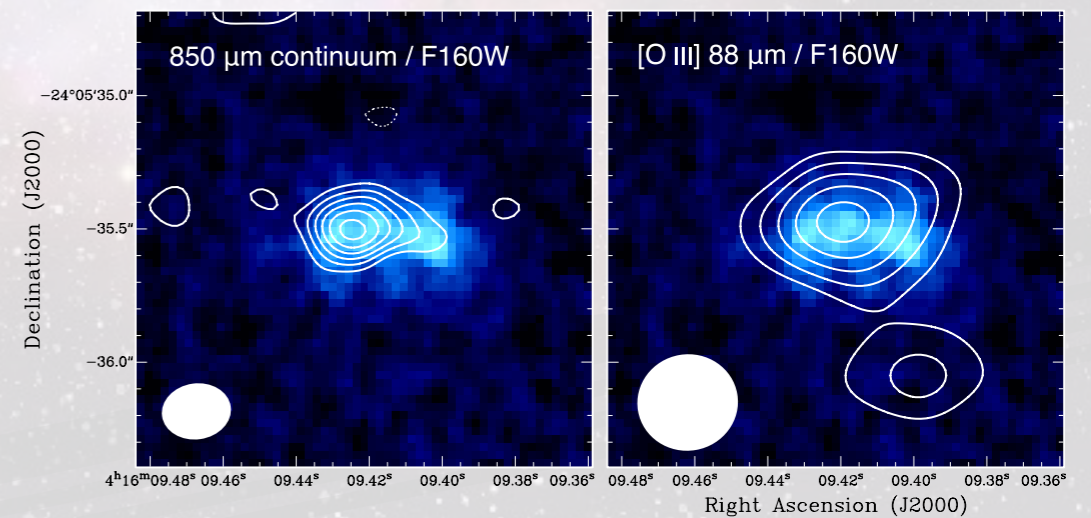
Tamura+19

# MACS0416\_Y1

ALMA redshift sweep found [OIII]88um at  $z = 8.31$

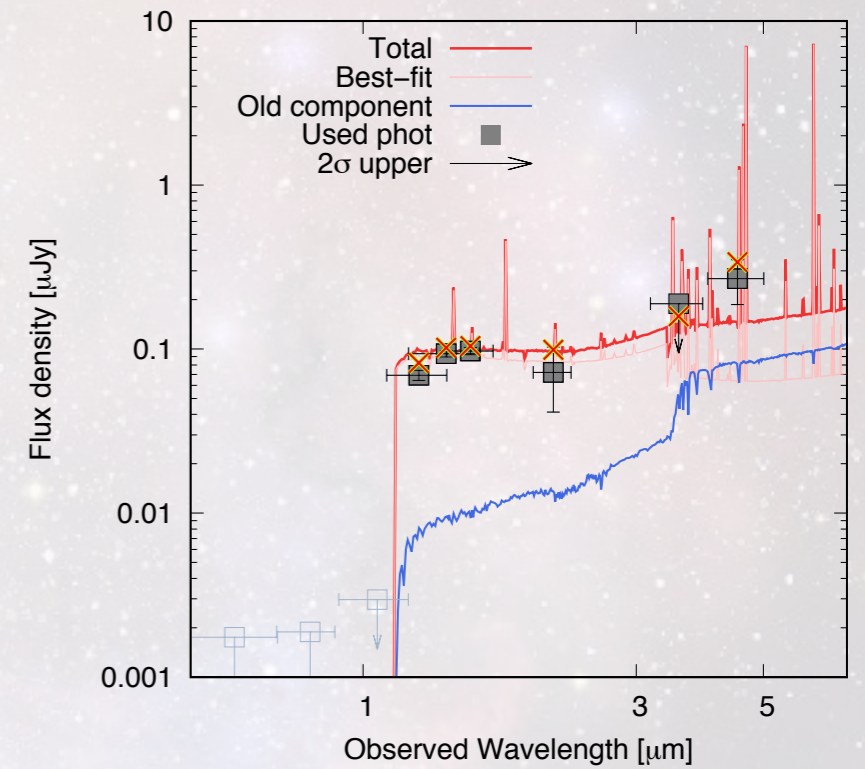
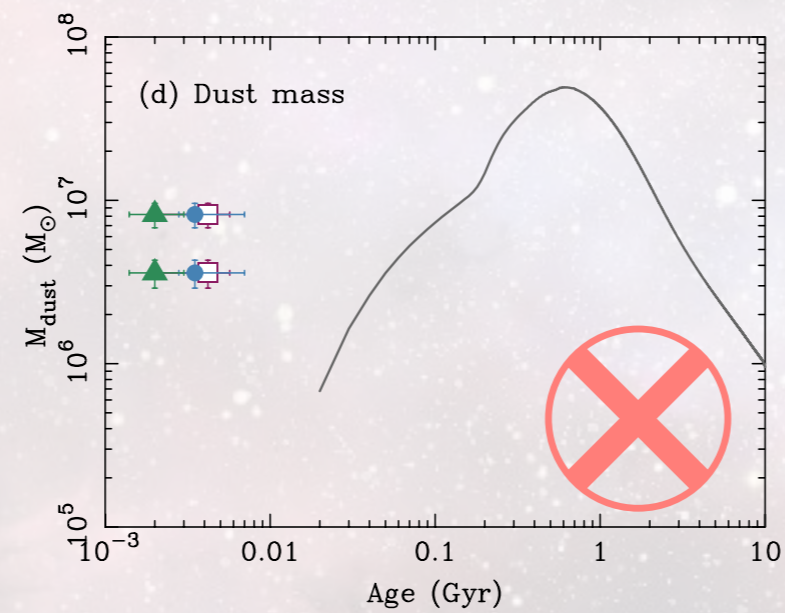
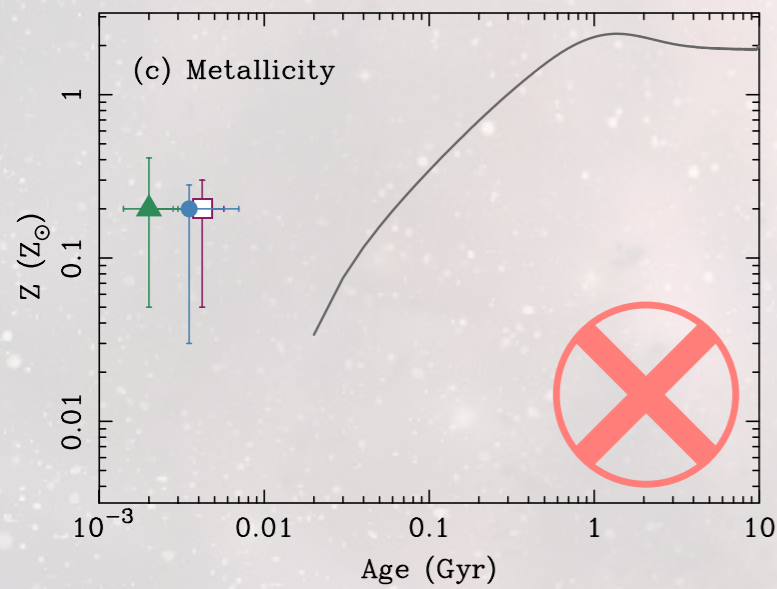
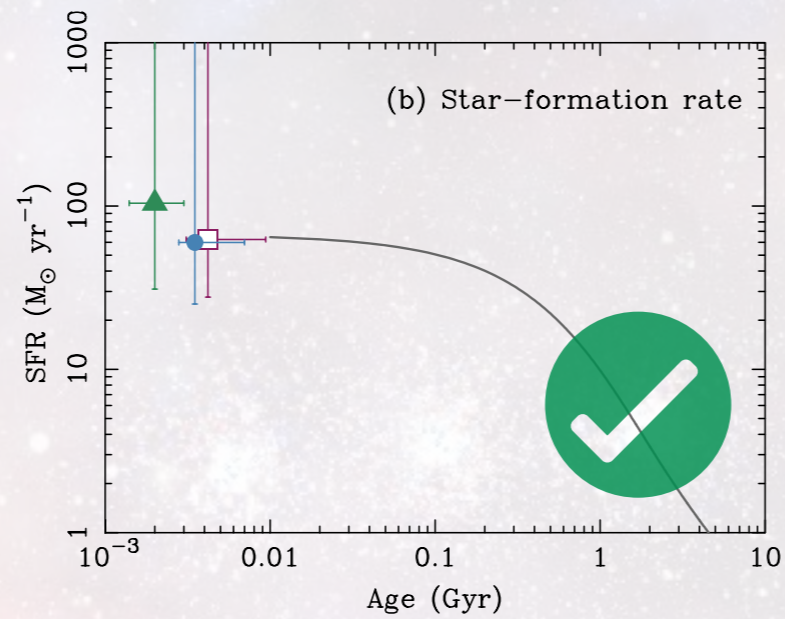
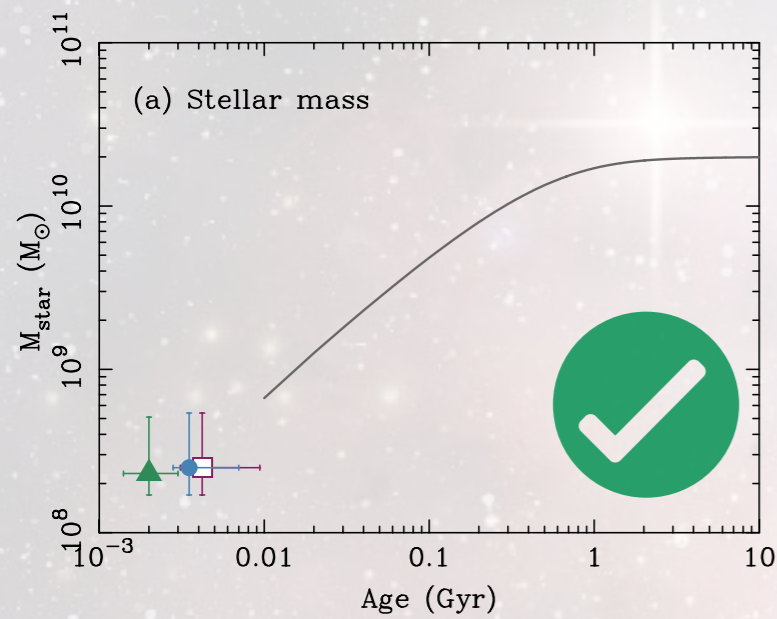


Tamura+19



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UV-to-FIR modeling suggests older stellar component at  $z = 15$

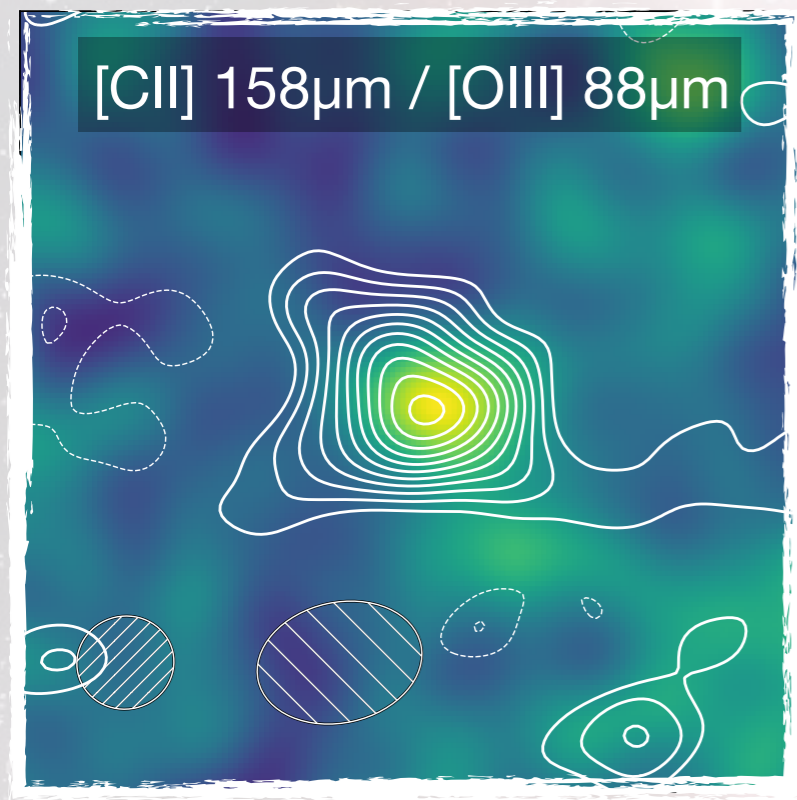


Tamura+19

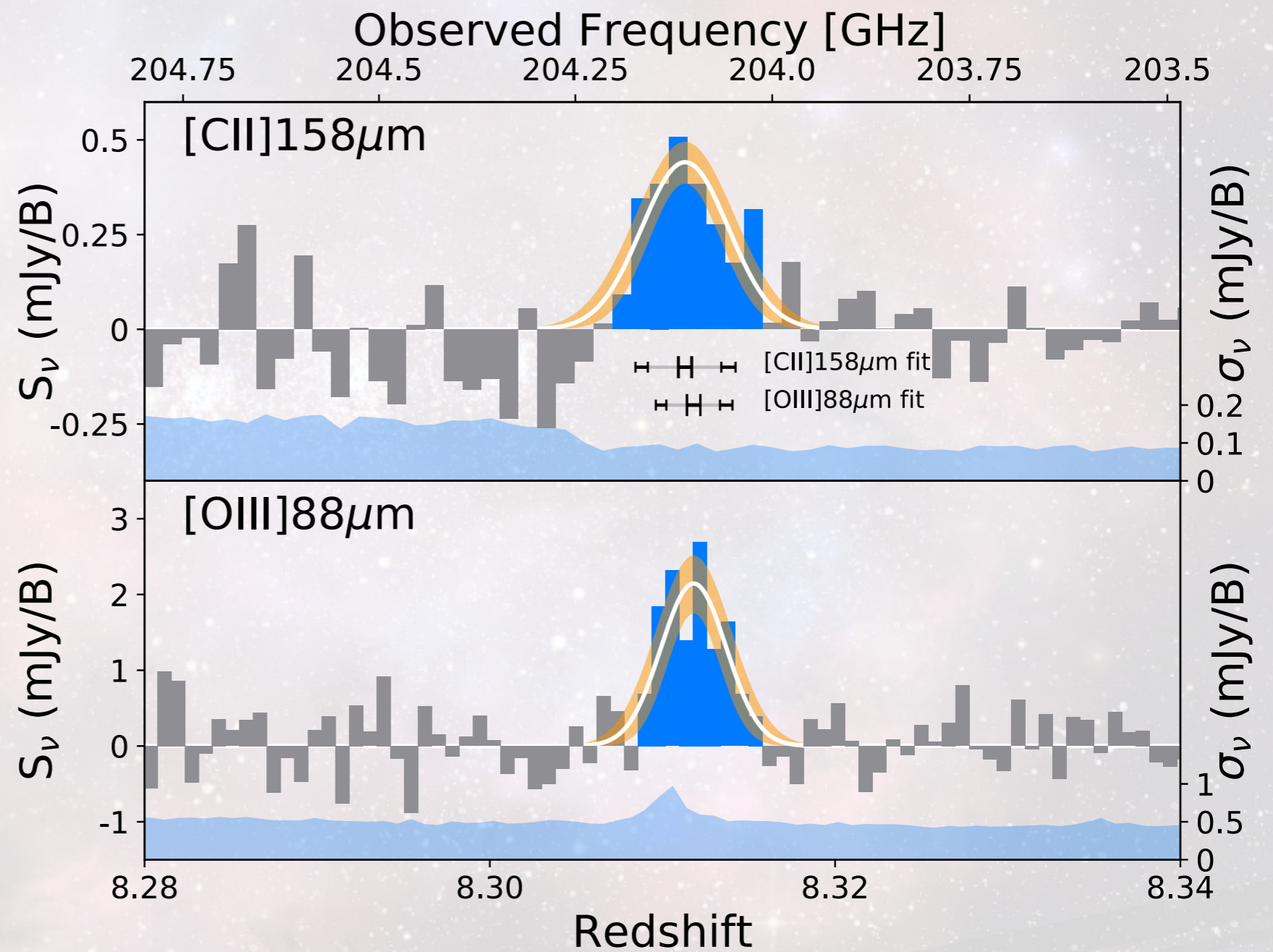
Yesterday's talk:  
G. Roberts-Borsani

# MACS0416\_Y1

No obvious offset between [CII] and [OIII]



Bakx+2020

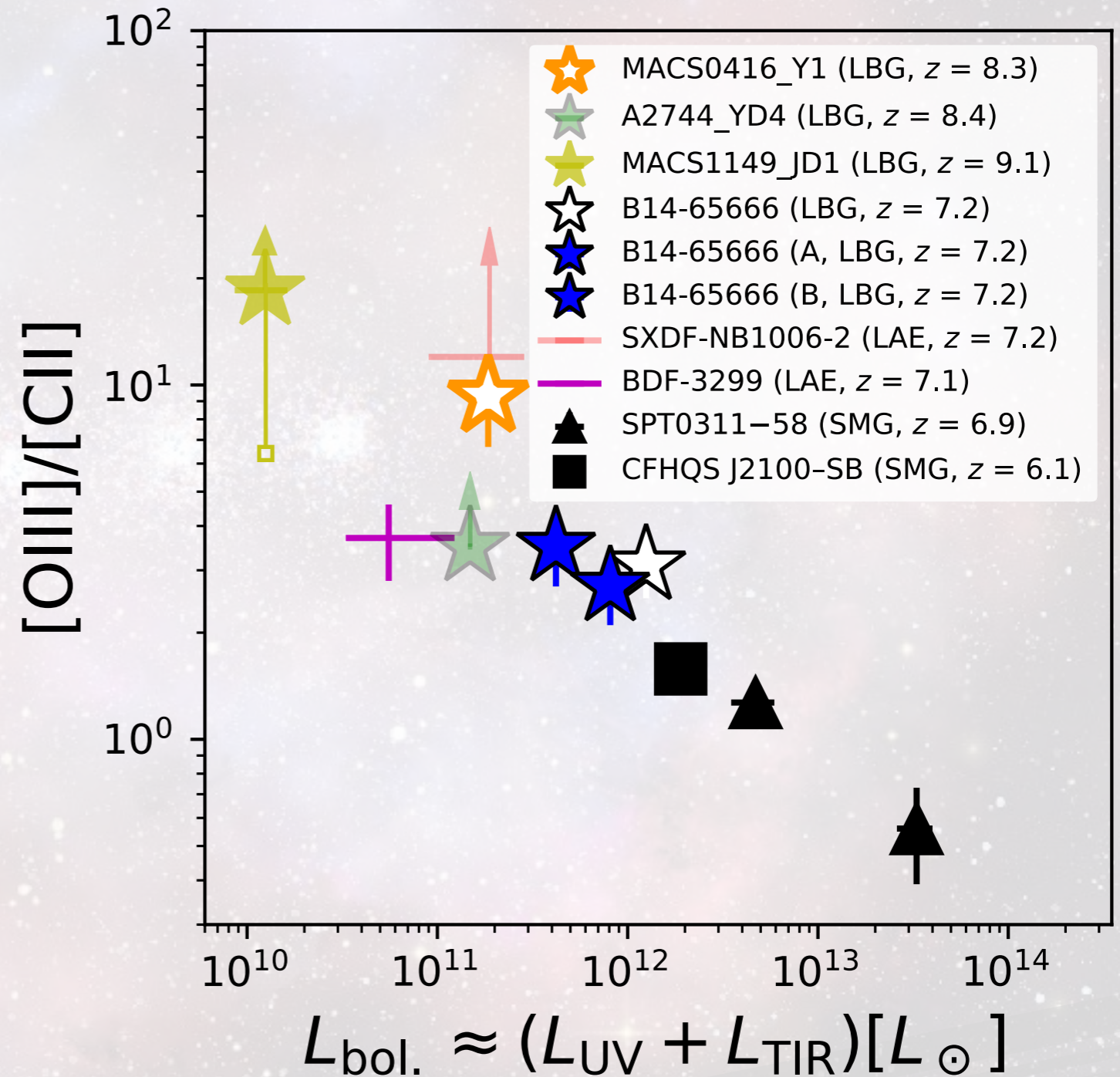
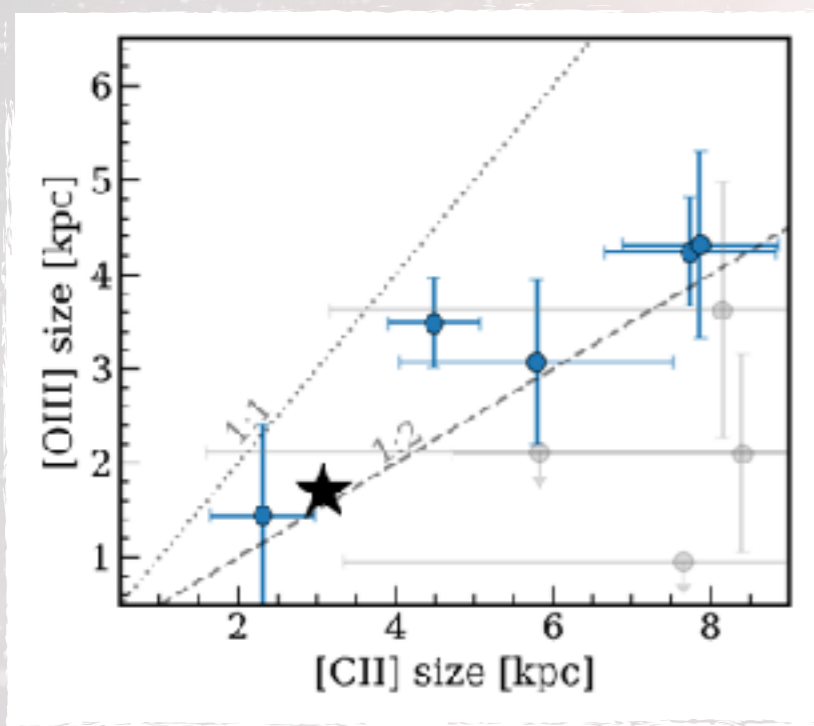


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High [OIII]/[CII] ratio suggests strong rad. fields

Today's talk:  
Y. Harikane  
Poster:  
M. Hagimoto

Carniani+20

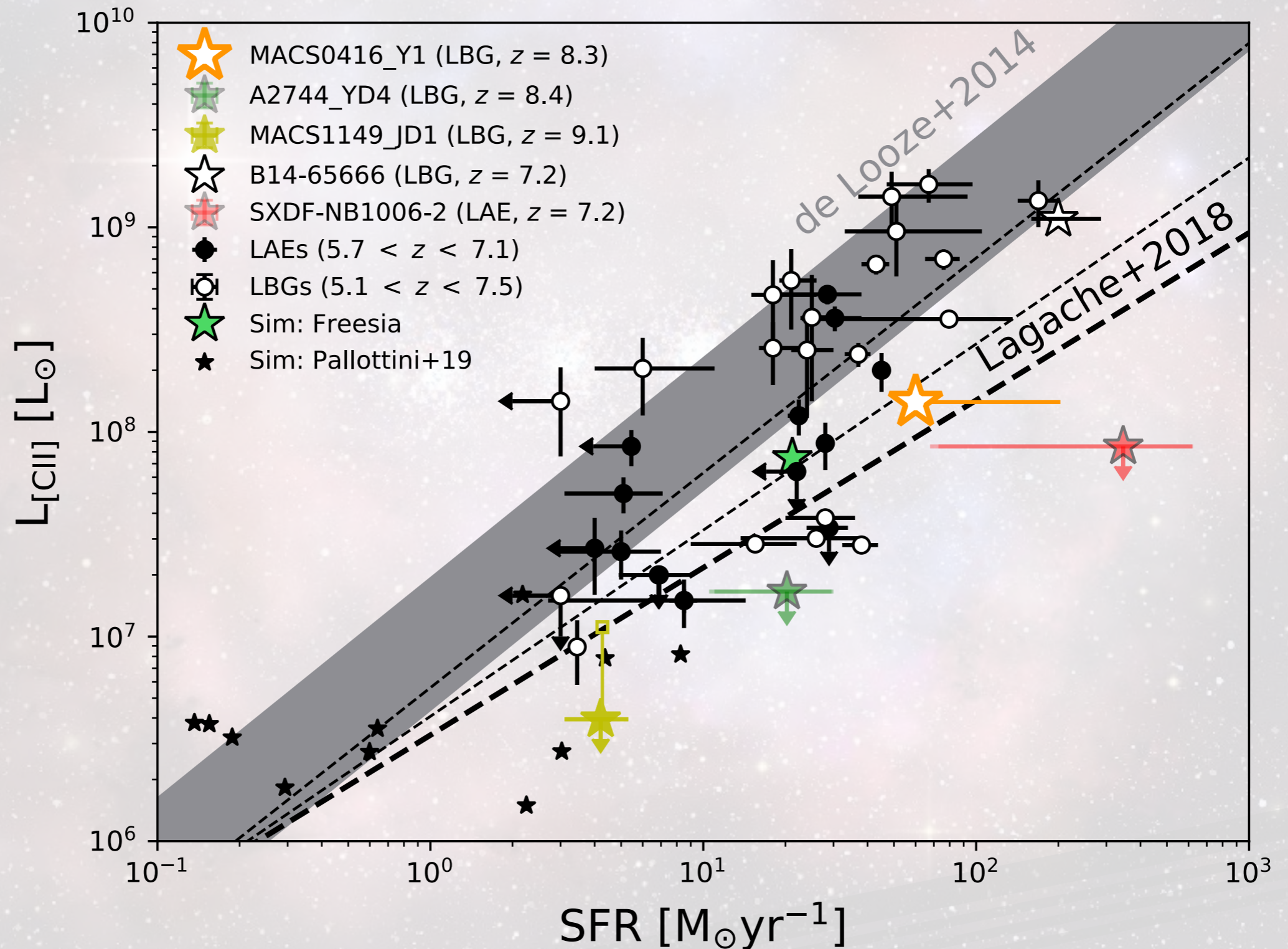




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[CII] deficit at high redshift?

Tomorrow's talk:  
Y. Khusanova

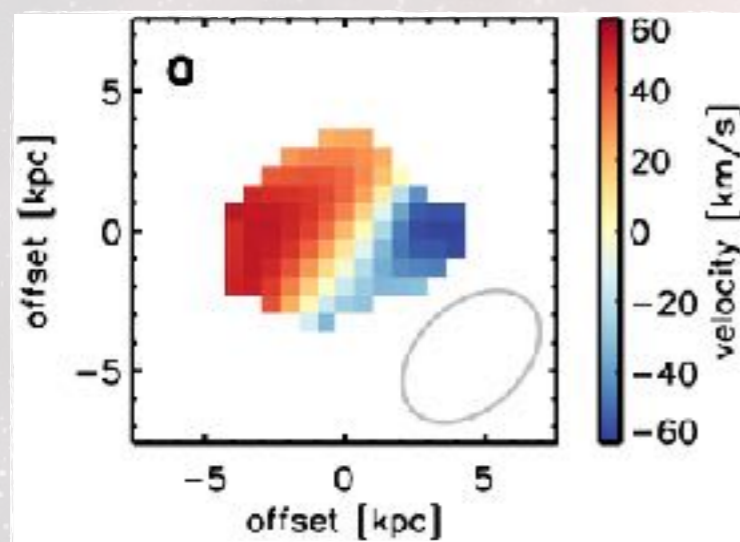
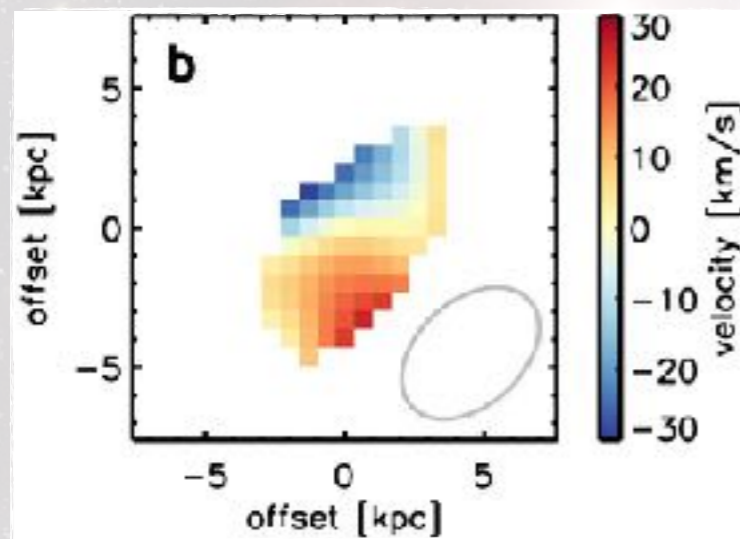


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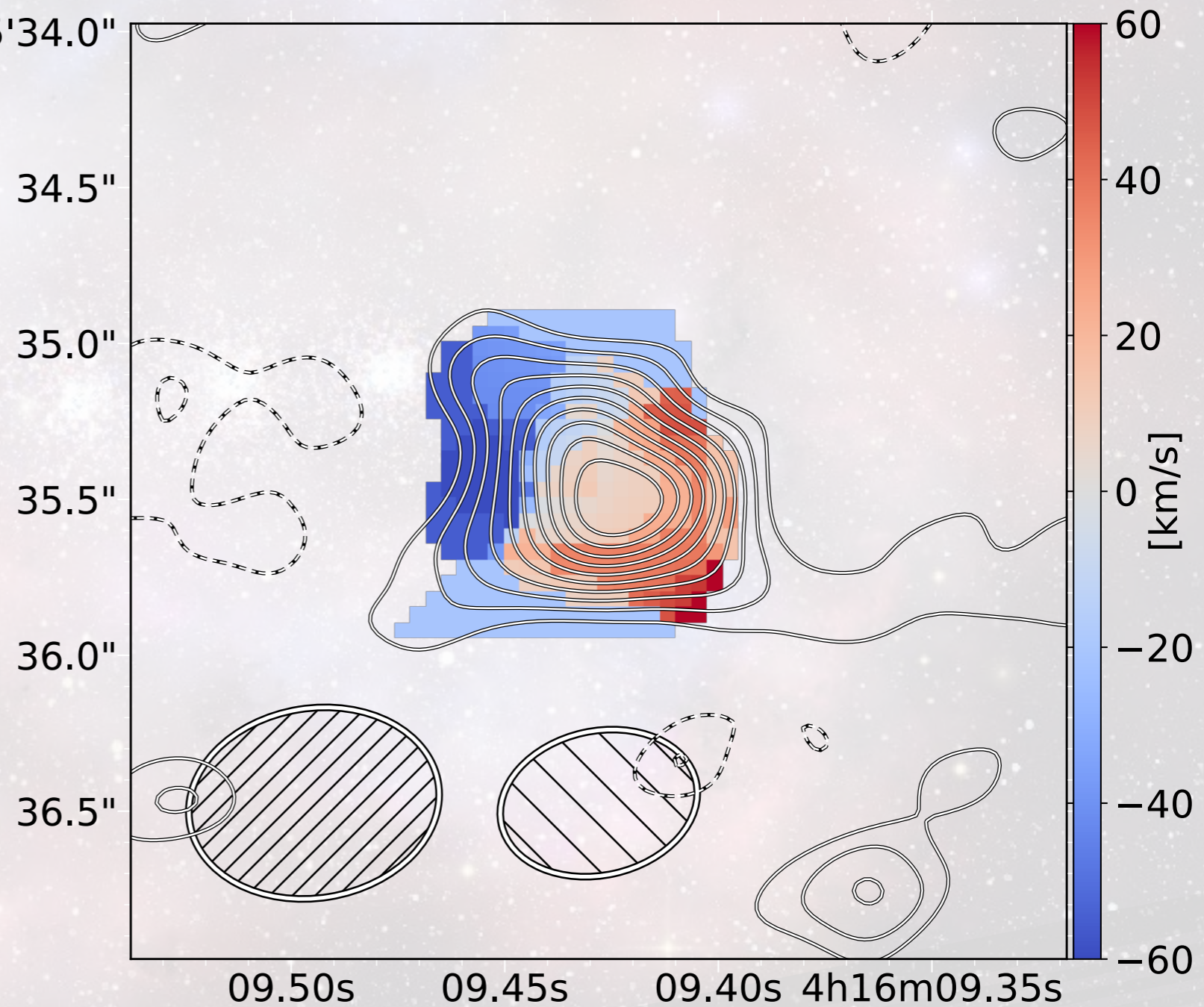
Rotation at  $z = 8.31$ ?

Tomorrow's talk:  
G. Jones

Smit+18



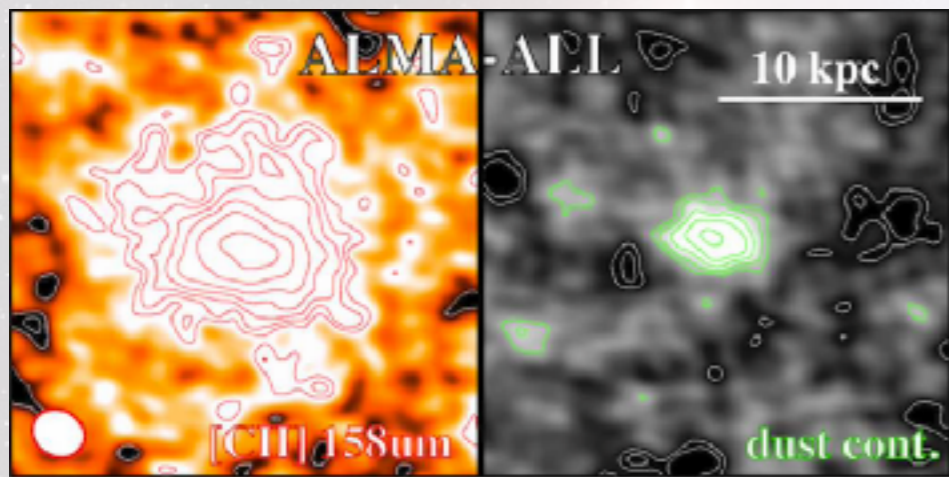
$-24^{\circ}05'34.0''$



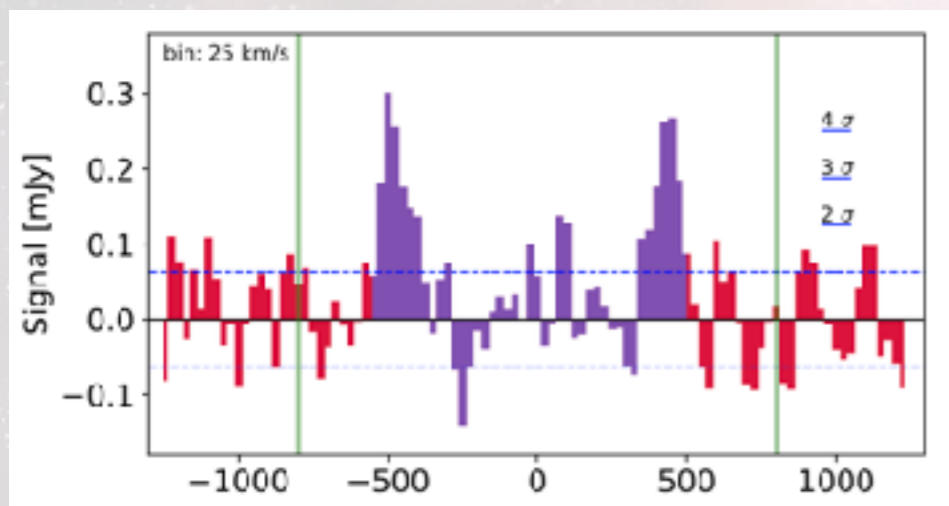
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Or an outflow at  $z = 8.31$ ?

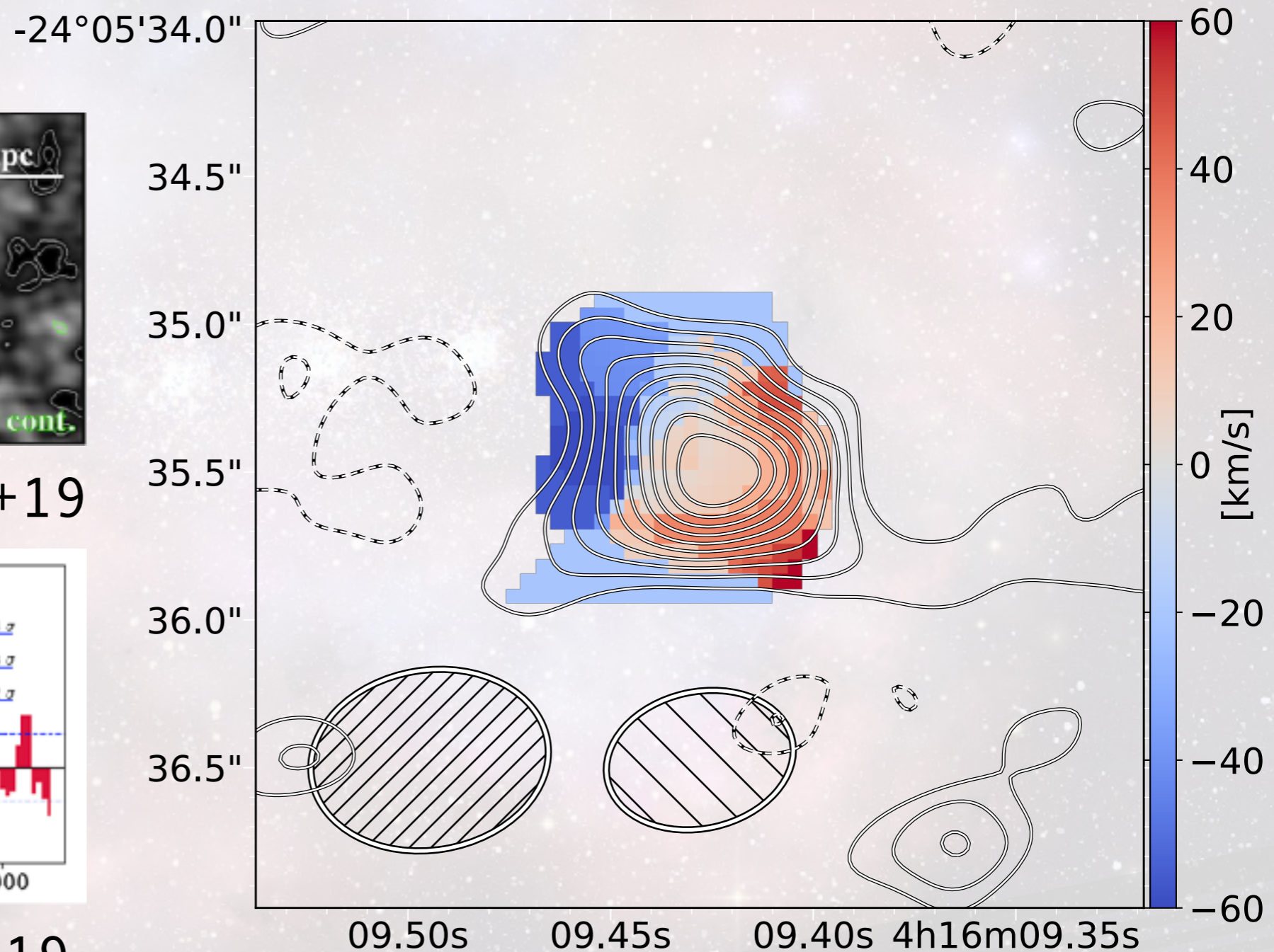
Today's talk:  
Y. Sugahara  
Tomorrow's talk:  
S. Fujimoto



Fujimoto+19



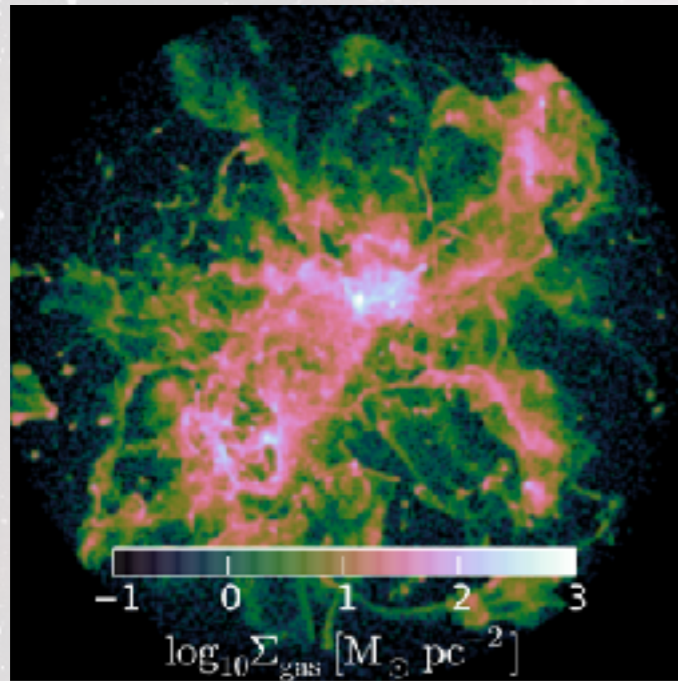
Ginolfi+19



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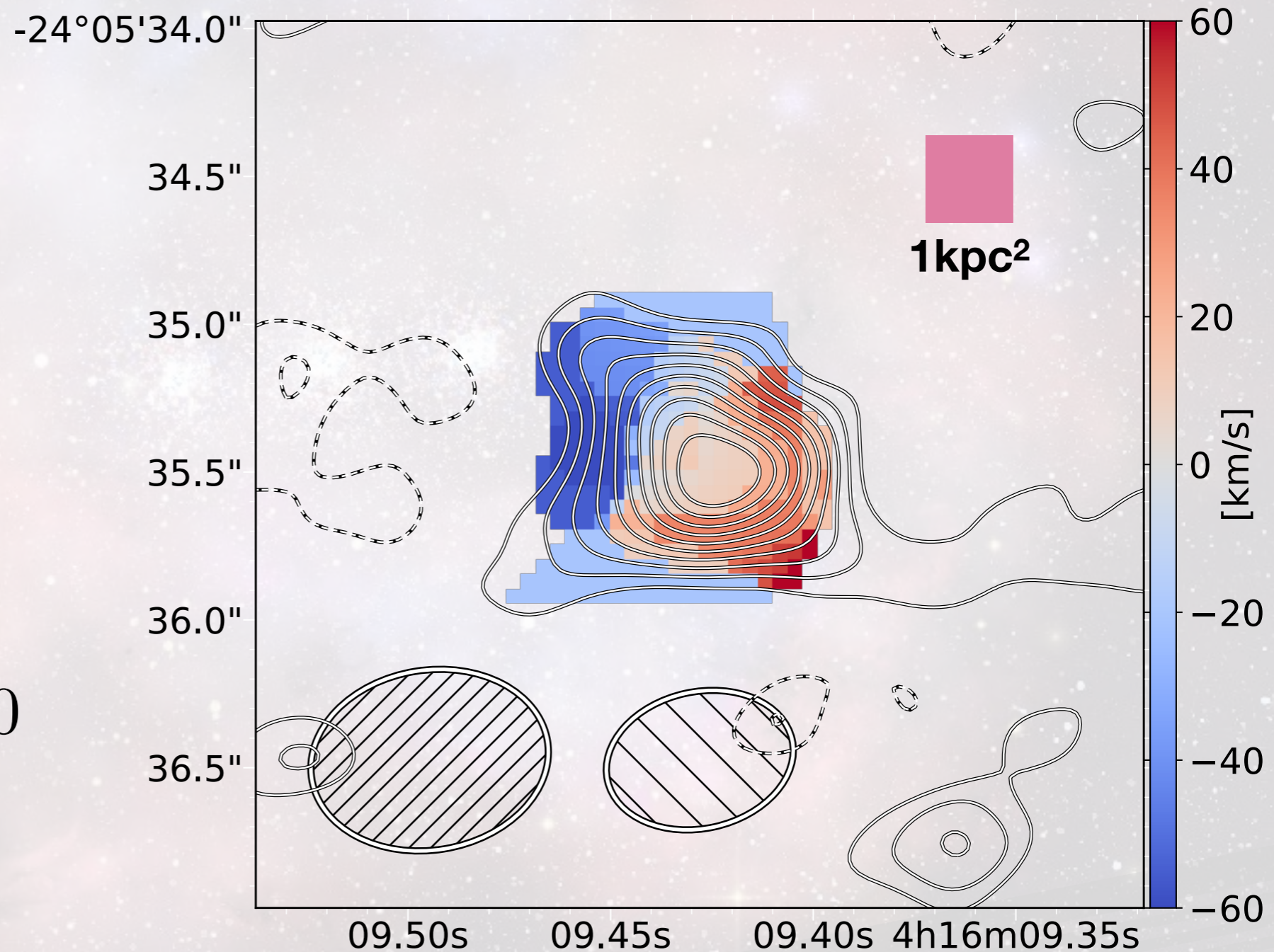
Shallow DM halo cannot keep the gas together

Today's talk:  
Y. Sugahara  
Tomorrow's talk:  
S. Fujimoto



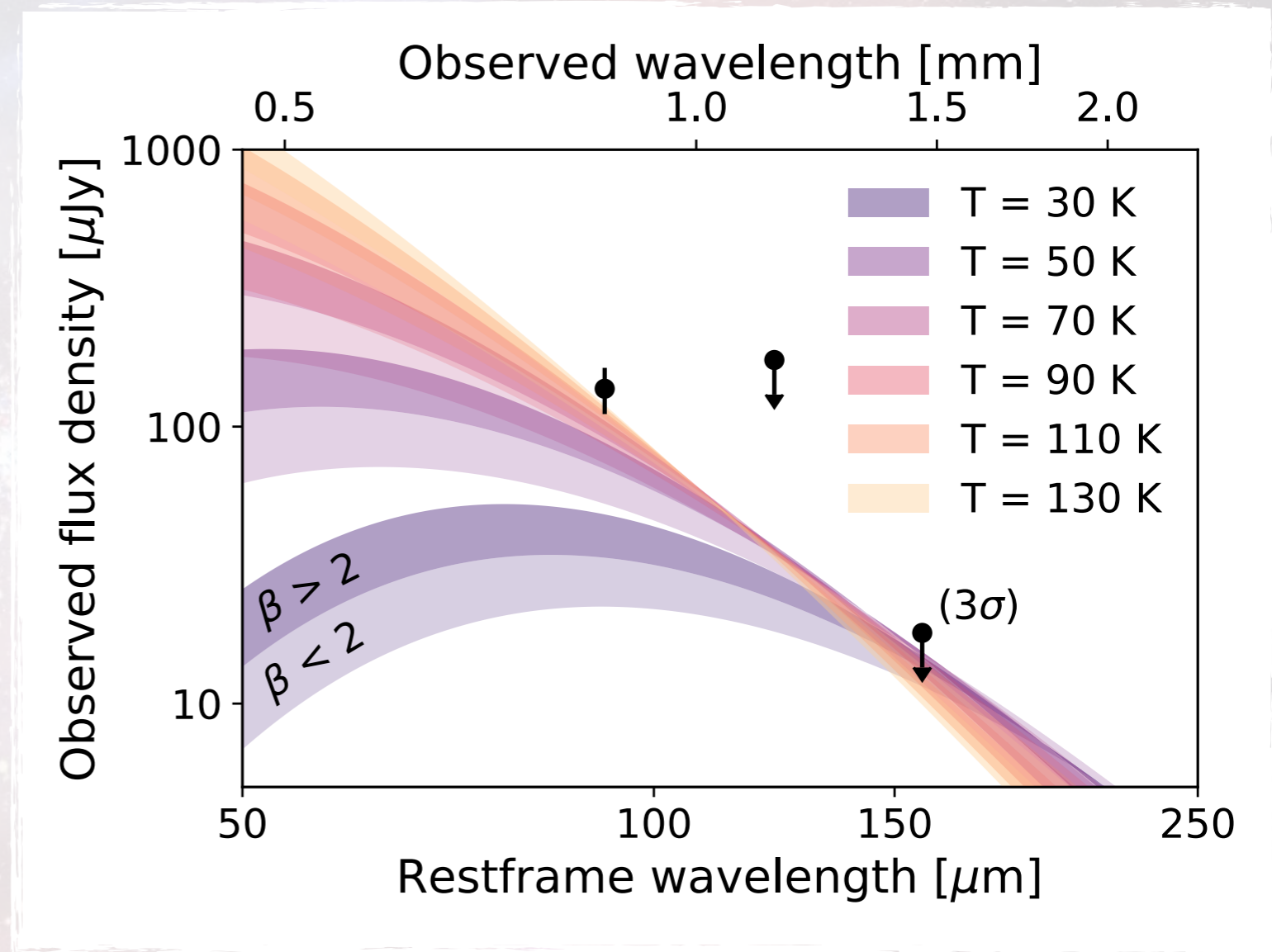
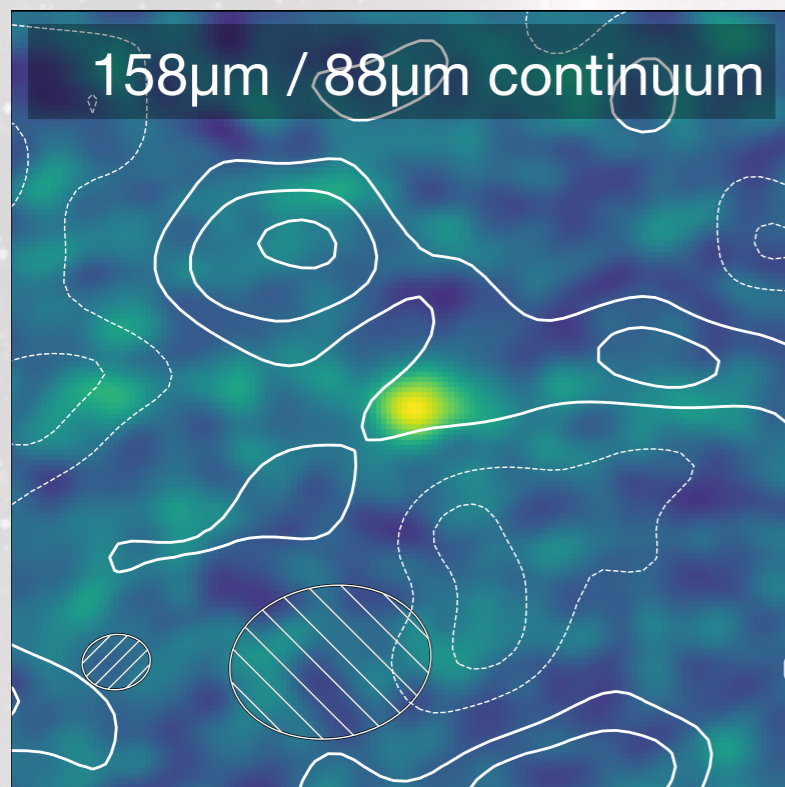
Arata+19

$$\frac{\dot{M}}{\text{SFR}} \sim 0.1 - 100$$



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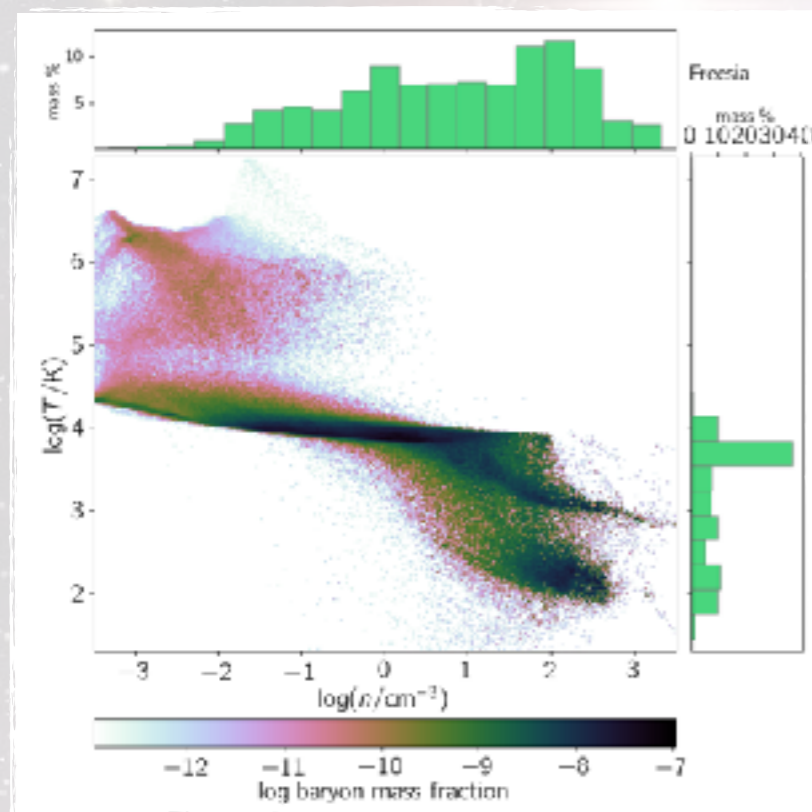
No detection at  $158\mu\text{m}$   $\therefore$  high dust temperatures



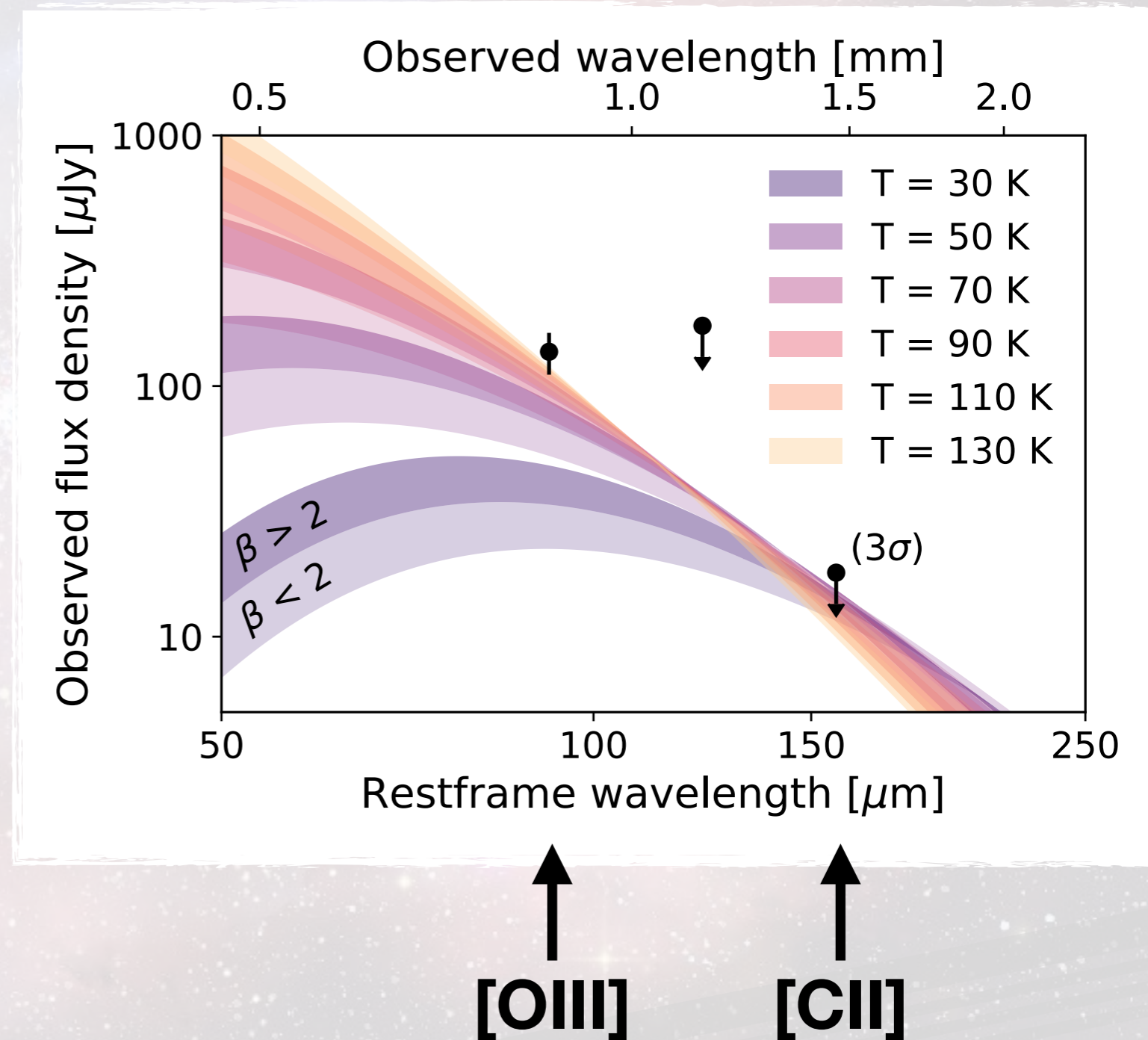
Tomorrow's talk:  
L. Sommovigo

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High dust temperatures  $\therefore$  lower dust masses



Pallottini+19

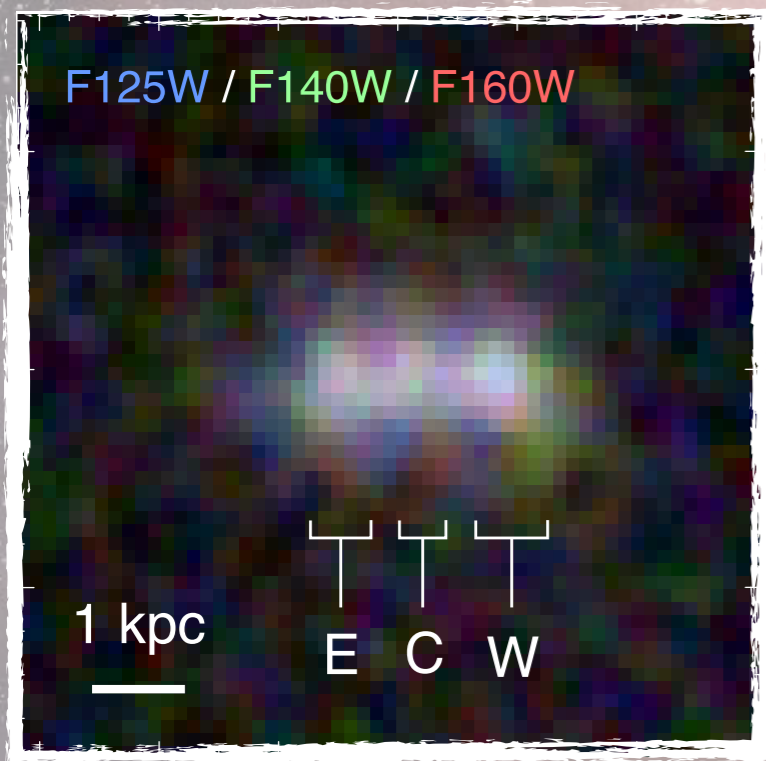


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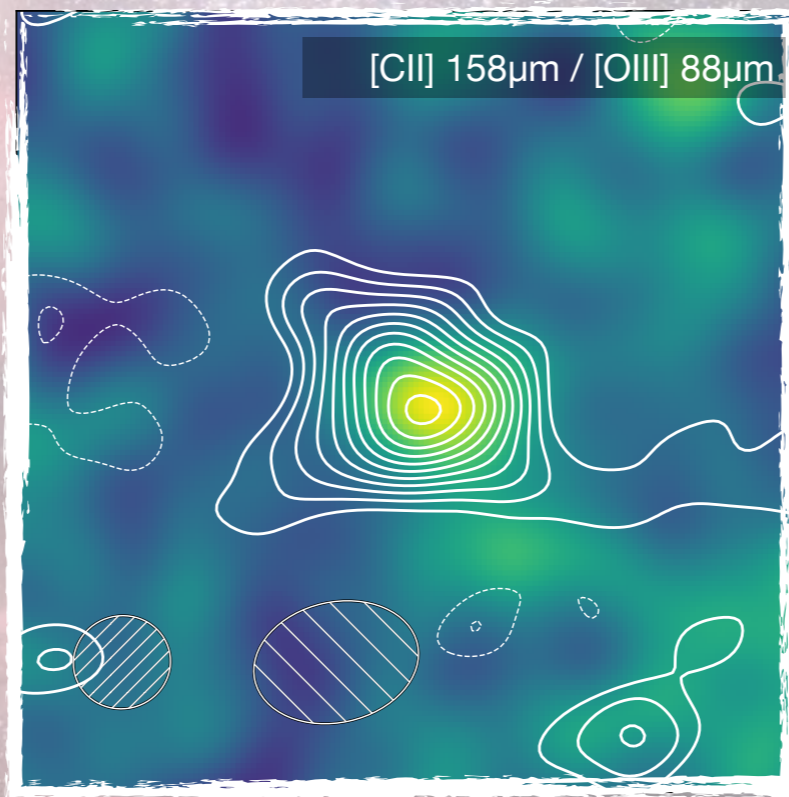
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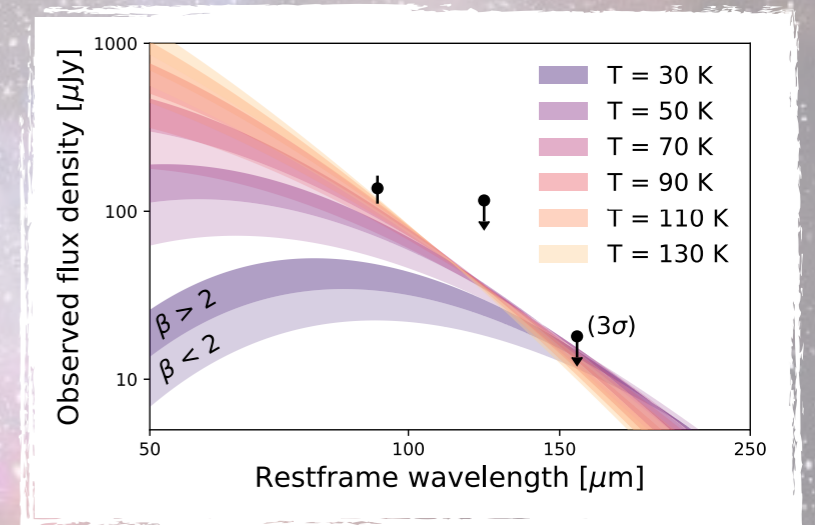
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