

# *Herschel* and *Chandra* reveal the interplay between SFR and AGN obscured activity at $z=2$

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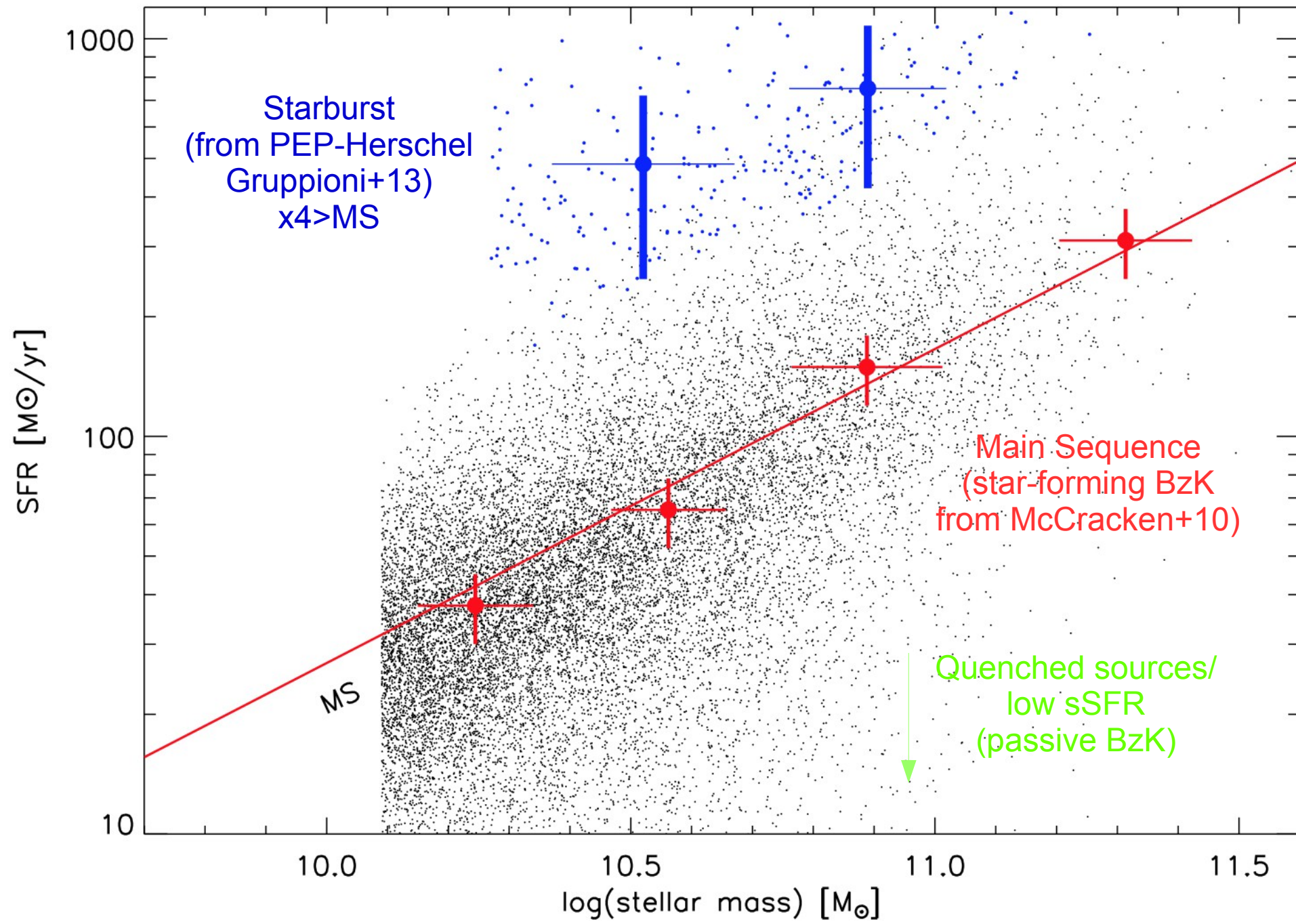
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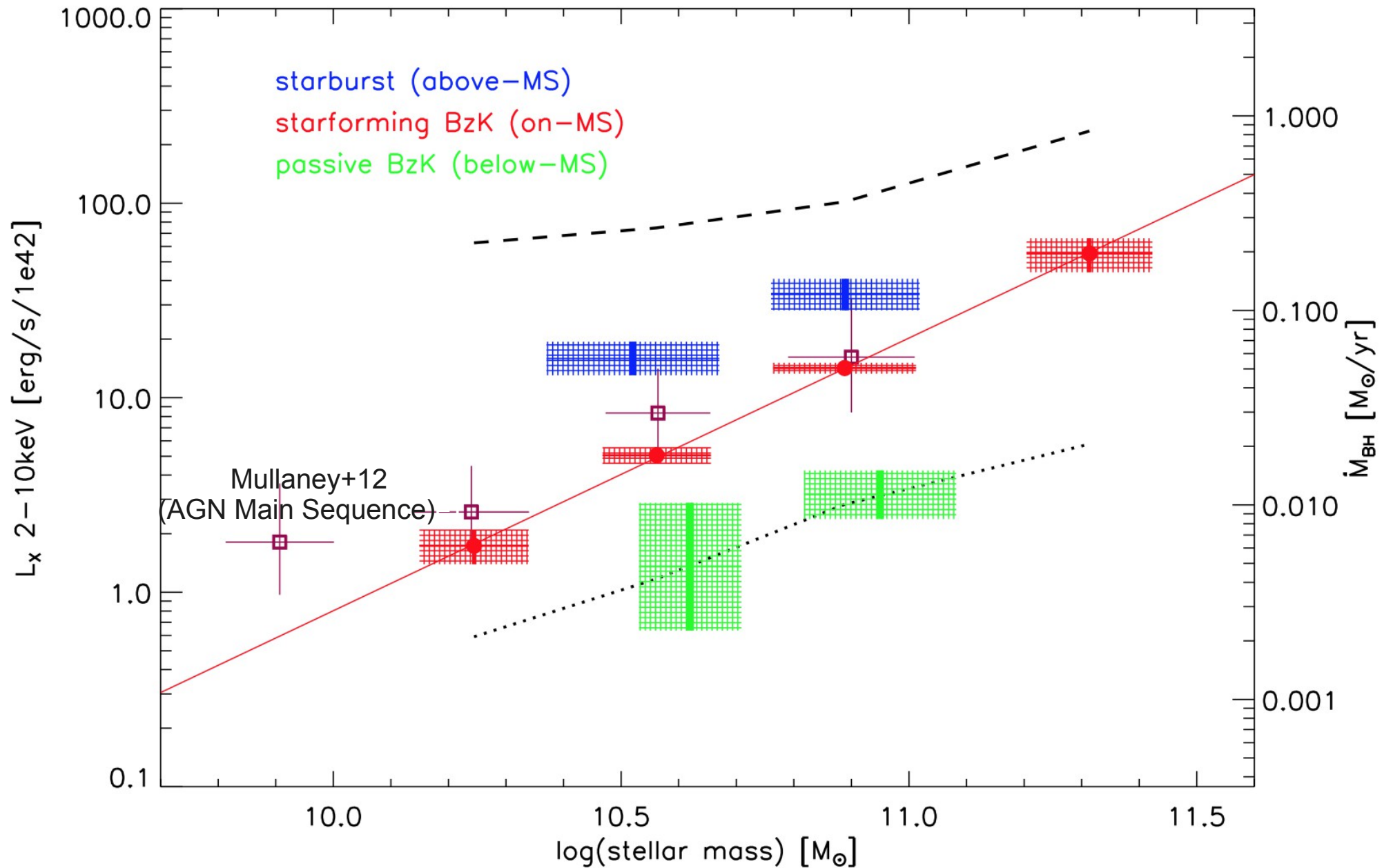
# *Adopted Technique*

- The only method to homogeneously sample the accretion rate or the (obscured+unobscured) AGN content as a function of the position in the stellar mass-SFR plane is the X-ray stacking analysis.
- Need to adopt as input a mass-complete and SFR-complete sample at a given redshift, to avoid any bias or partial view of the connection.

# Sample selection: above/on/below the MS at $1.4 < z < 2.5$ in the COSMOS field



# *X-ray stacking analysis to characterize $L_x$ over the whole mass-SFR plane*

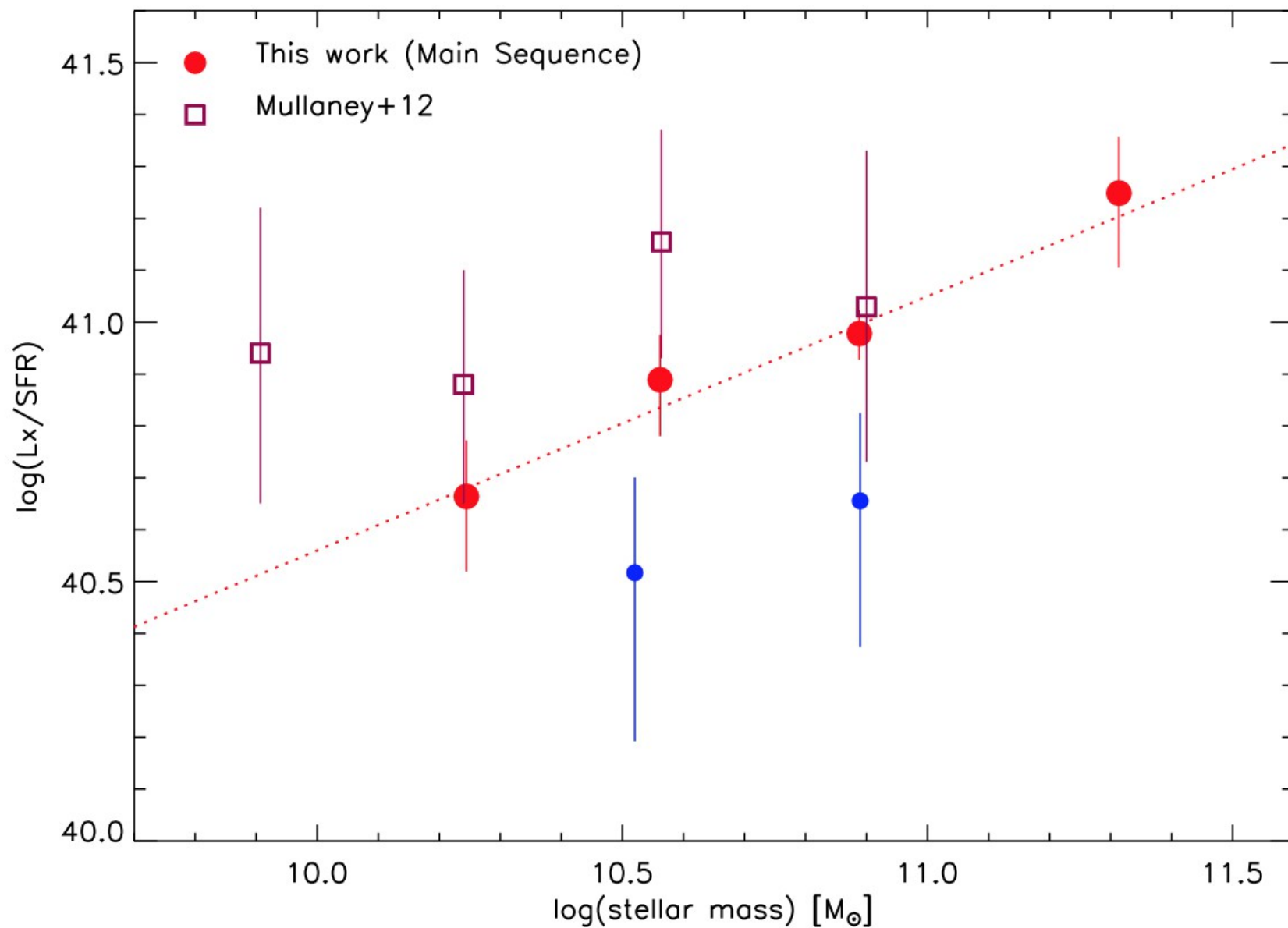


# First result

# Lx/SFR as a function of stellar mass

$$Lx/SFR \propto M^{*0.4}$$

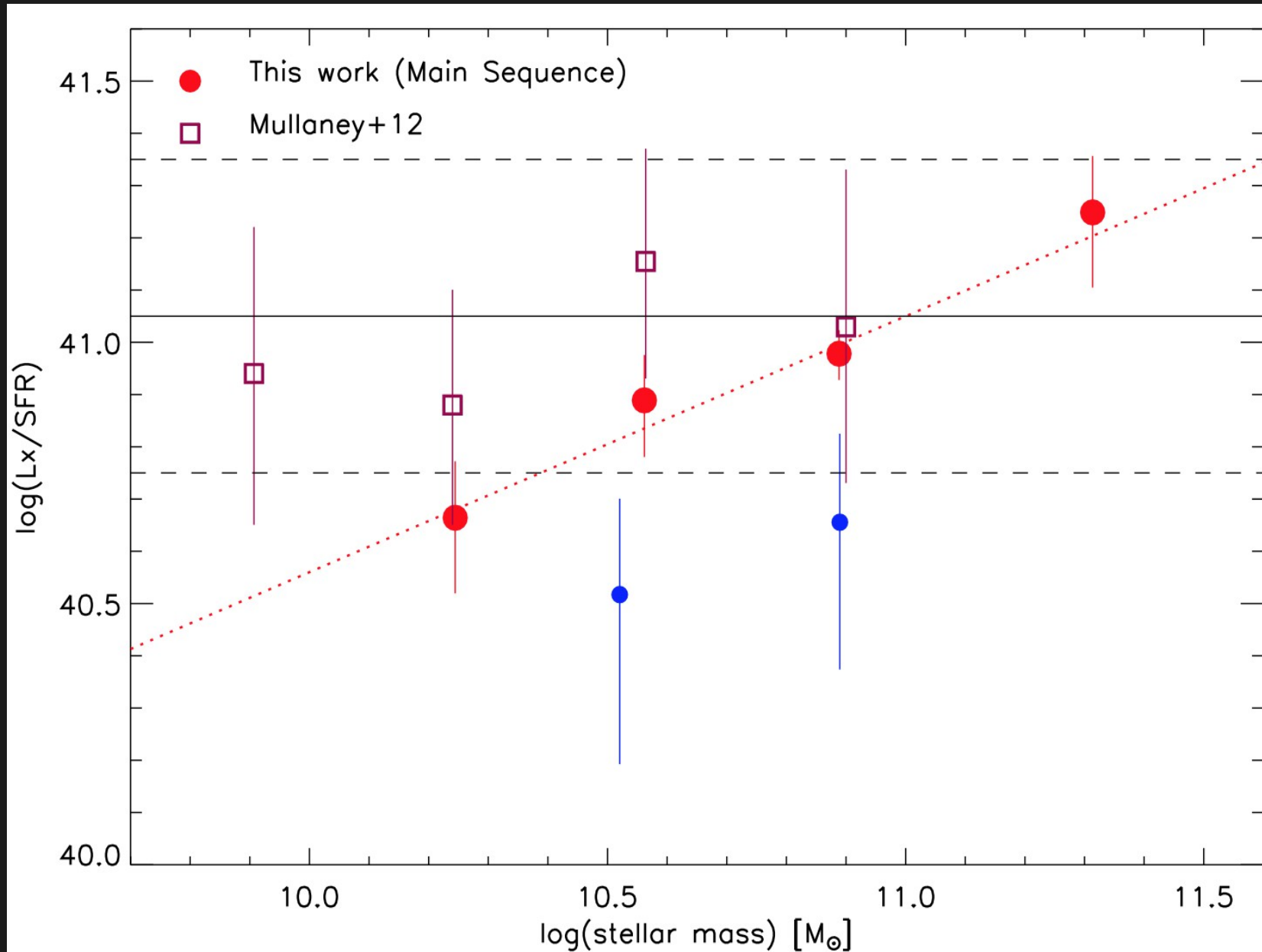
*Lx/SFR not mass invariant*



○ MBH/SFR

Mullaney+12 found an Lx/LIR ratio consistent with a flat relation:

$$M_{\text{BH}}/\text{SFR} = \text{const} \implies M_{\text{BH}}/M^* = \text{const}$$



$M_{\text{BH}}/\text{SFR}$

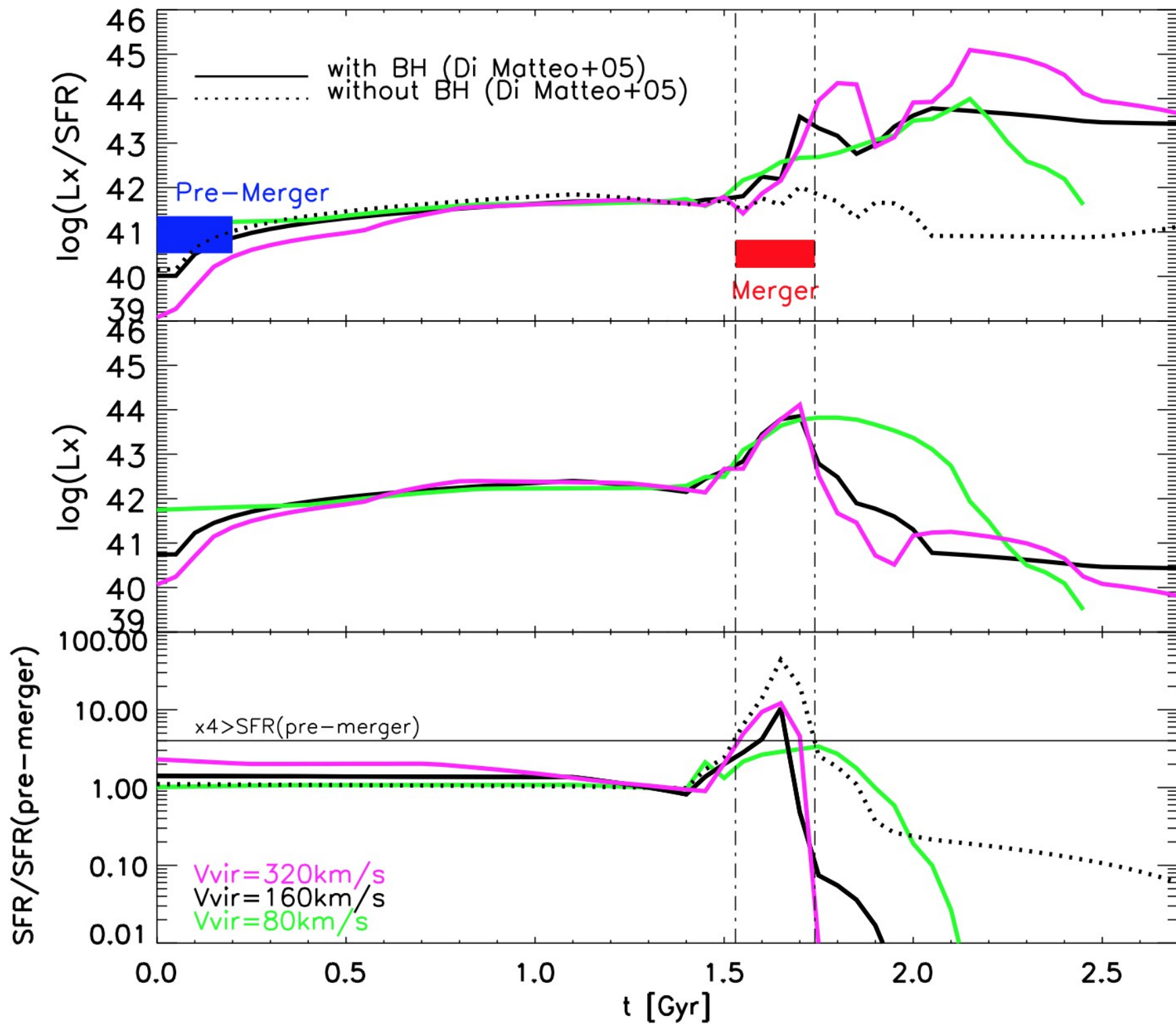
- From a flat  $\dot{M}_{\text{BH}}/\text{SFR}$  distribution Mullaney+12 deduce a constant  $M_{\text{BH}}/M^*$  ratio, which can be interpreted in the secular co-evolution of the galaxy-AGN processes that lead to the build up of the local MBH/MBulge relation.
- However, within the large error bars (due to the low statistics) they allow a factor 2 of uncertainty, which is safely consistent with the results of our slightly superlinear  $\dot{M}_{\text{BH}}/\text{SFR}$  vs  $M^*$  relation.
- Our results also imply that the distribution of Eddington ratios is not invariant with mass, as suggested by Aird et al. (2012).



# Second result

# *Comparison with hydrodynamic model predictions (Di Matteo+05, Hopkins+12)*

- During a merger phase, standard models, including BH feedback, foresee an enhancement of  $L_x/SFR$  by order of magnitudes (mainly due to the shutdown of SFR).
- On the contrary, we find that during the starburst phase (above MS)  $L_x/SFR$  is basically similar to that of the Main Sequence (pre-merger) phase, or even lower.
- This means that the average excess IR luminosity of the starburst/merger phase overtakes the corresponding excess X-ray luminosity: i.e. *during a starburst  $L_x$  does not increase as much as SFR.*
- Models of AGN triggering in a burst phase followed by strong feedback need to be revised.



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Comments and suggestions more  
than welcome!!

thanks