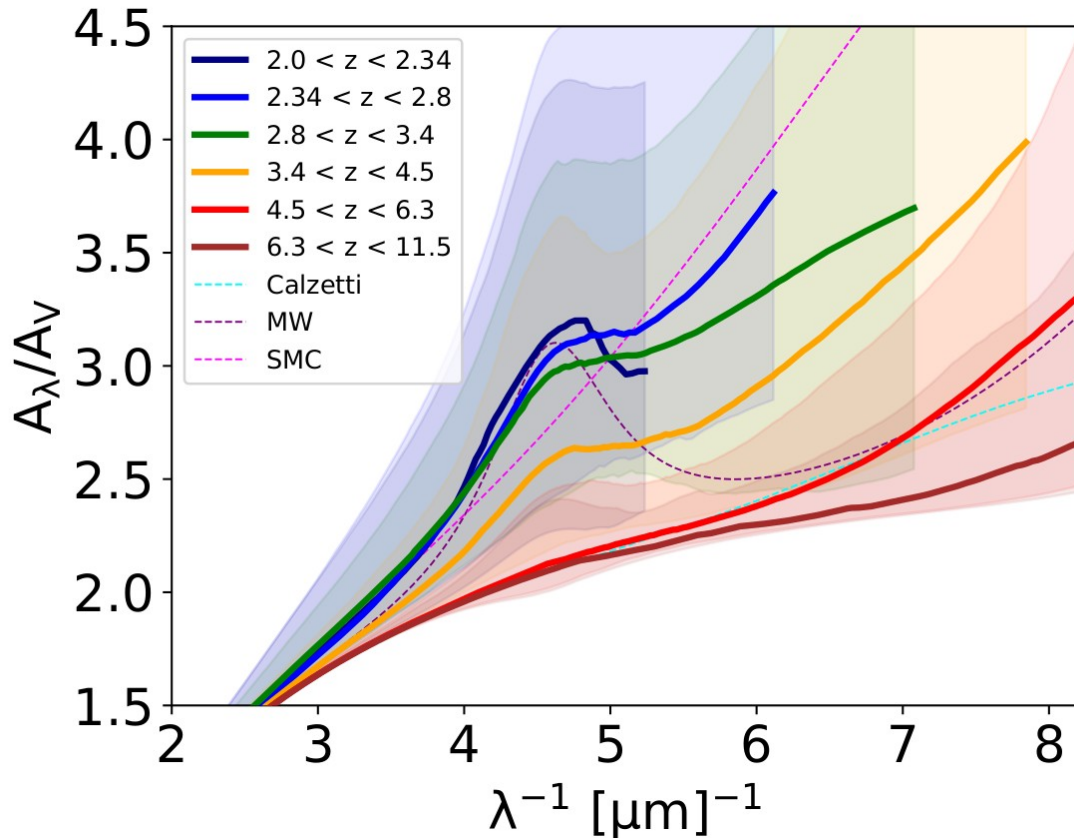


# Evolution of dust attenuation in high-redshift galaxies observed by JWST



## Vladan Markov

S. Gallerani, A. Ferrara,  
M. Bradac et al.



Markov+23



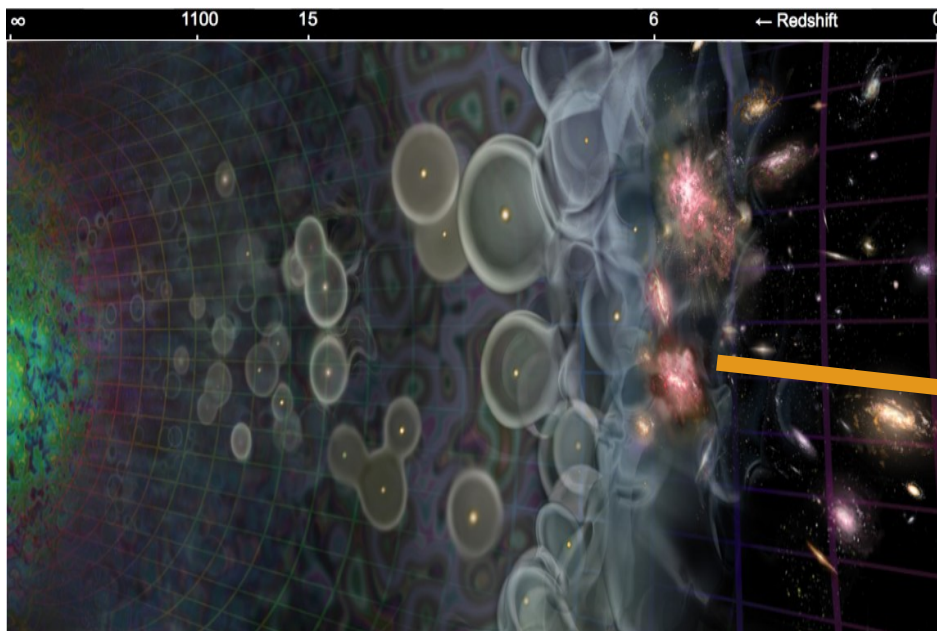
Markov+24

University of Ljubljana

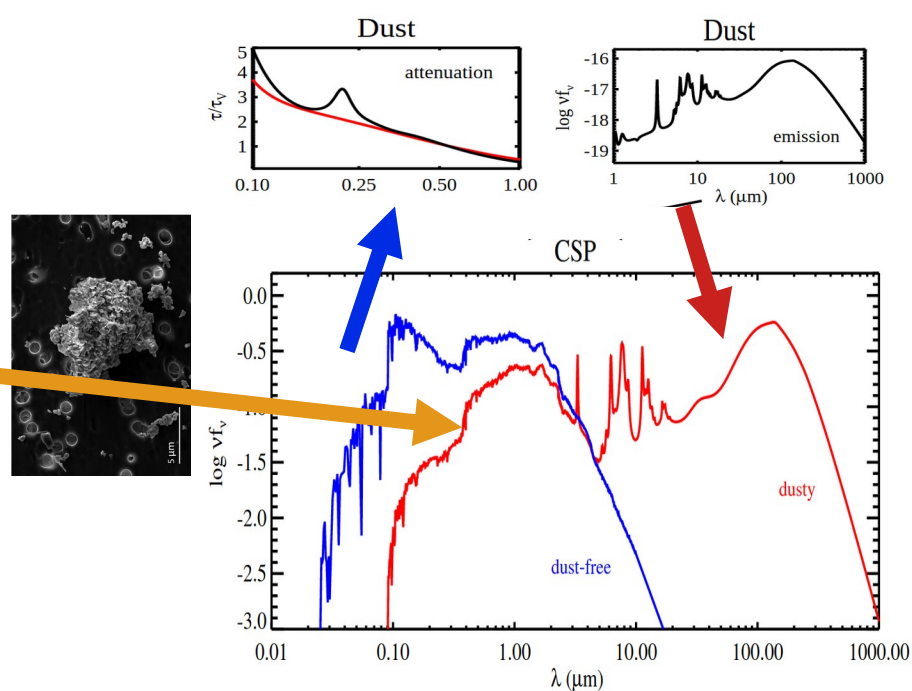




# Dust strongly affects the SED of galaxies



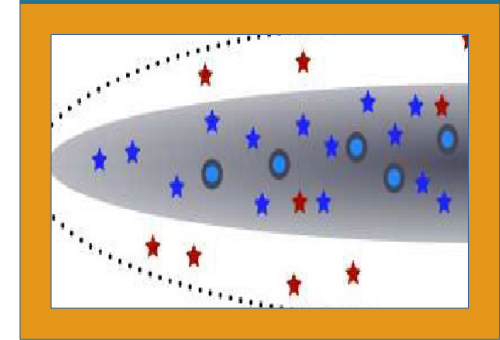
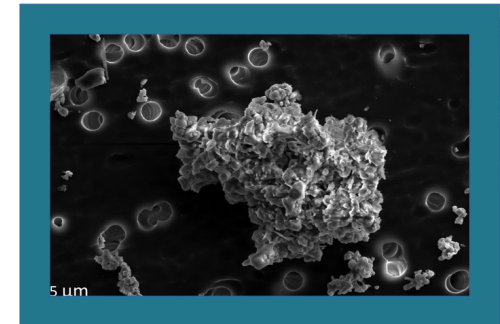
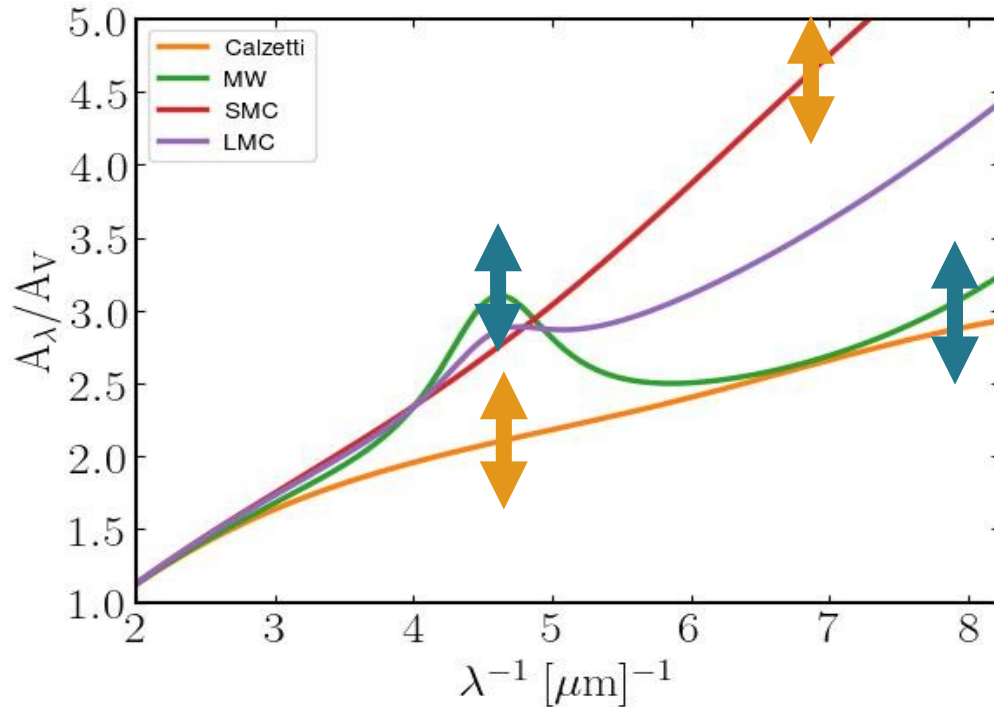
Loeb+06



Conroy+13



# What shapes dust attenuation curves ?



Extinction



Attenuation



See: Salim & Narayanan+20



## Main goals:

- Tool for constraining the dust attenuation law and global properties in early galaxies



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- Tool for constraining the dust attenuation law and global properties in early galaxies
- Redshift evolution of the dust attenuation curve



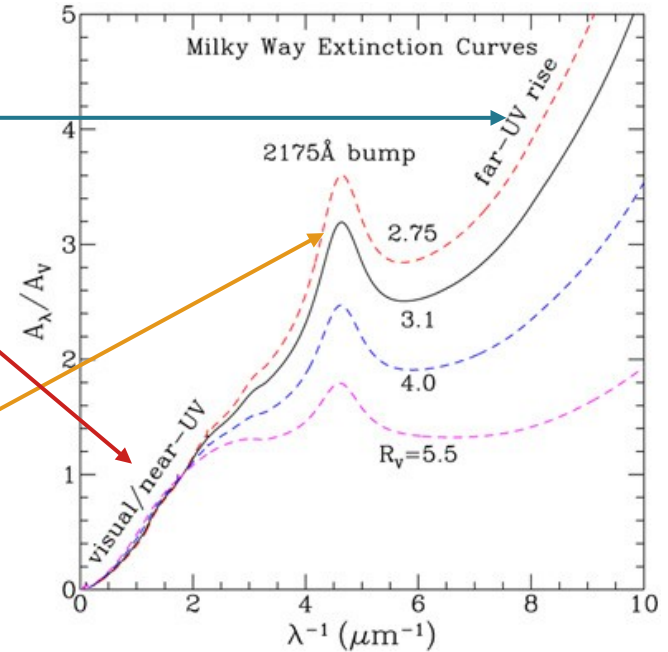
## Main goals:

- Tool for constraining the dust attenuation law and global properties in early galaxies
- Redshift evolution of the dust attenuation curve
- UV bump detection at  $z \sim 2 - 7.5$



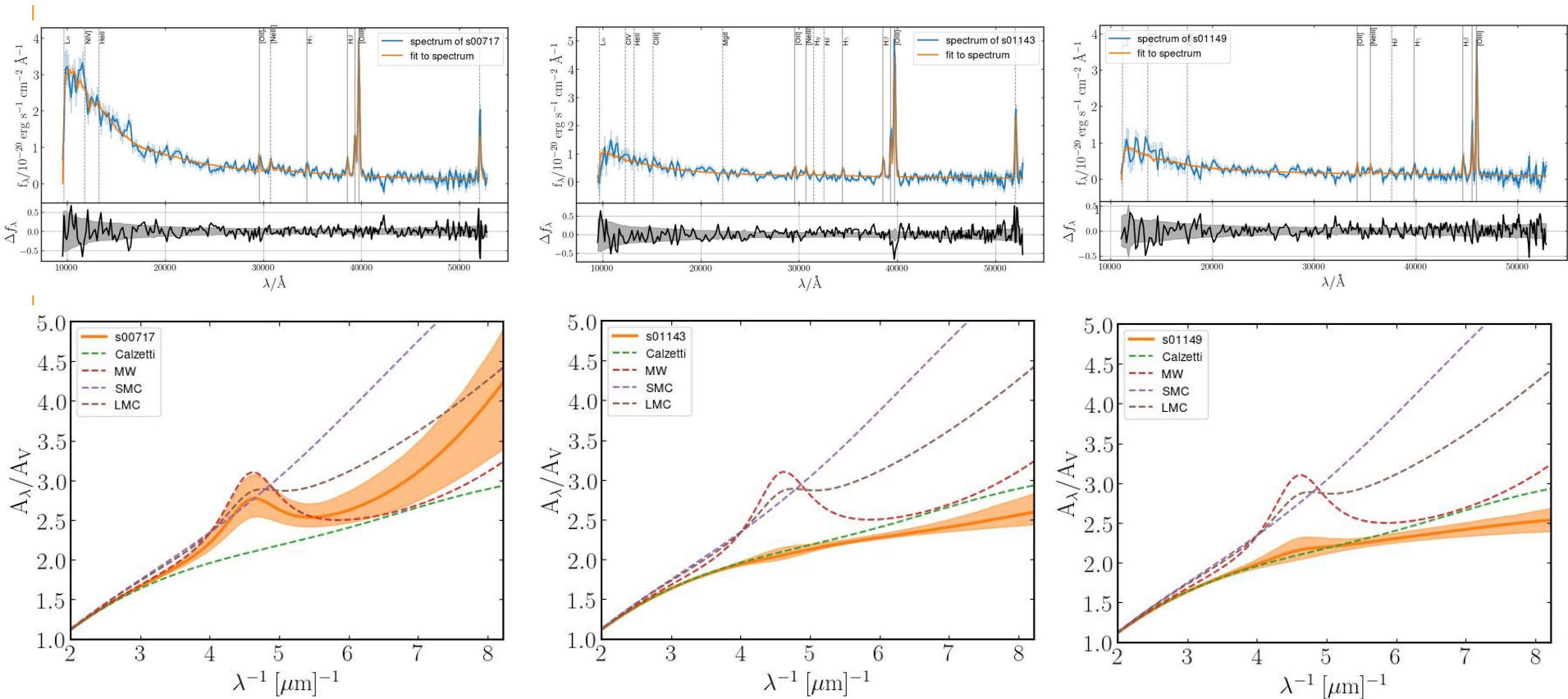
# Analytical dust attenuation model (Li+08) → BAGPIPES (Carnall+18)

$$\begin{aligned}
 A_\lambda/A_V = & \frac{c_1}{(\lambda/0.08)^{c_2} + (0.08/\lambda)^{c_2} + c_3} \\
 & + \frac{233[1 - c_1/(6.88^{c_2} + 0.145^{c_2} + c_3) - c_4/4.60]}{(\lambda/0.046)^2 + (0.046/\lambda)^2 + 90} \\
 & + \frac{c_4}{(\lambda/0.2175)^2 + (0.2175/\lambda)^2 - 1.95},
 \end{aligned}$$





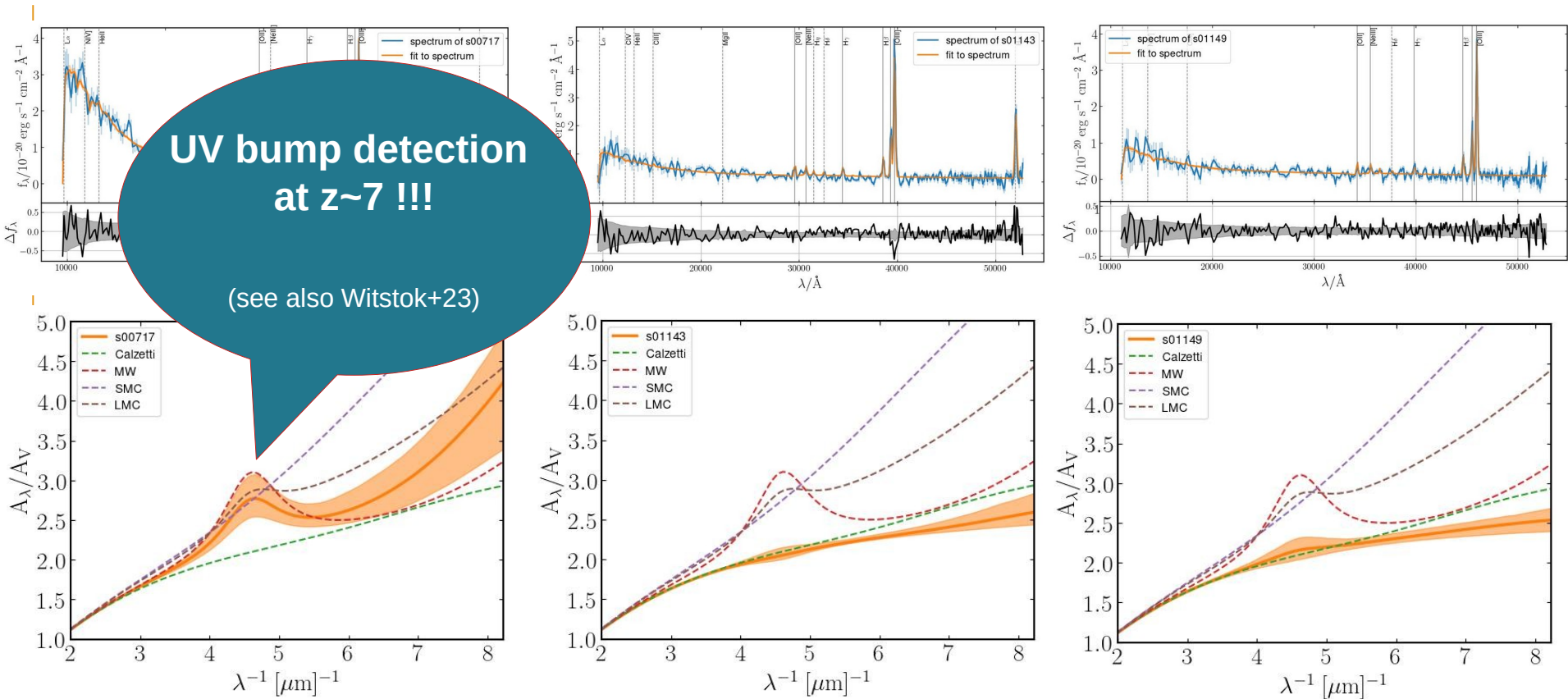
# Dust attenuation curves in JWST galaxies at the EOR (Markov+23)





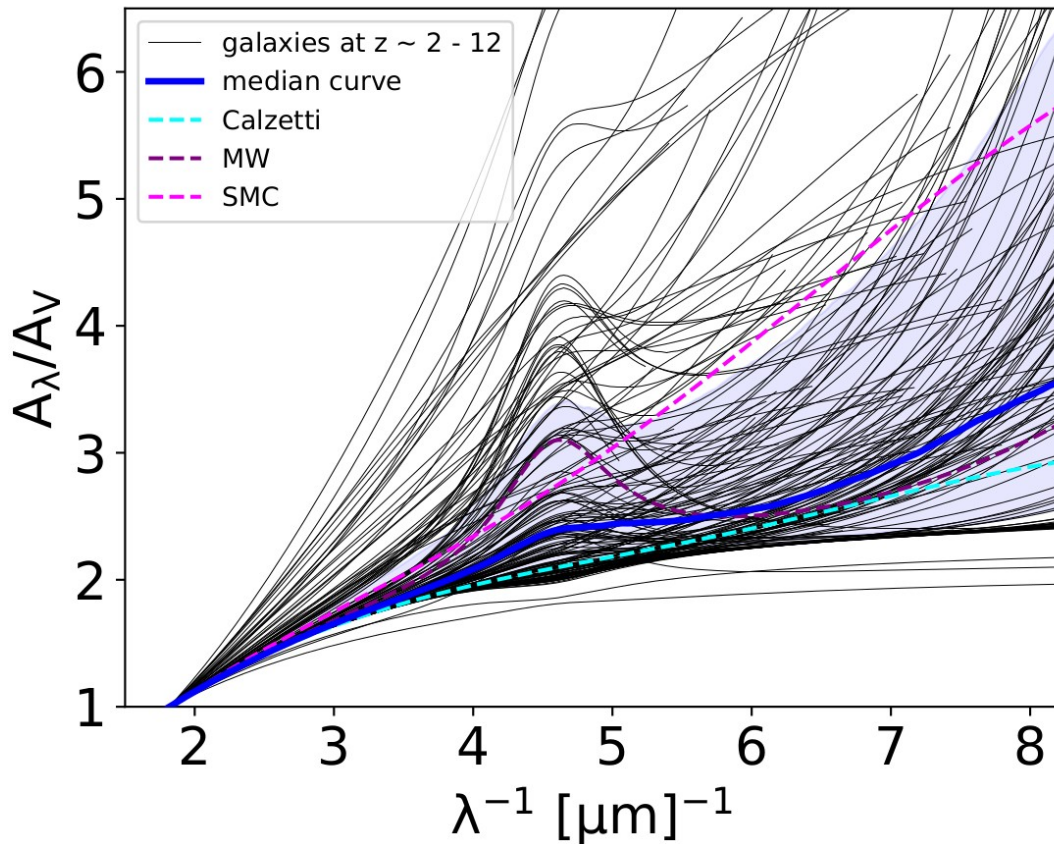


# Dust attenuation curves in JWST galaxies at the EOR (Markov+23)



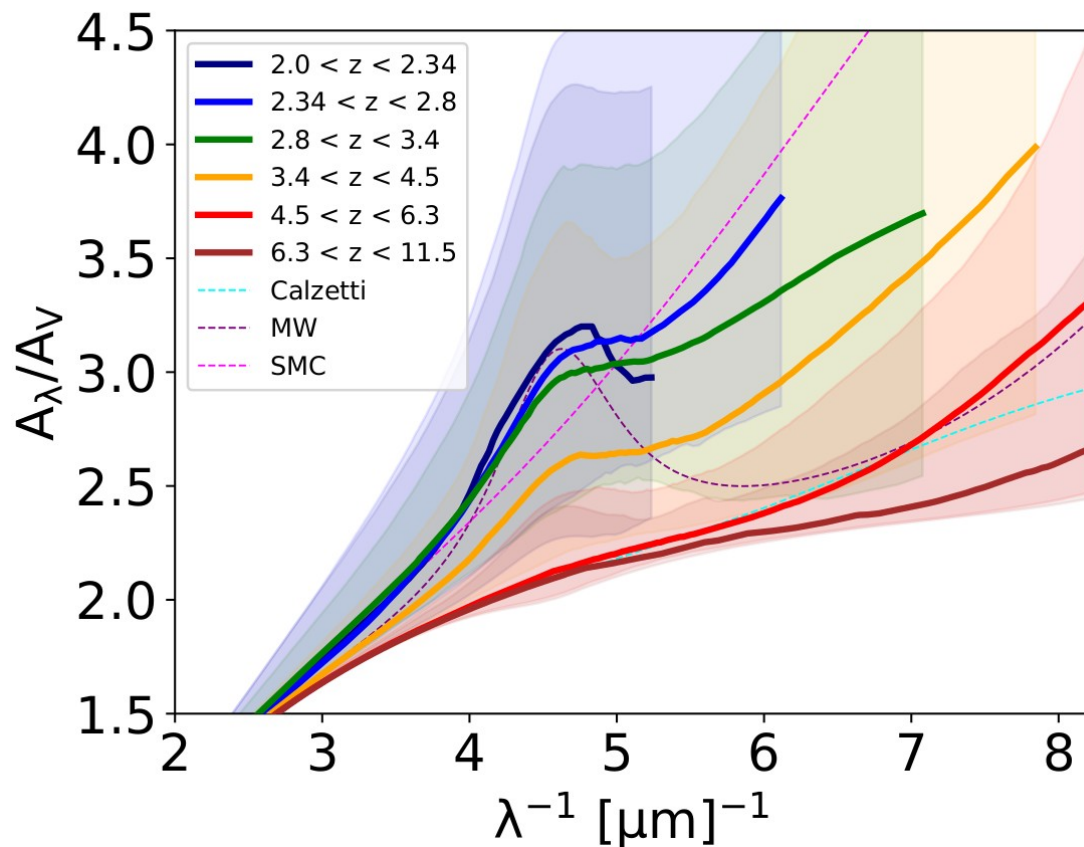


# Diversity of dust attenuation curves at $z \sim 2-12$ (Markov+24)



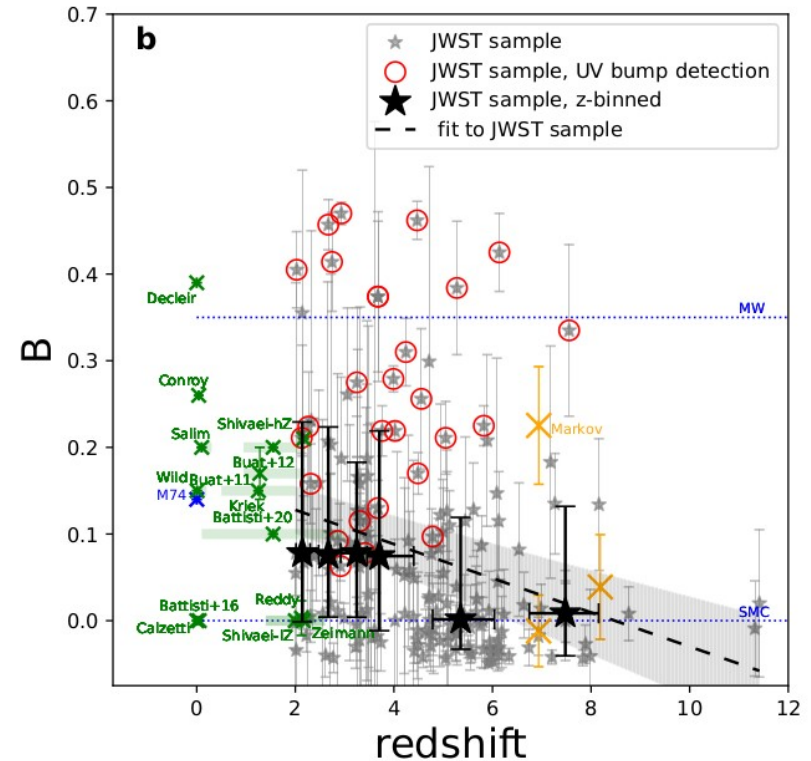
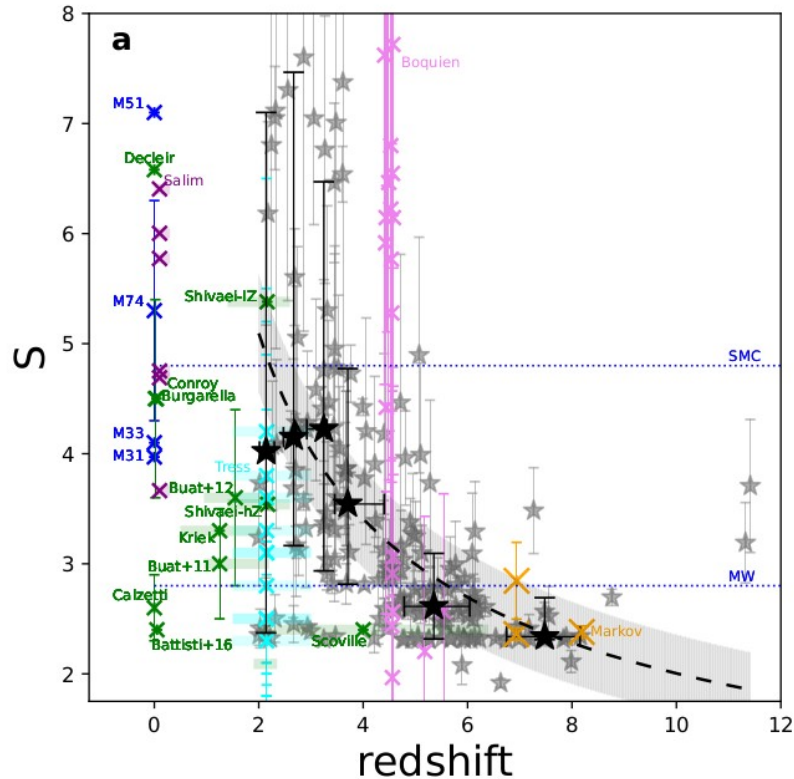


## Redshift trends of dust attenuation curves (Markov+24)



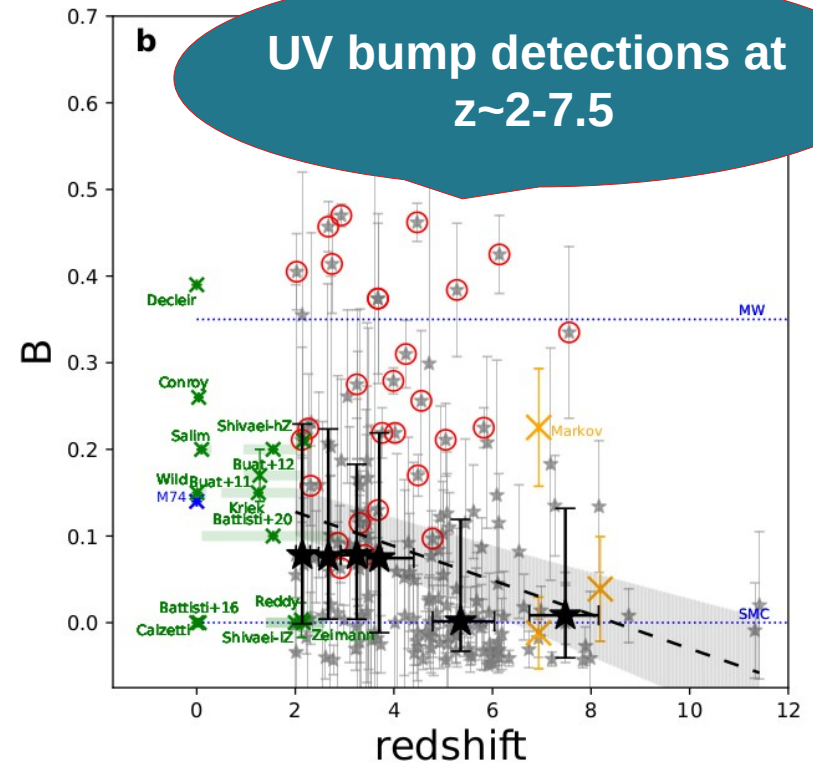
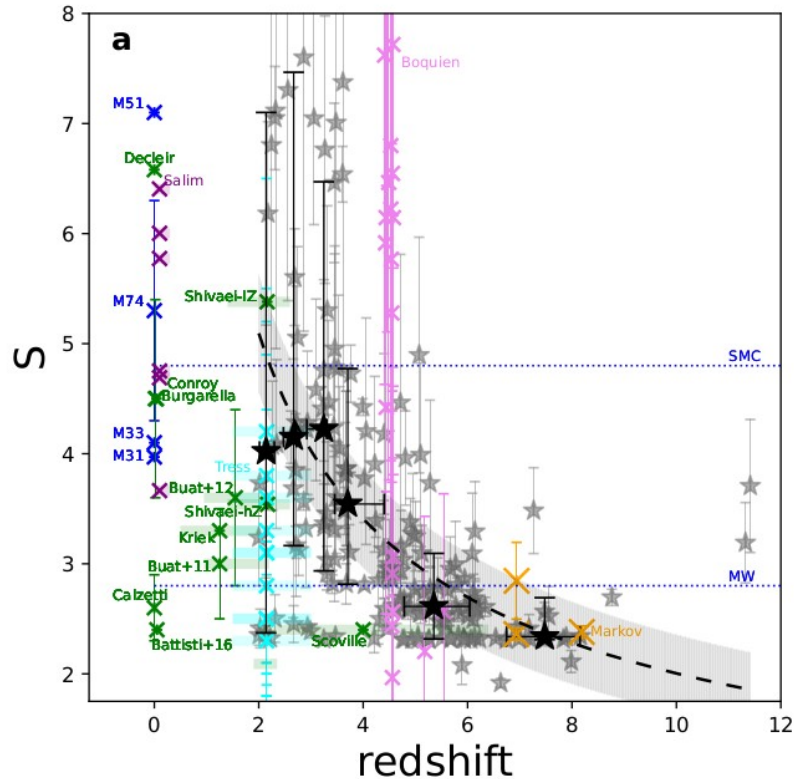


# Redshift trends of the slope and UV bump (Markov+24)



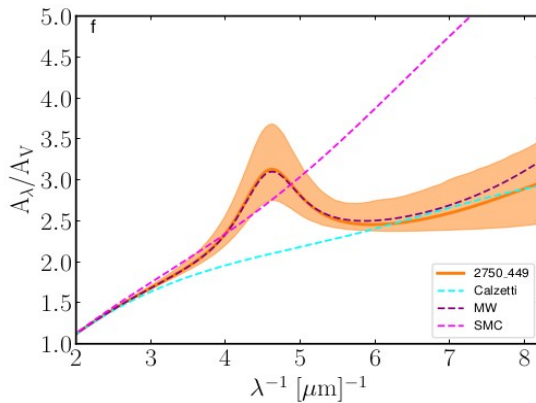
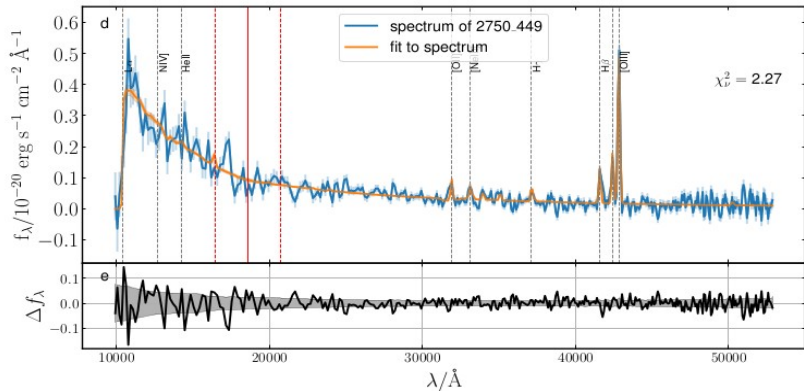
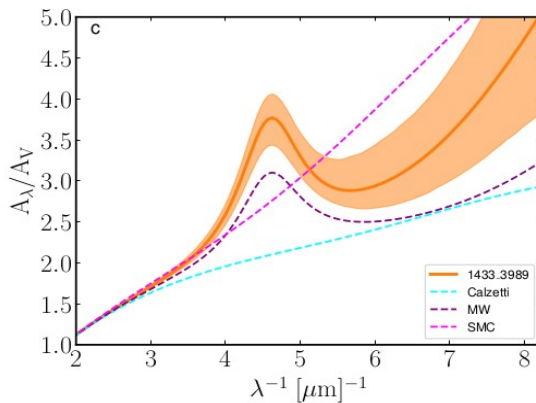
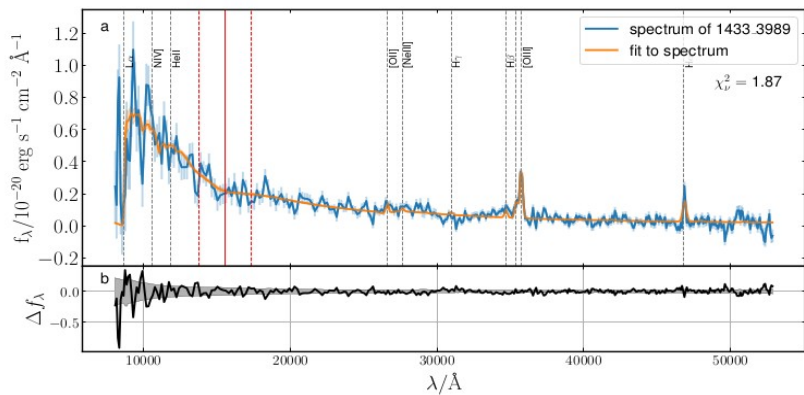


# Redshift trends of the slope and UV bump (Markov+24)





# UV bump detection at $z \sim 6.1$ & $z \sim 7.5$ (Markov+24)



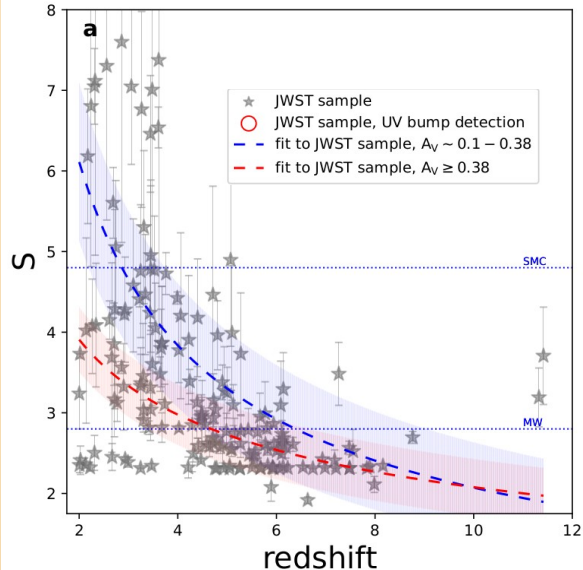
see also :  
Witstok+23, Markov+23



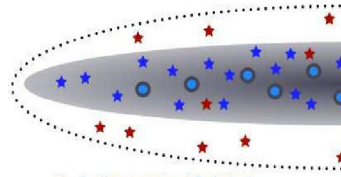
# What drives the redshift trends of attenuation curves?



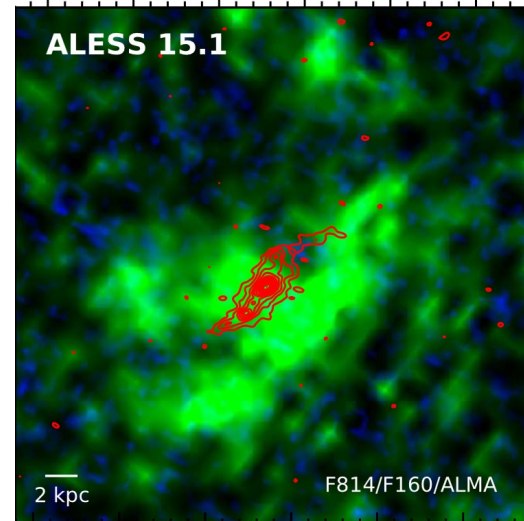
## 1) $A_V$



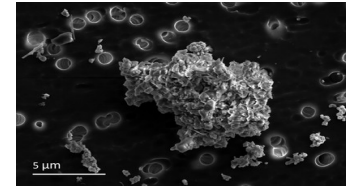
> See also: Salim & Narayanan+20



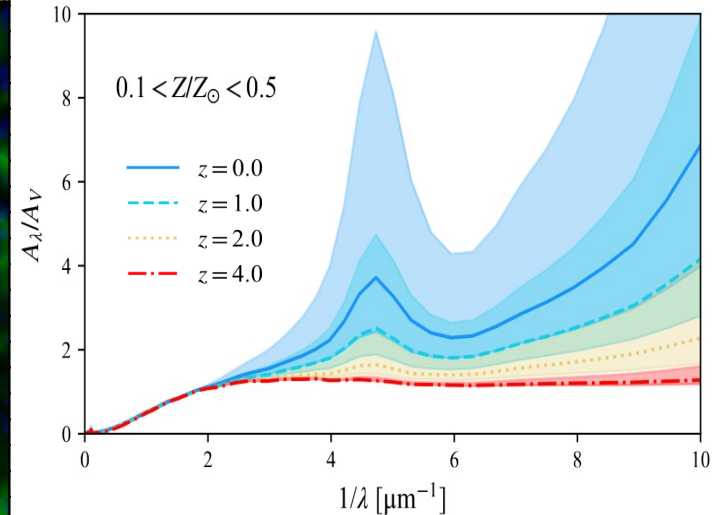
## 2) Dust-star geometry



> Hodge+19



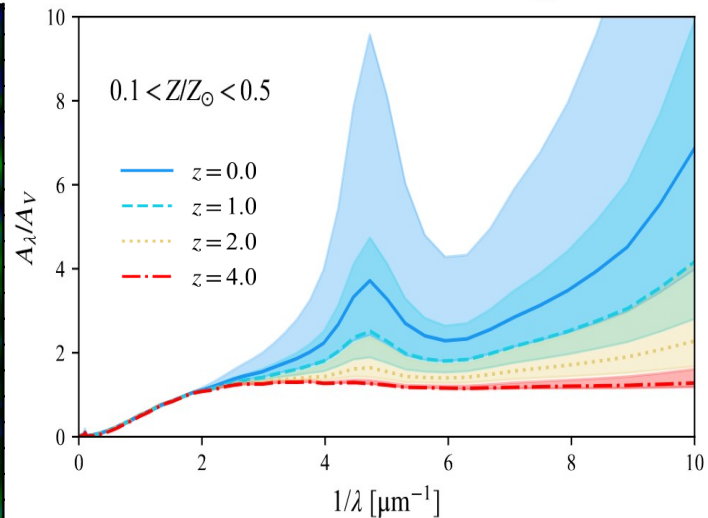
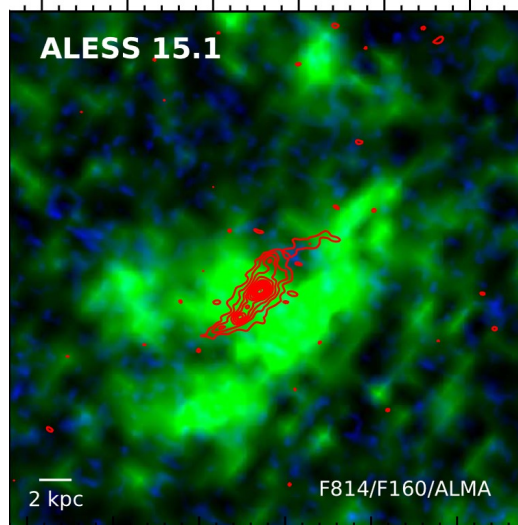
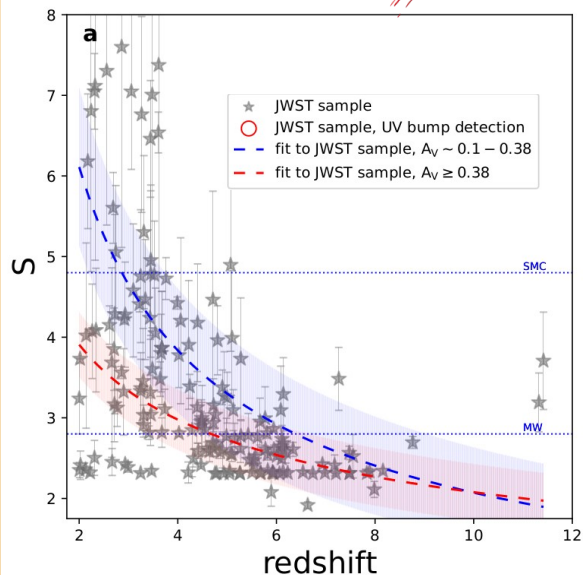
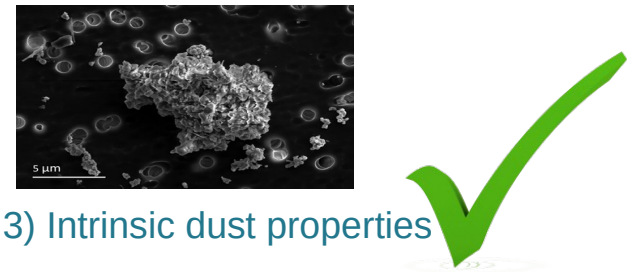
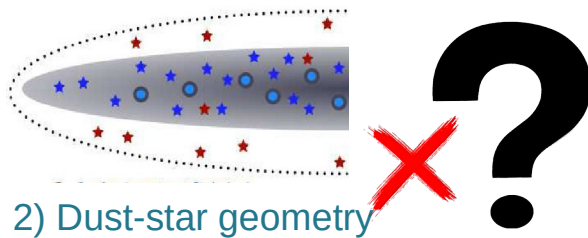
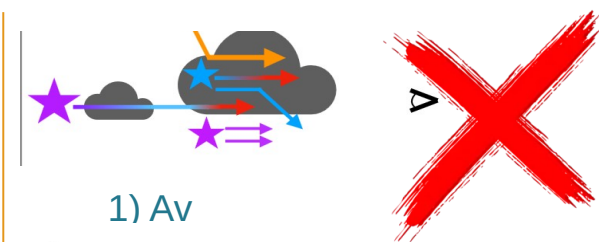
## 3) Intrinsic dust properties



Makiya & Hirashita+22



# What drives the redshift trends of attenuation curves?



> See also: Salim & Narayanan+20

> Hodge+19

Makiya & Hirashita+22





# Summary and future work

- **Customized BAGPIPES tool for simultaneously constraining the dust attenuation law and global properties of galaxies (Markov+23)**
- **Slope and UV bump evolves with time → intrinsic dust properties evolution (Markov+24)**
- **UV bump detection in ~30 sources at  $z \sim 2-7.5$**
- **Dust attenuation curve dependence on all galaxy properties**

