

# Measuring the Heat/Coihueco energy calibration using inclined lasers

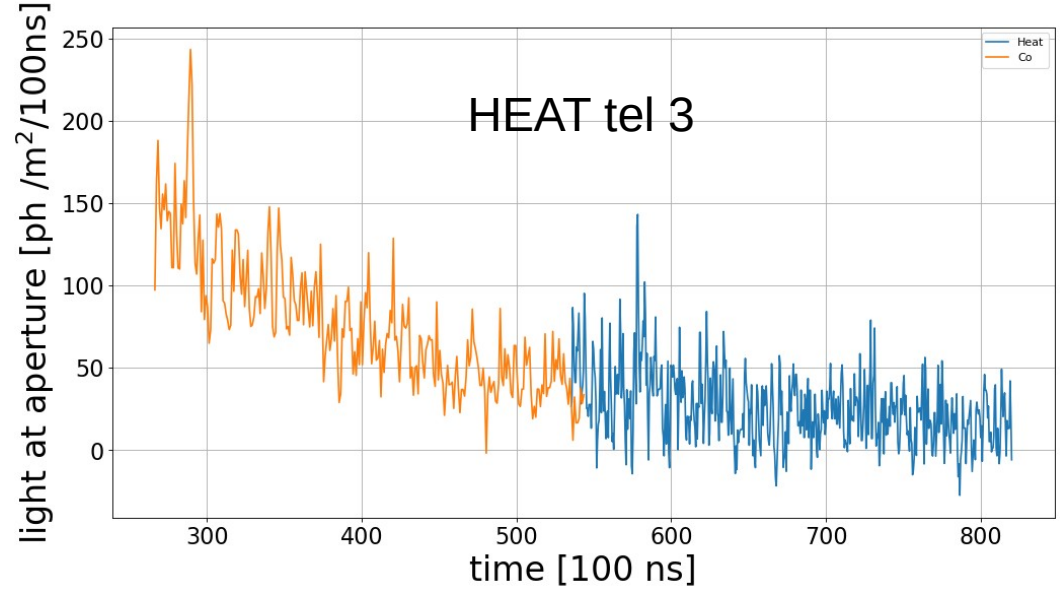
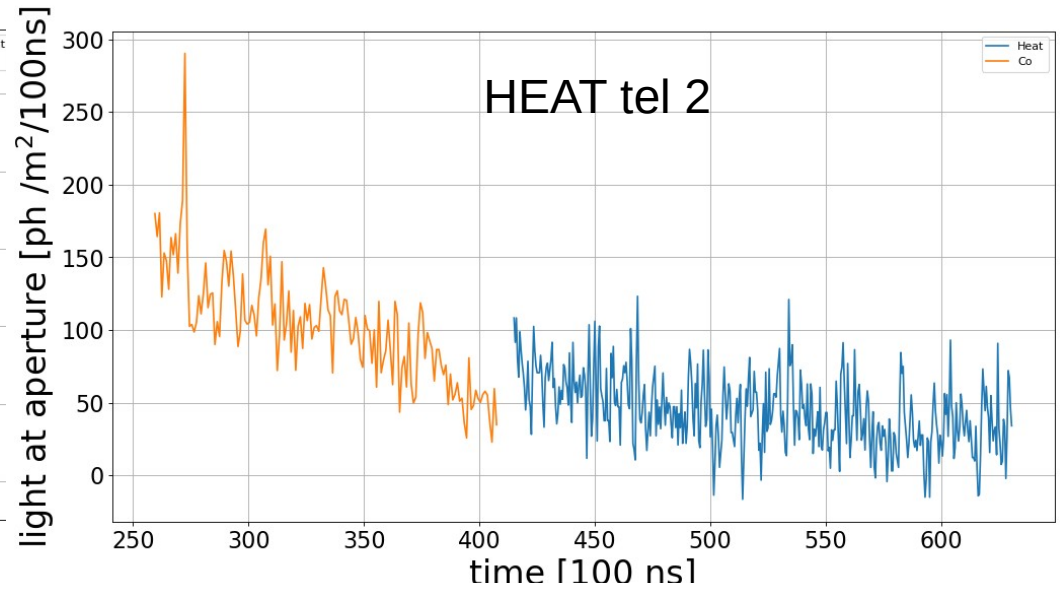
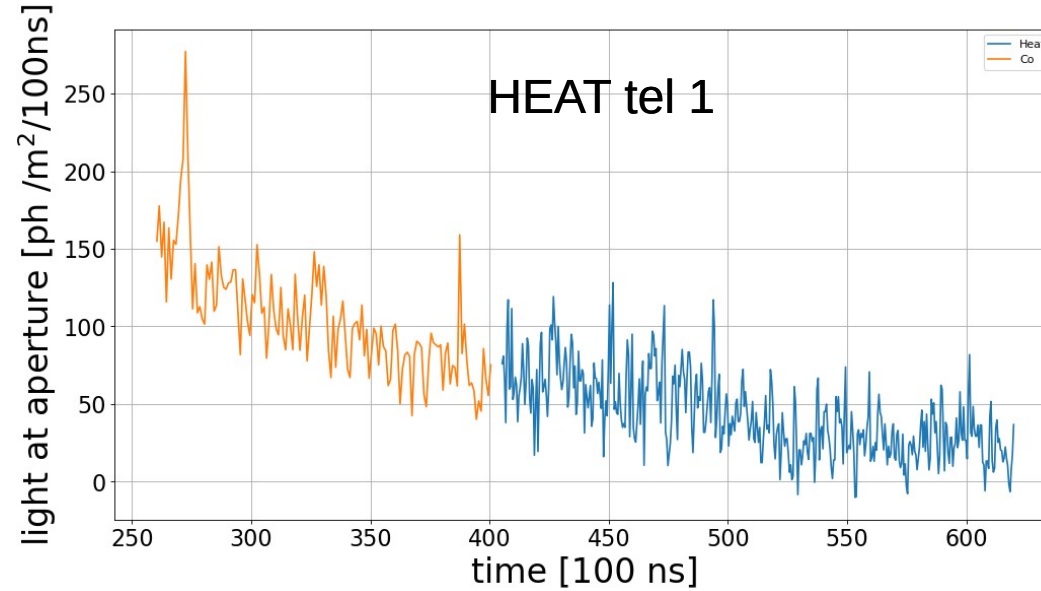
Jose Bellido, Bruce Dawson

The University of Adelaide

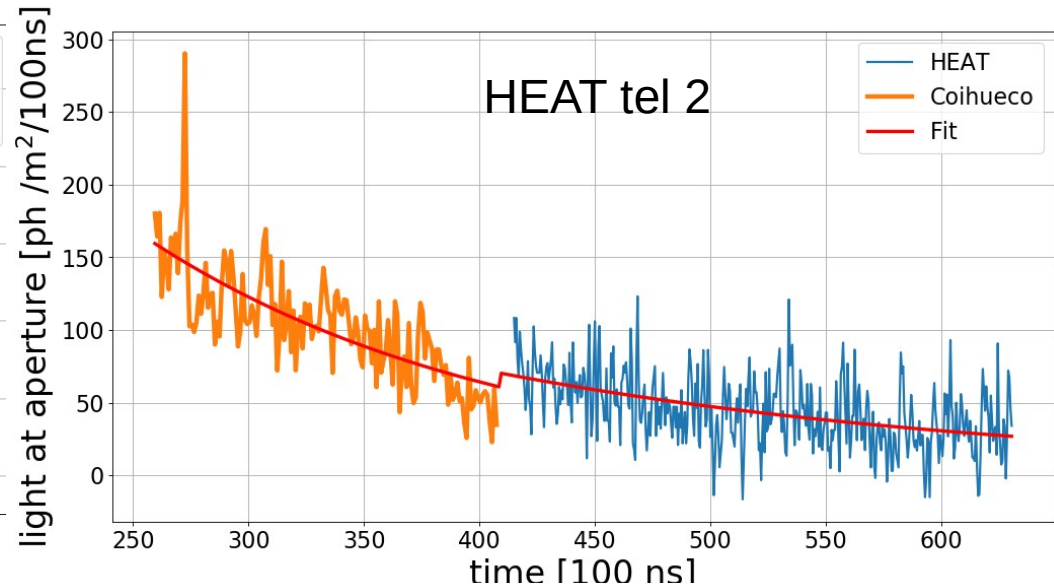
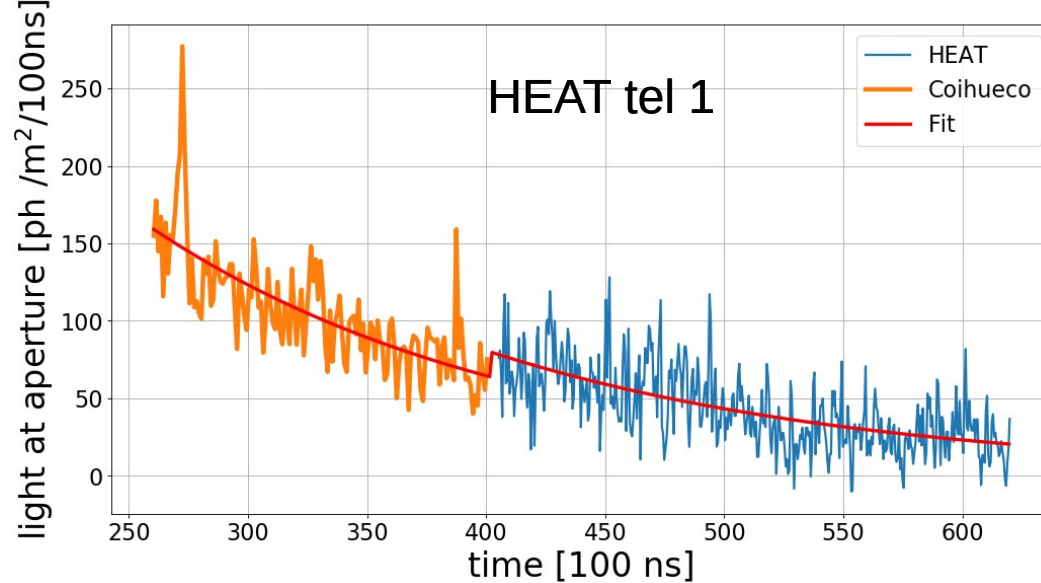
September 13<sup>th</sup>, 2018

October 25<sup>th</sup>, 2018 (start on slide 18)

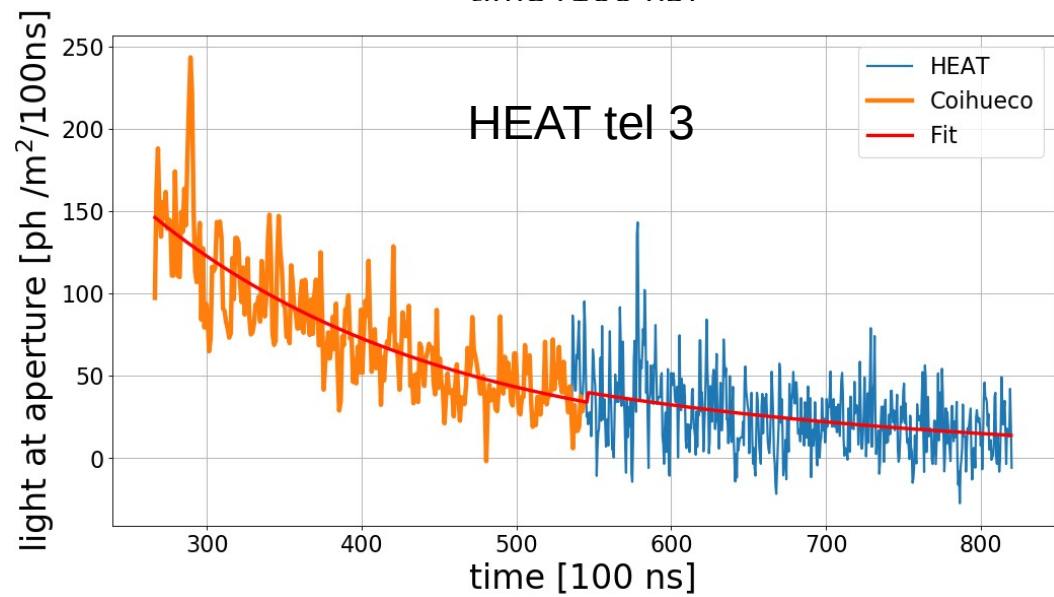
Many thanks to **Lawrence and Kevin Merenda** for implementing inclined lasers in the regular schedule of CLF (for timing) and XLF (for HeCo calibration)!

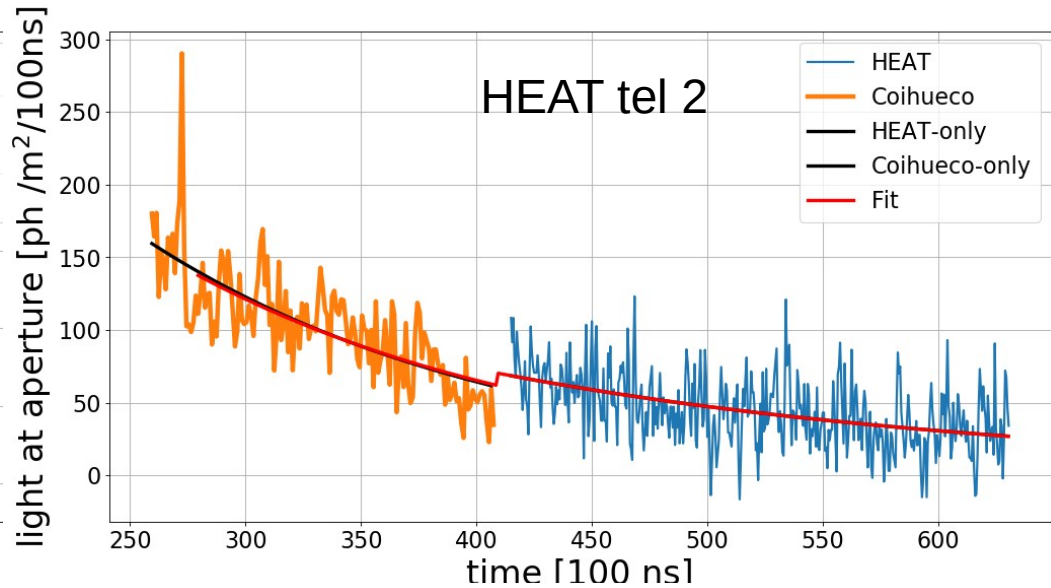
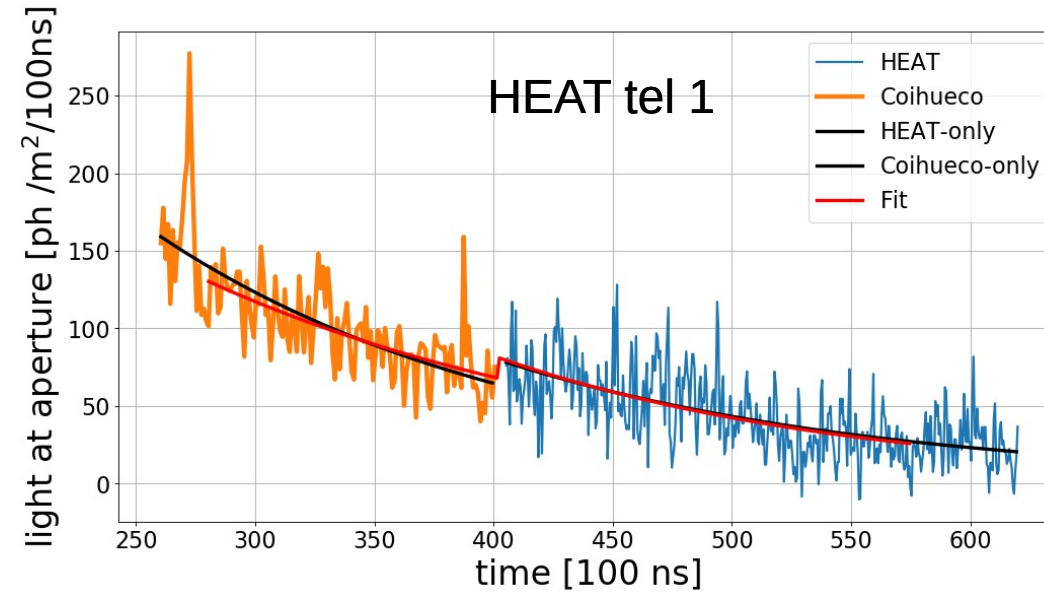


**Lasers with 30° elevation aiming towards HeCo**



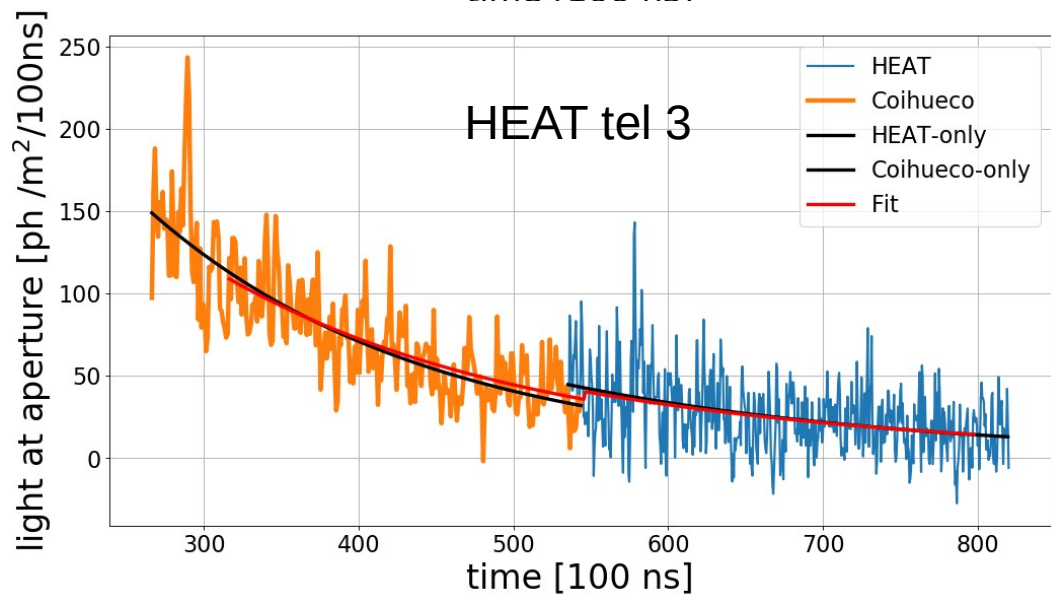
Fitting entire range





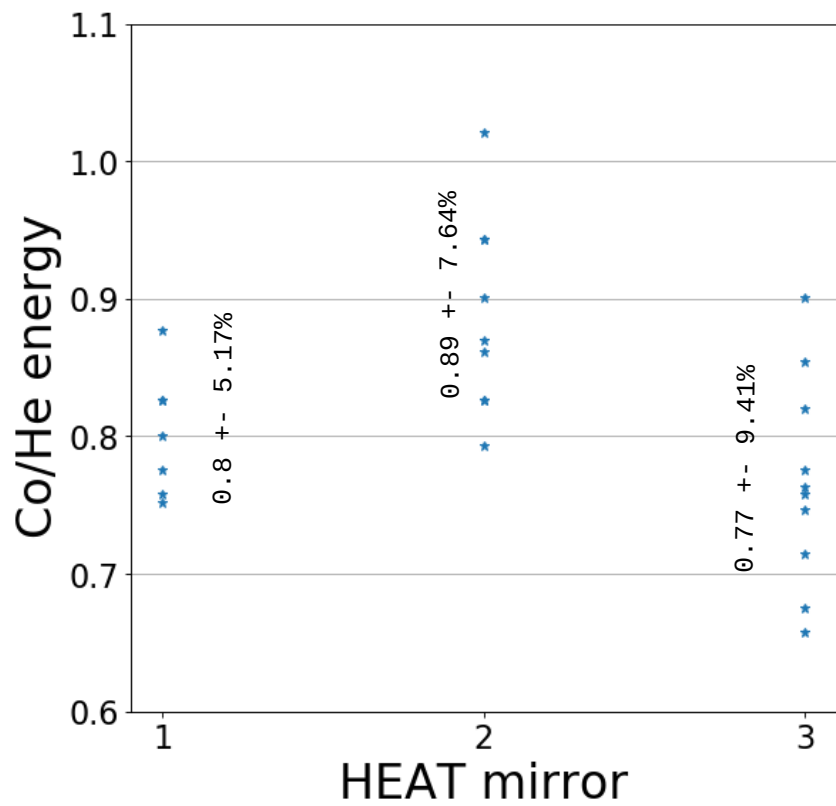
Fitting a smaller range

(to improve the fitting stability)



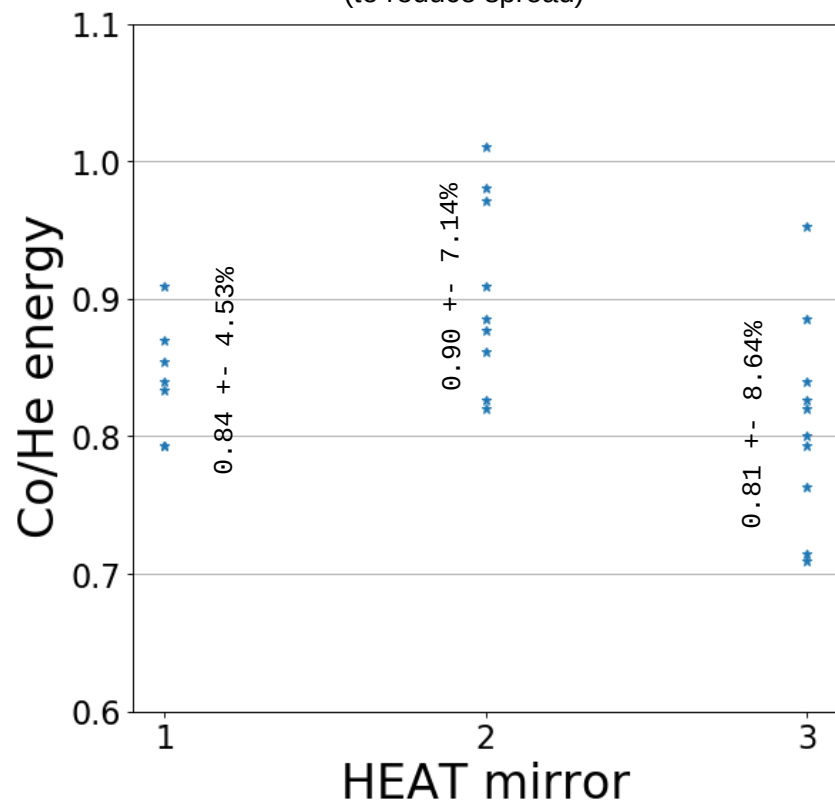
# Results

## Fitting the entire range

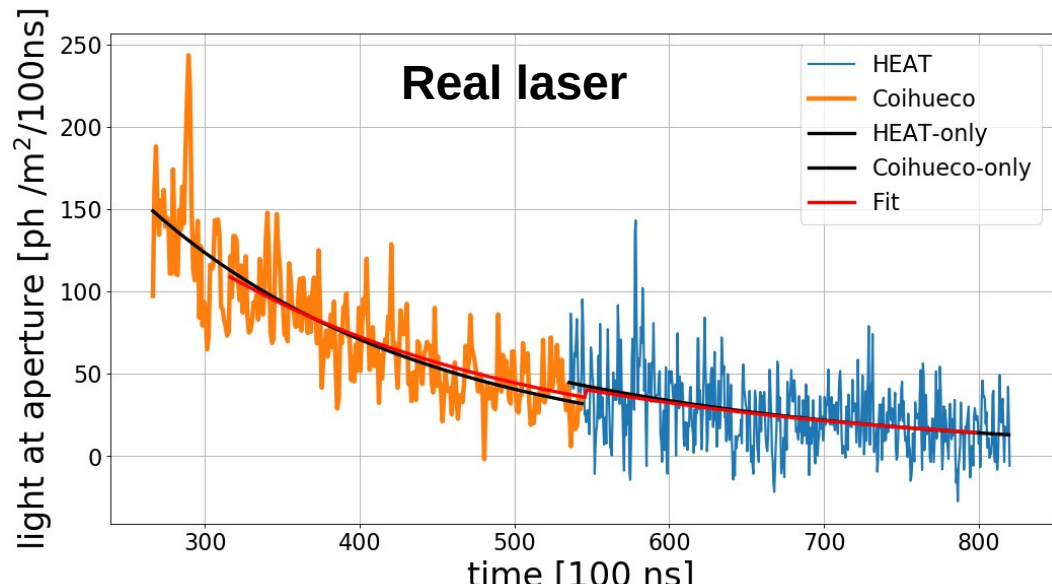
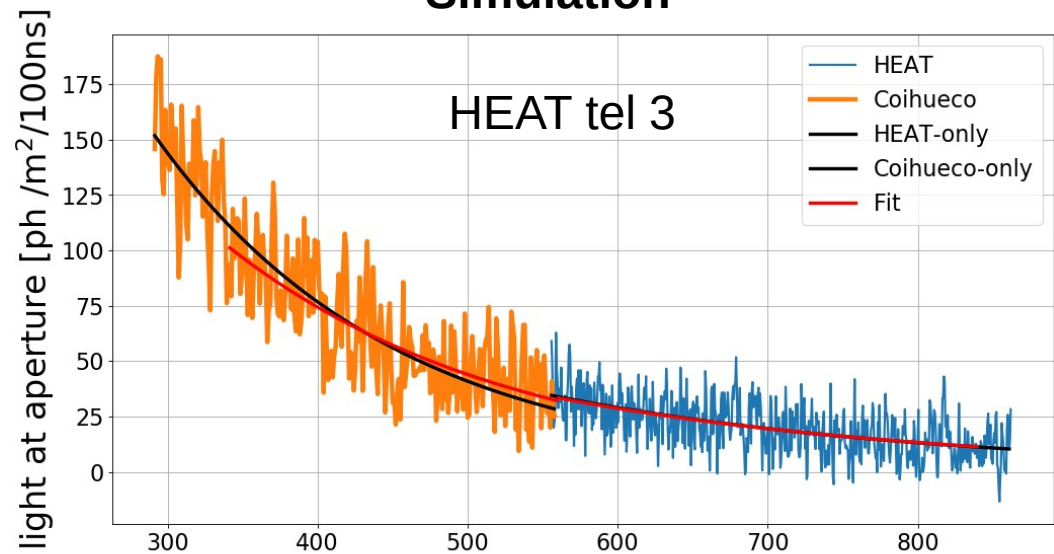


## Tuned fit range

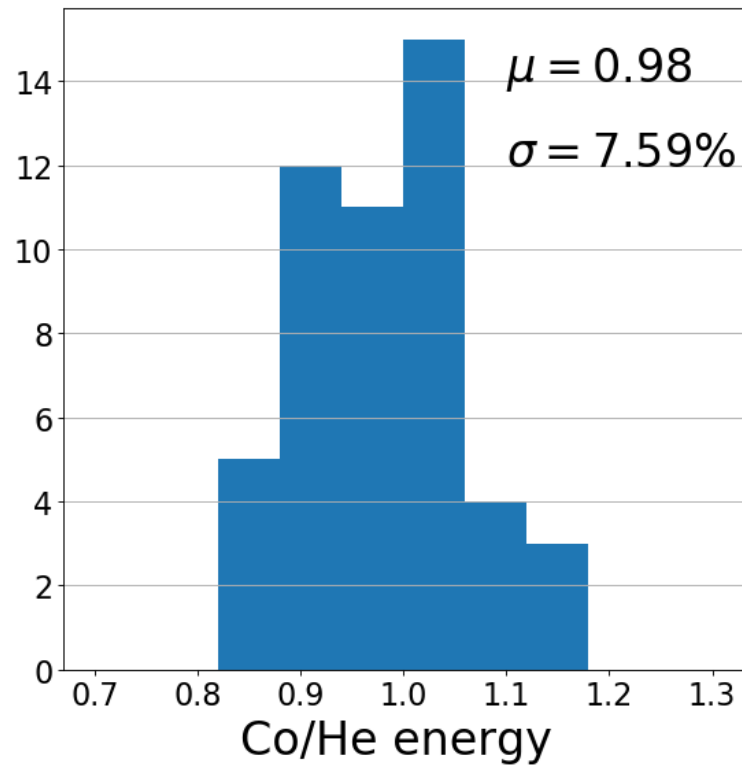
(to reduce spread)



## Simulation



## Estimated performance using simulations



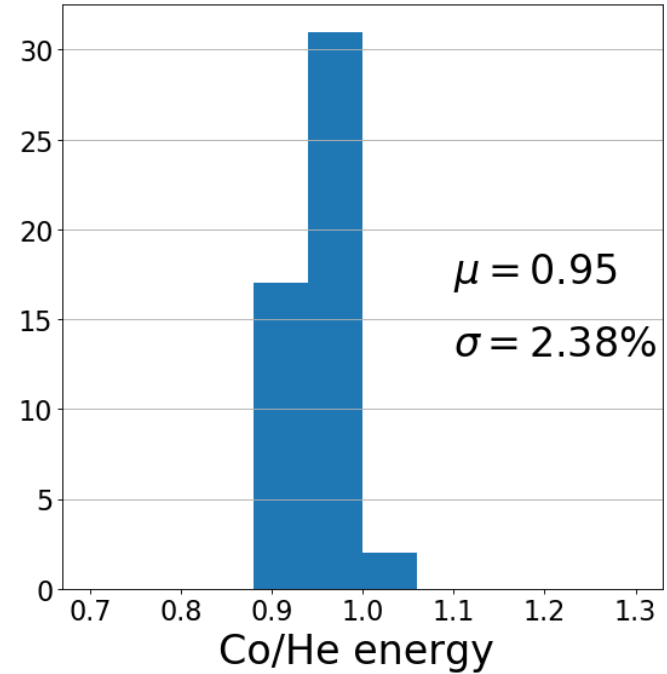
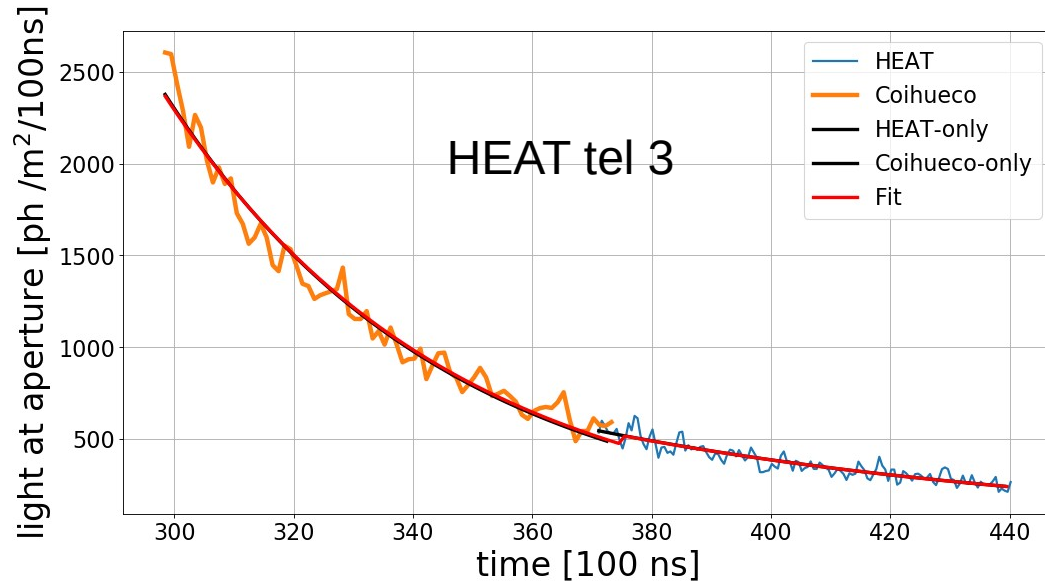
With tuned fitting range

... we had to make them more inclined for increased intensity



# Testing a more inclined laser (10° elevation)

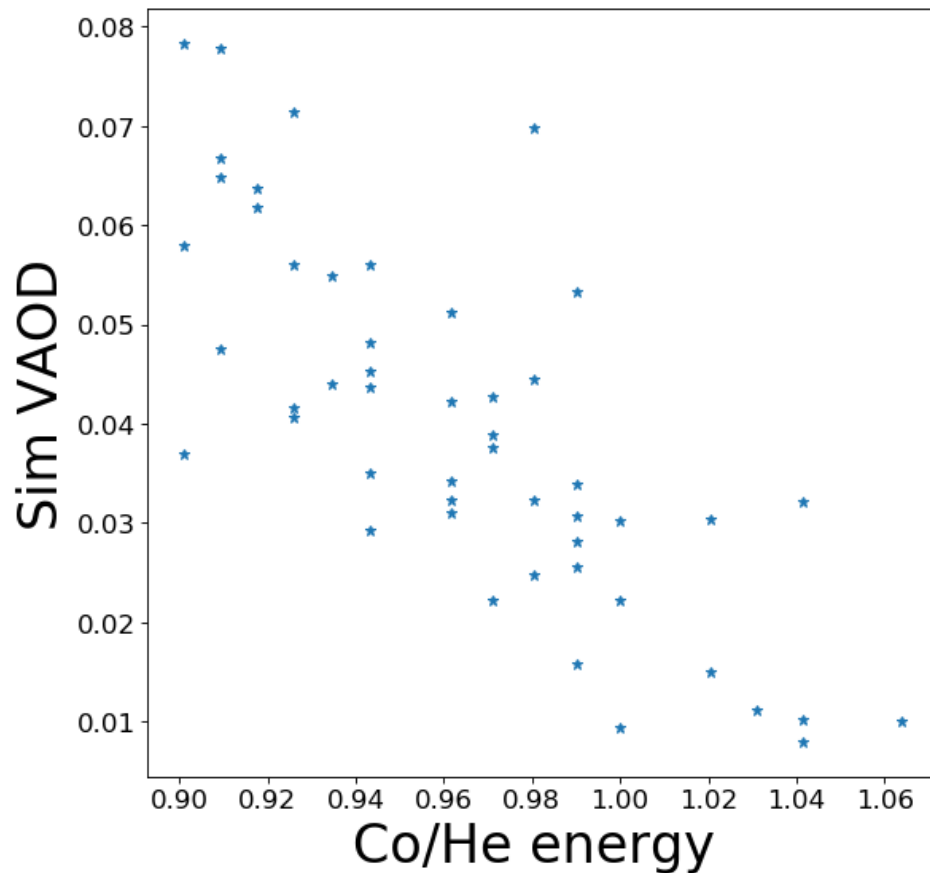
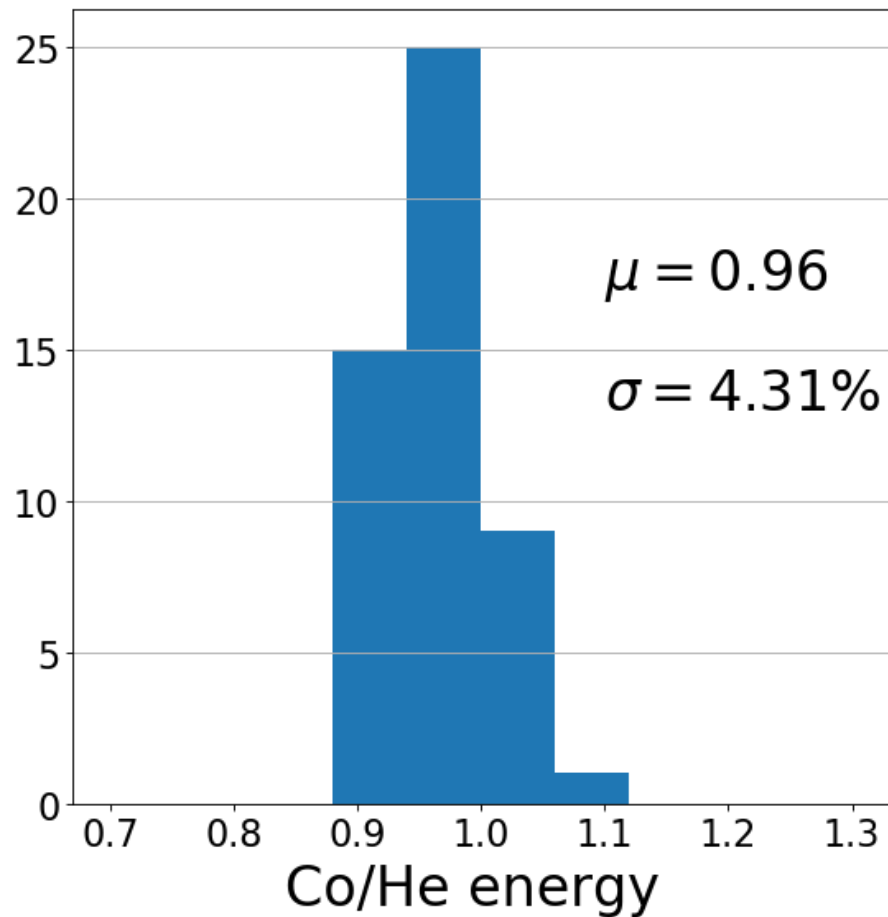
(to increase light flux)



Fitting the entire range

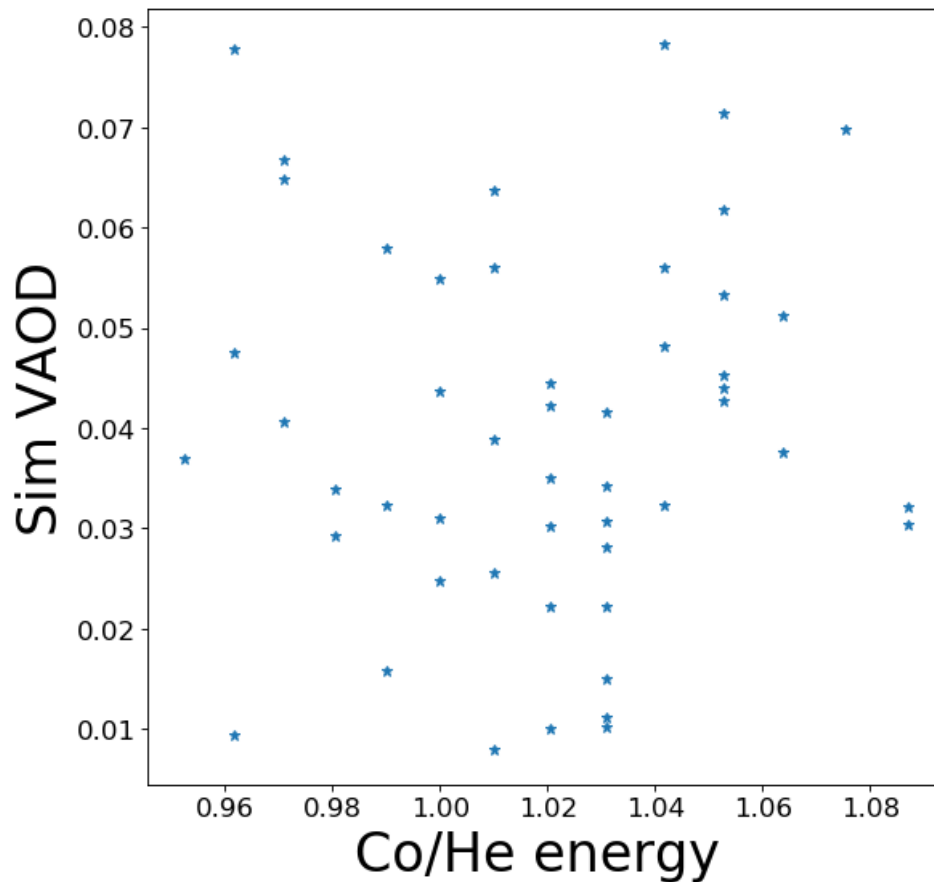
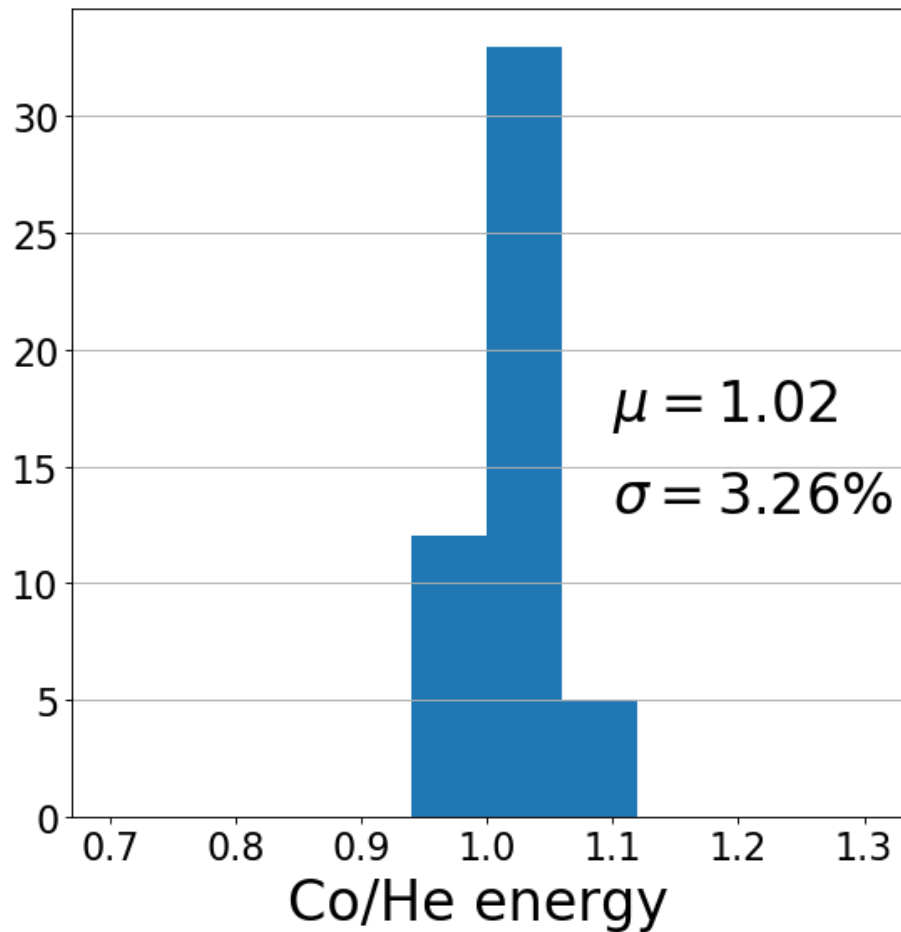
# Effects of aerosol variations (10° elevation)

Fitting the entire range



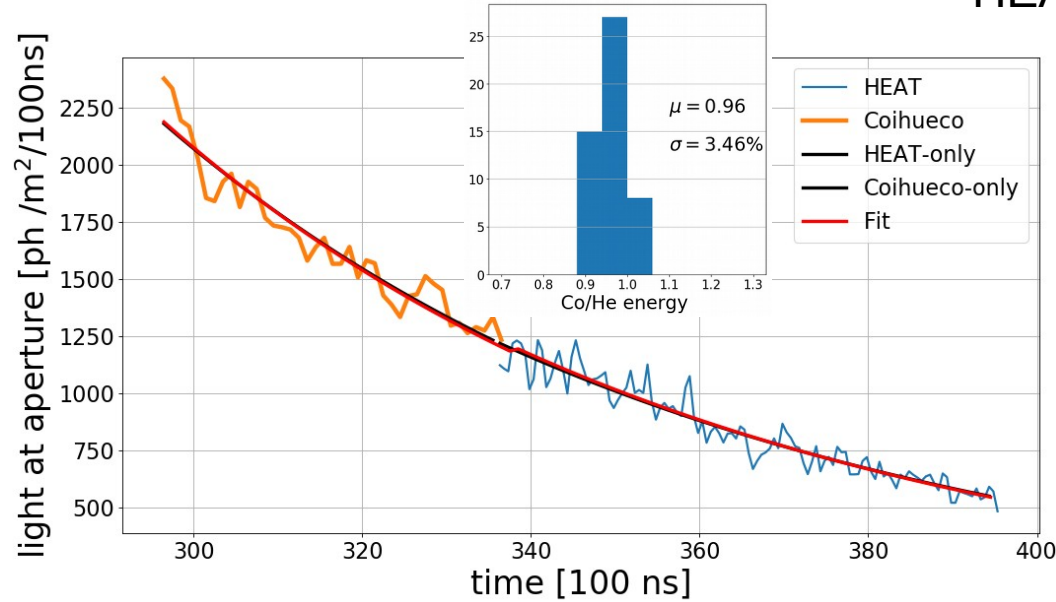
# Effects of aerosol variations (10° elevation)

After optimising fit range

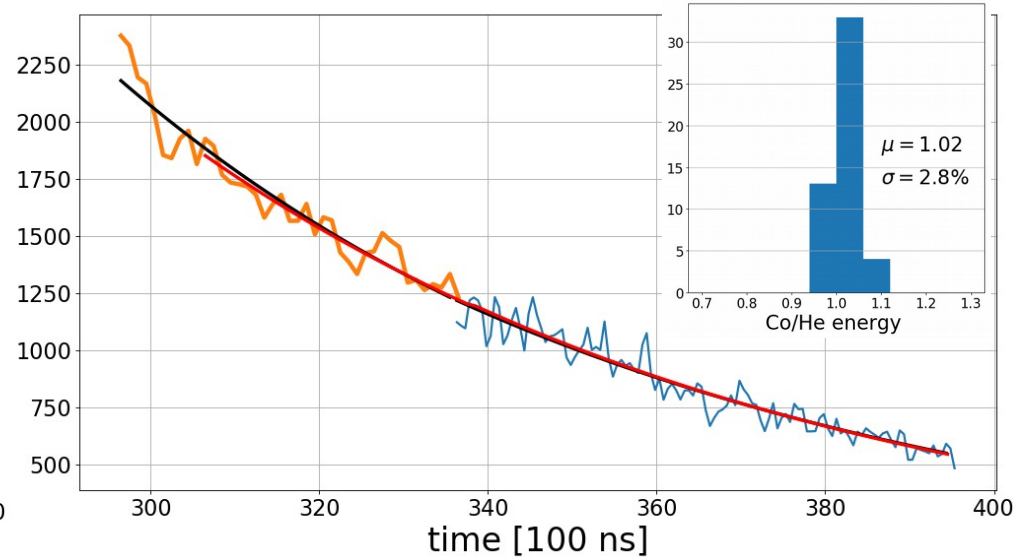


# Testing a more inclined laser (10° elevation) (to increase light flux)

## HEAT tel 1



Fitting the entire range



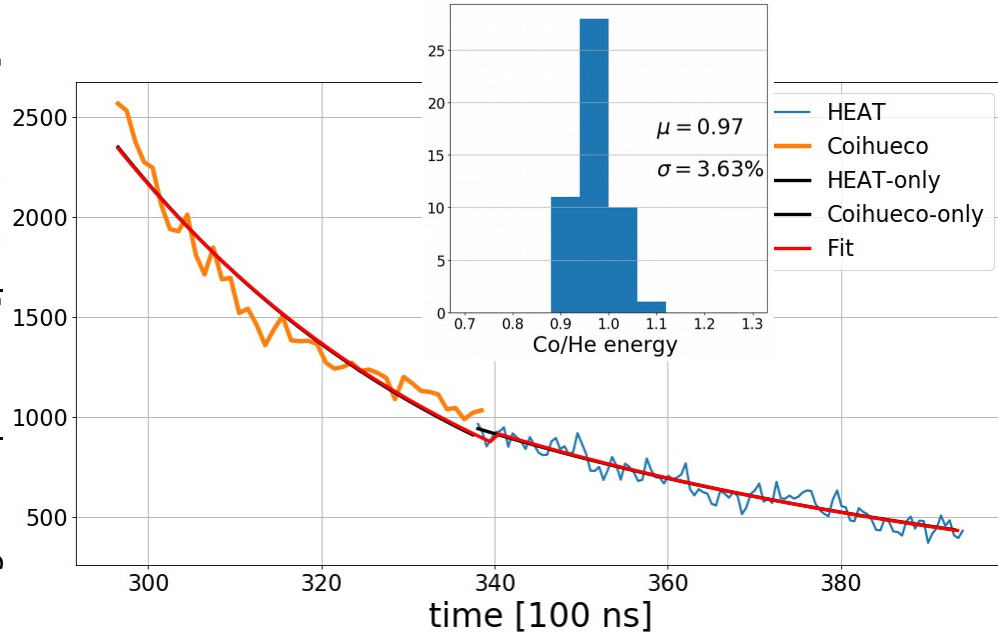
Optimised fit range

# Testing a more inclined laser (10° elevation)

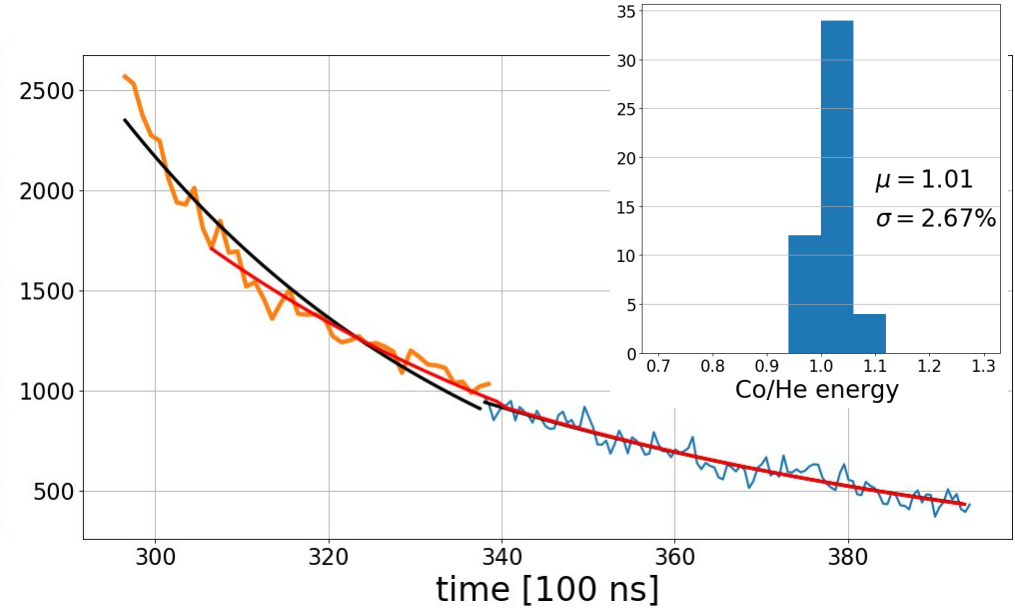
(to increase light flux)

## HEAT tel 2

light at aperture [ph / m<sup>2</sup>/100ns]



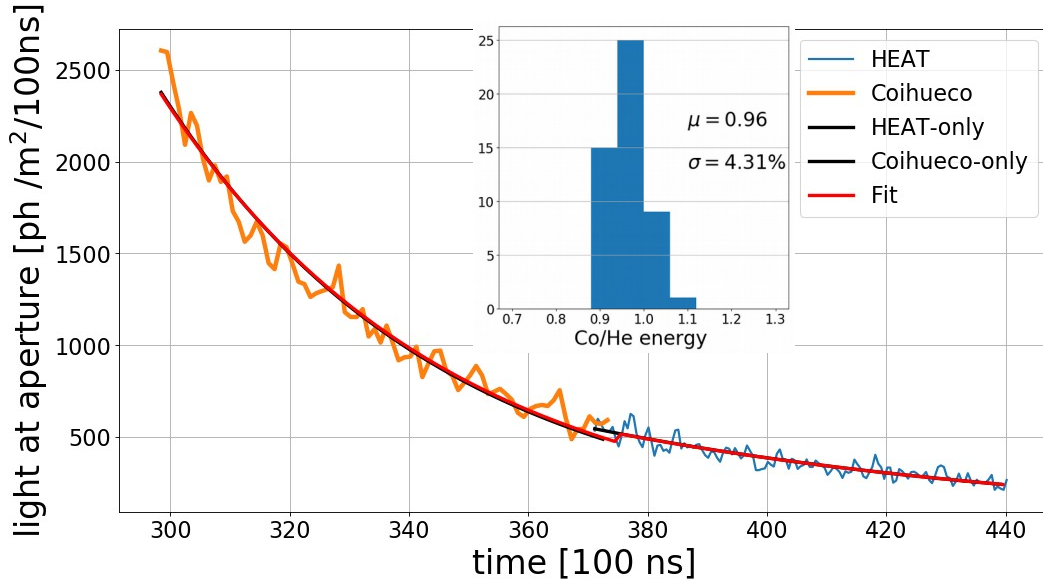
Fitting the entire range



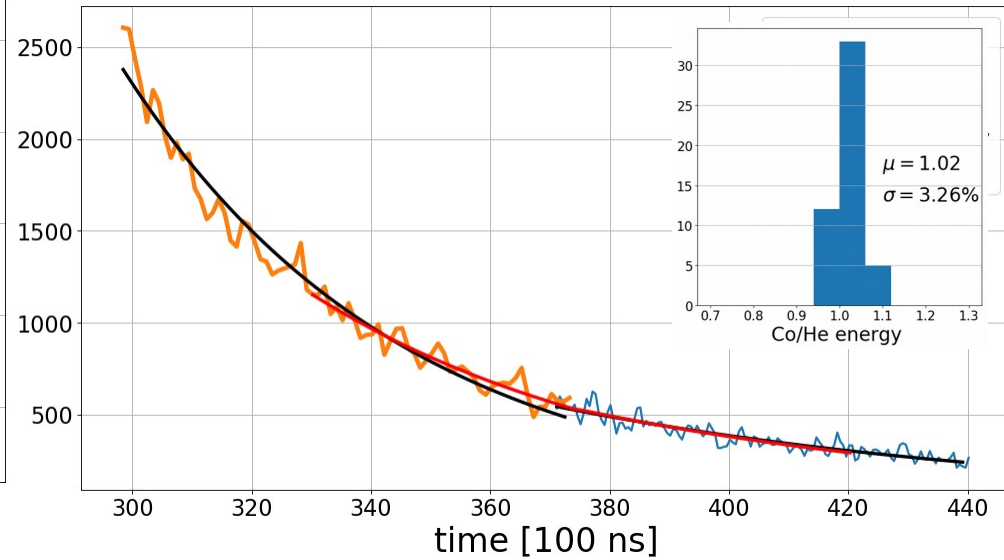
Optimised fit range

# Testing a more inclined laser (10° elevation) (to increase light flux)

## HEAT tel 3



Fitting the entire range



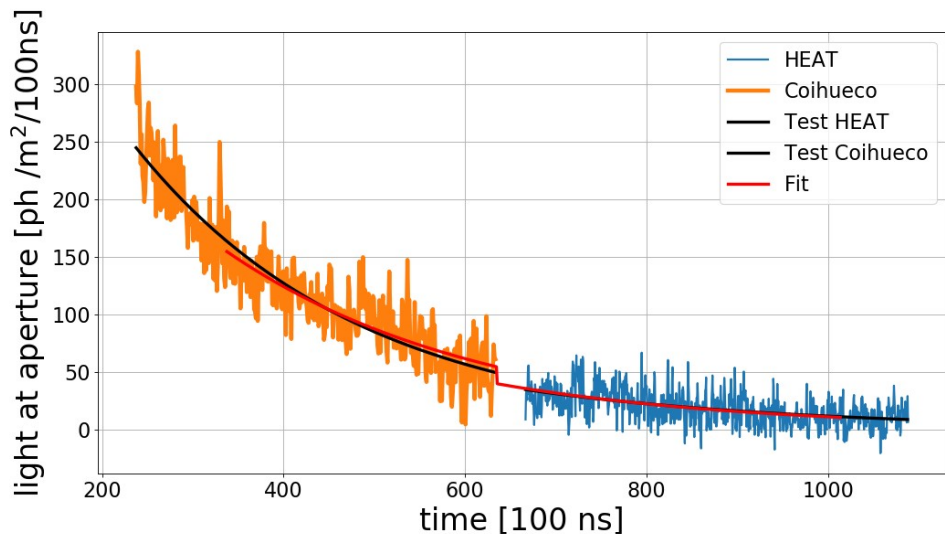
Optimised fit range

## Attempt to use historical lasers

In the past lasers were fired aiming AGNs, some of these geometries crossed the HeCo field of view. So, we tried to use them to measure the HeCo calibration in the past.

There are two issues:

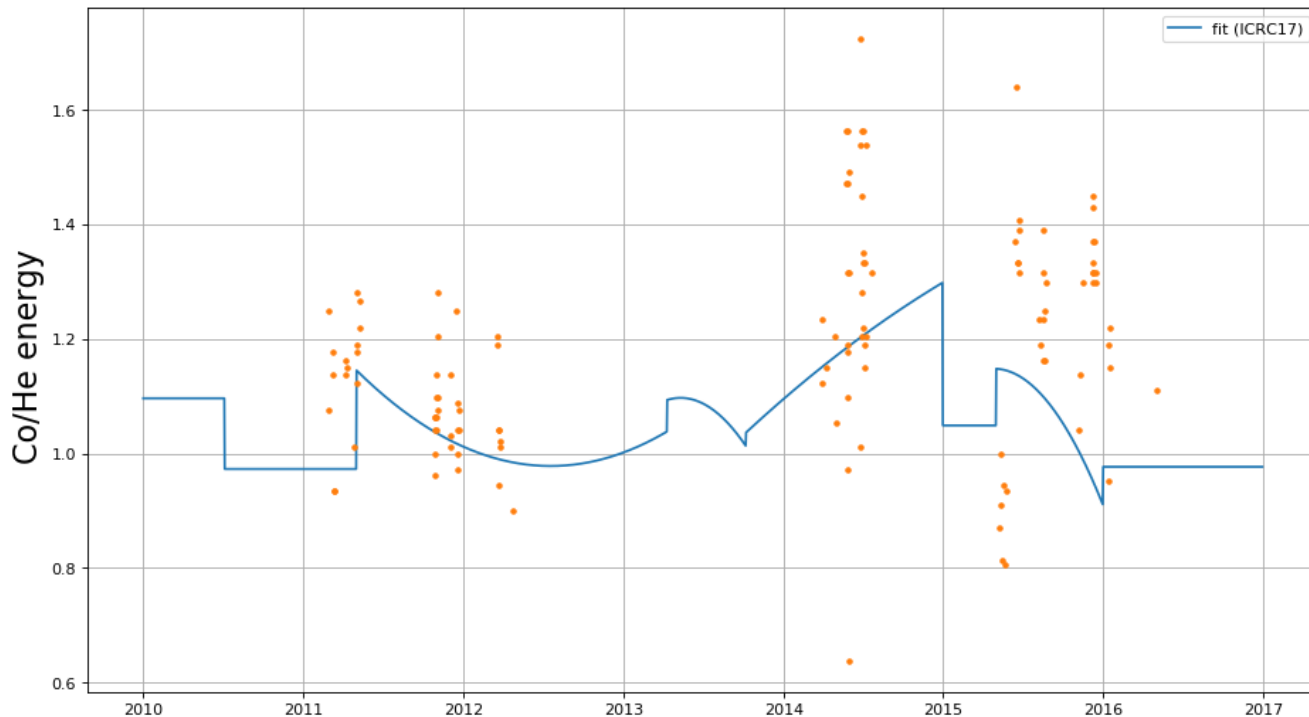
The light flux is low and  
The geometries are all different making it difficult to understand systematics.



## Attempt to use historical lasers

In the past lasers were fired aiming AGNs, some of these geometries crossed the HeCo field of view. So, we tried to use them to measure the HeCo calibration in the past.

The overall spread is 16%



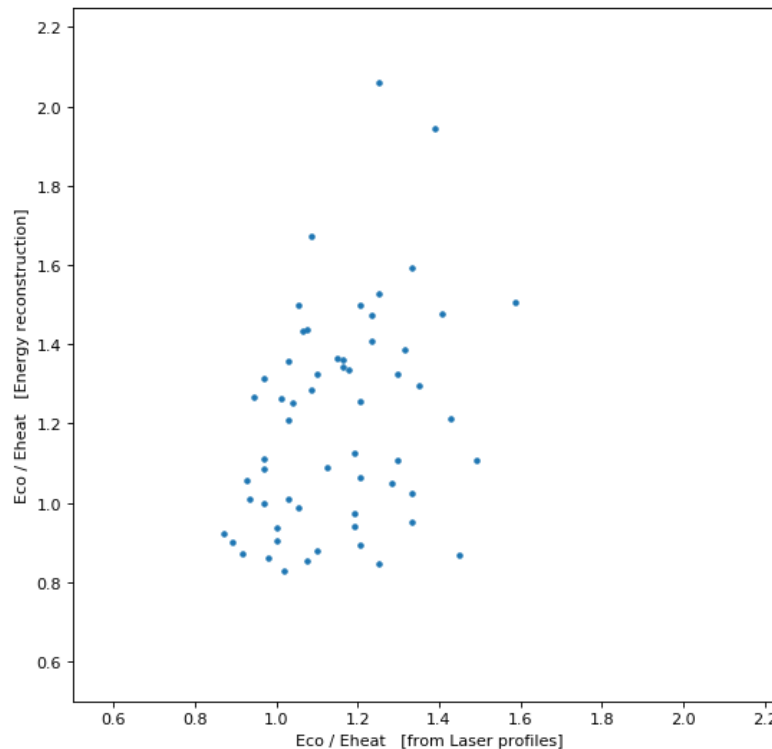


## Attempt to use historical lasers

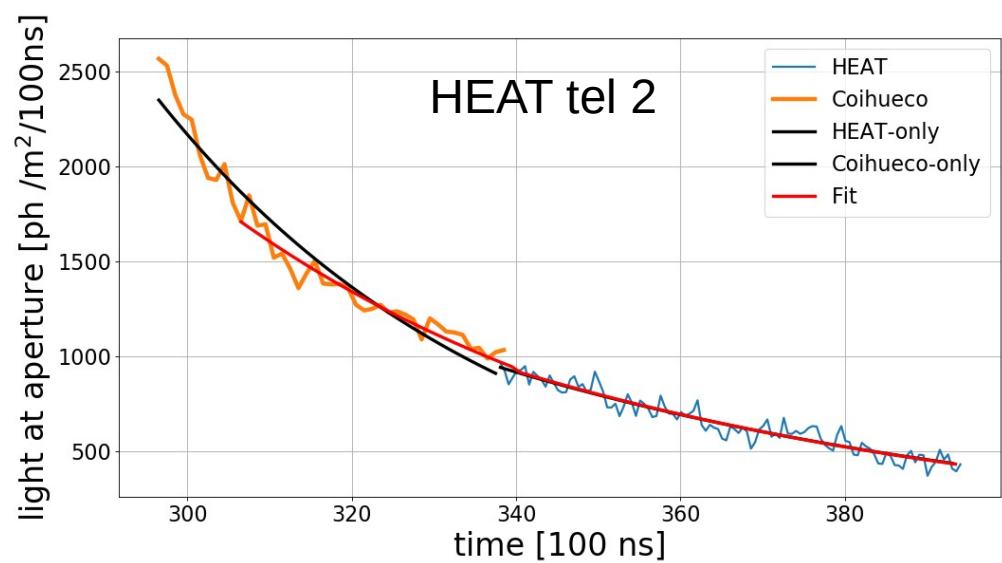
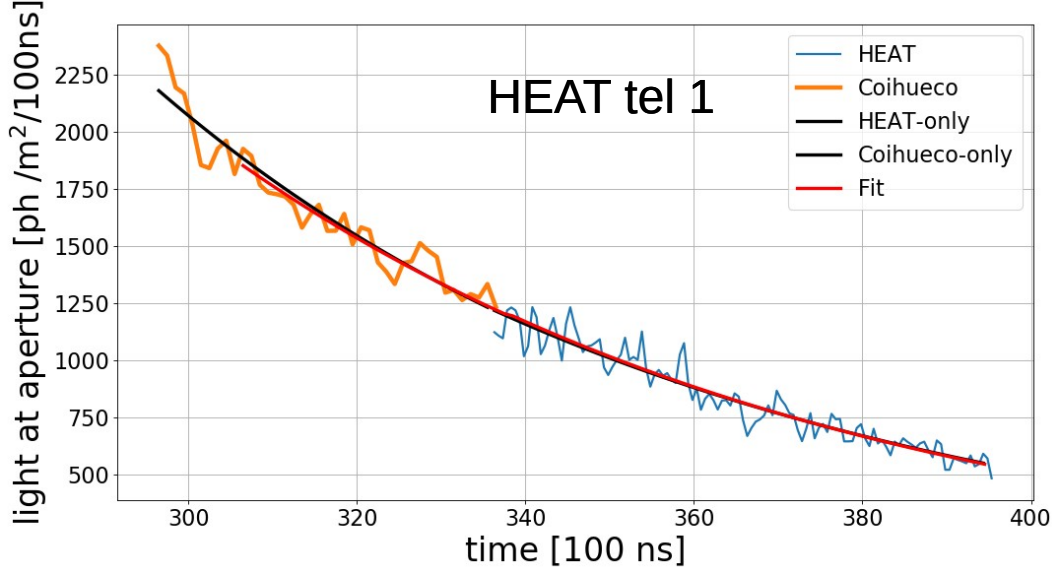
In the past lasers were fired aiming AGNs, some of these geometries crossed the HeCo field of view. So, we tried to use them to measure the HeCo calibration in the past.

Comparing results using  
Joachim's module

Thanks to Violet!

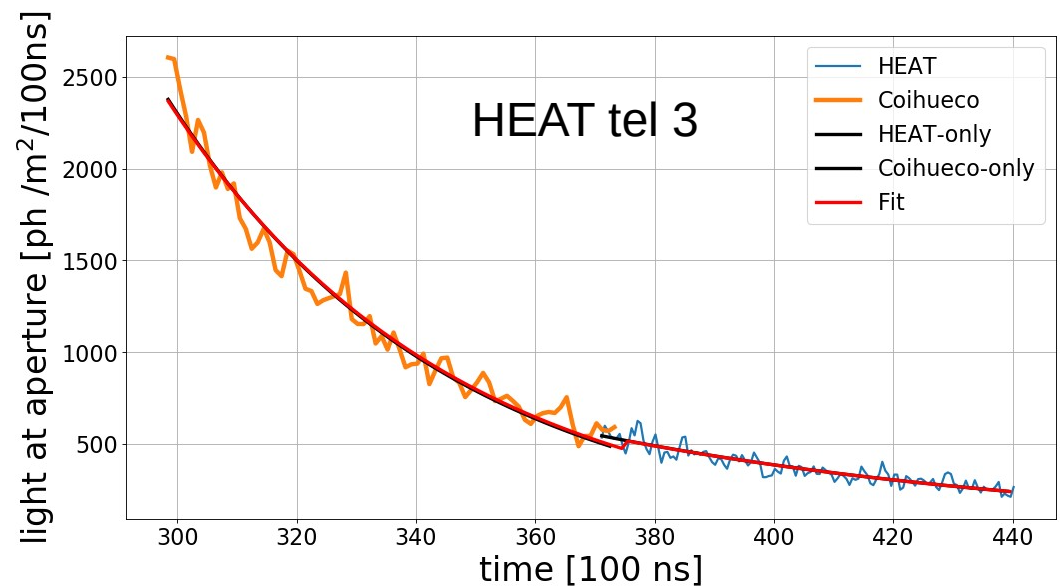


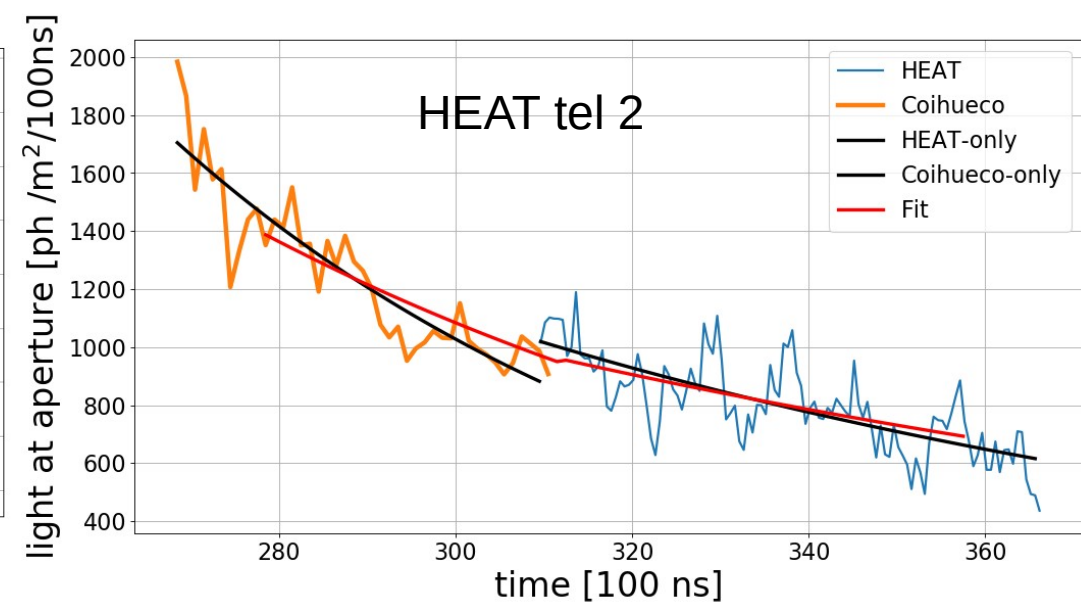
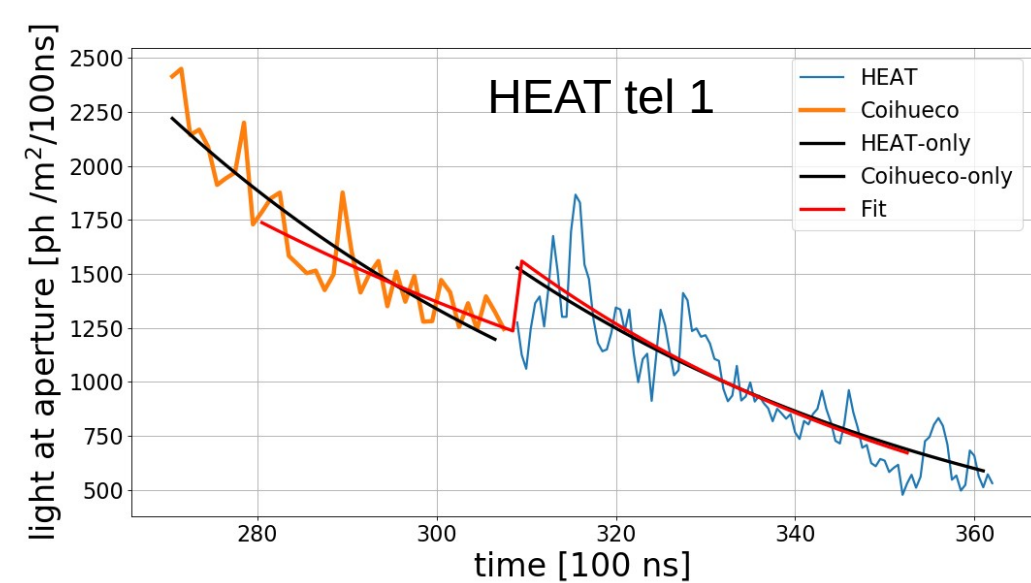
October 25<sup>th</sup>, 2018 (continuing ... )



Simulation

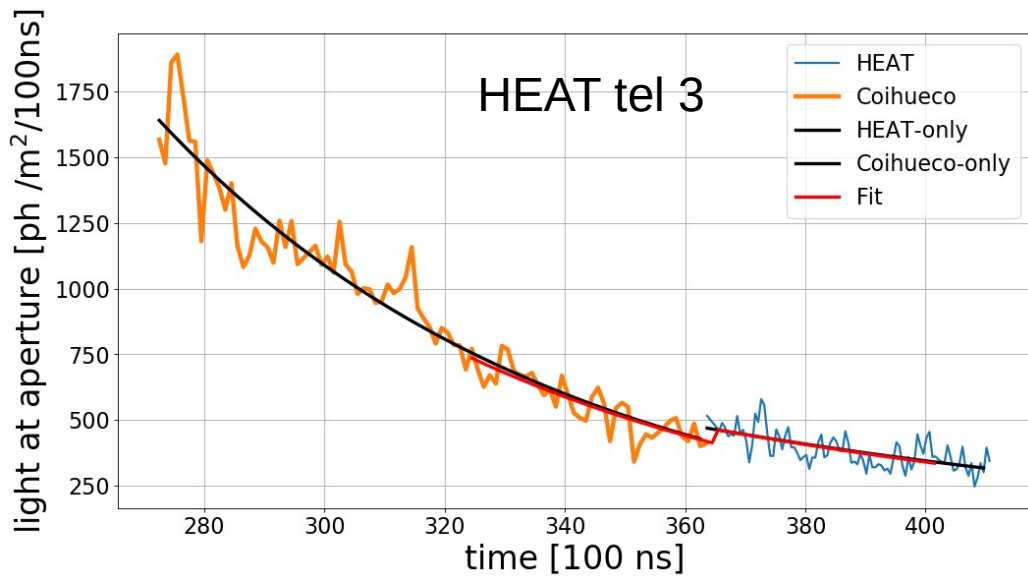
Testing a more inclined laser ( $10^\circ$  elevation)

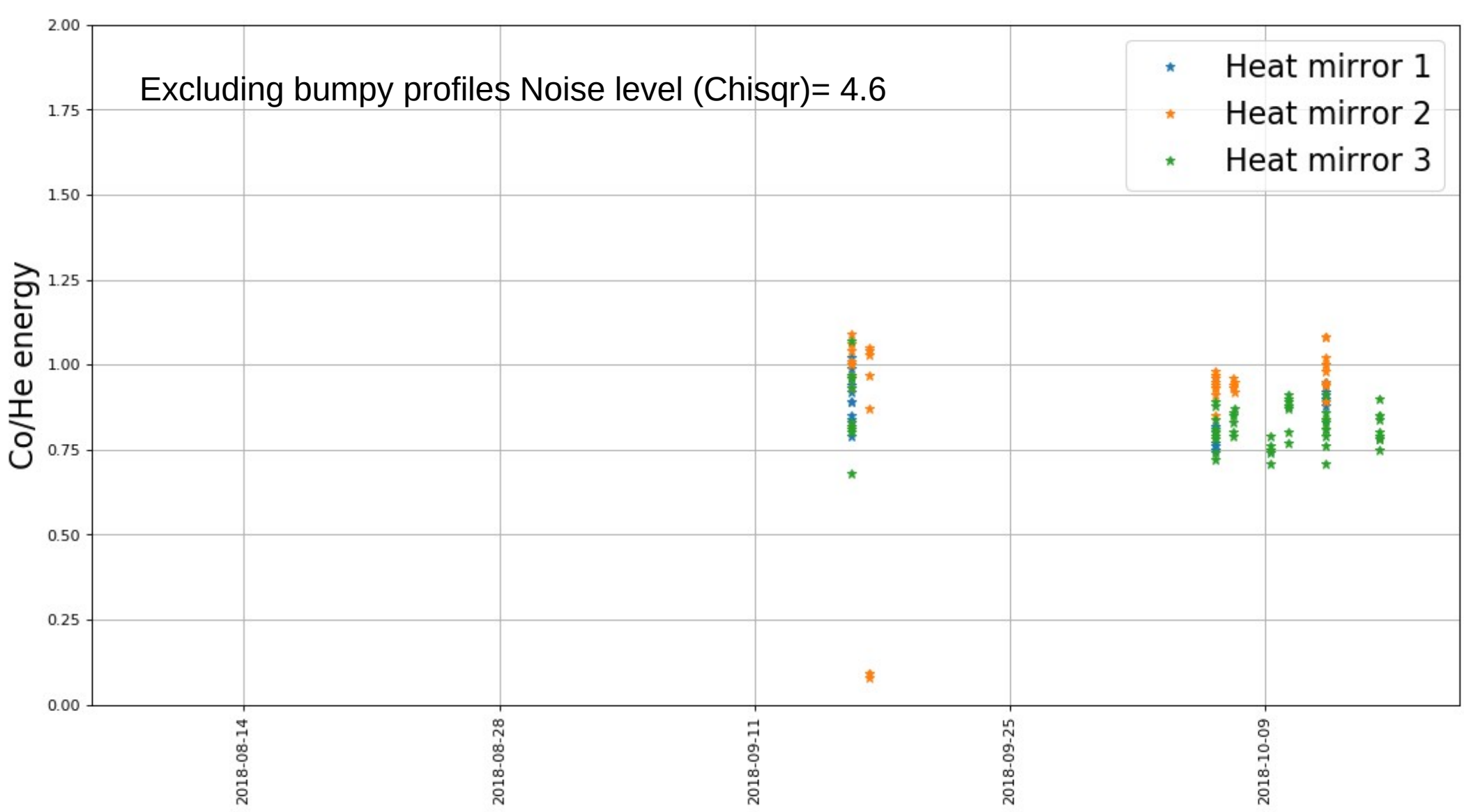


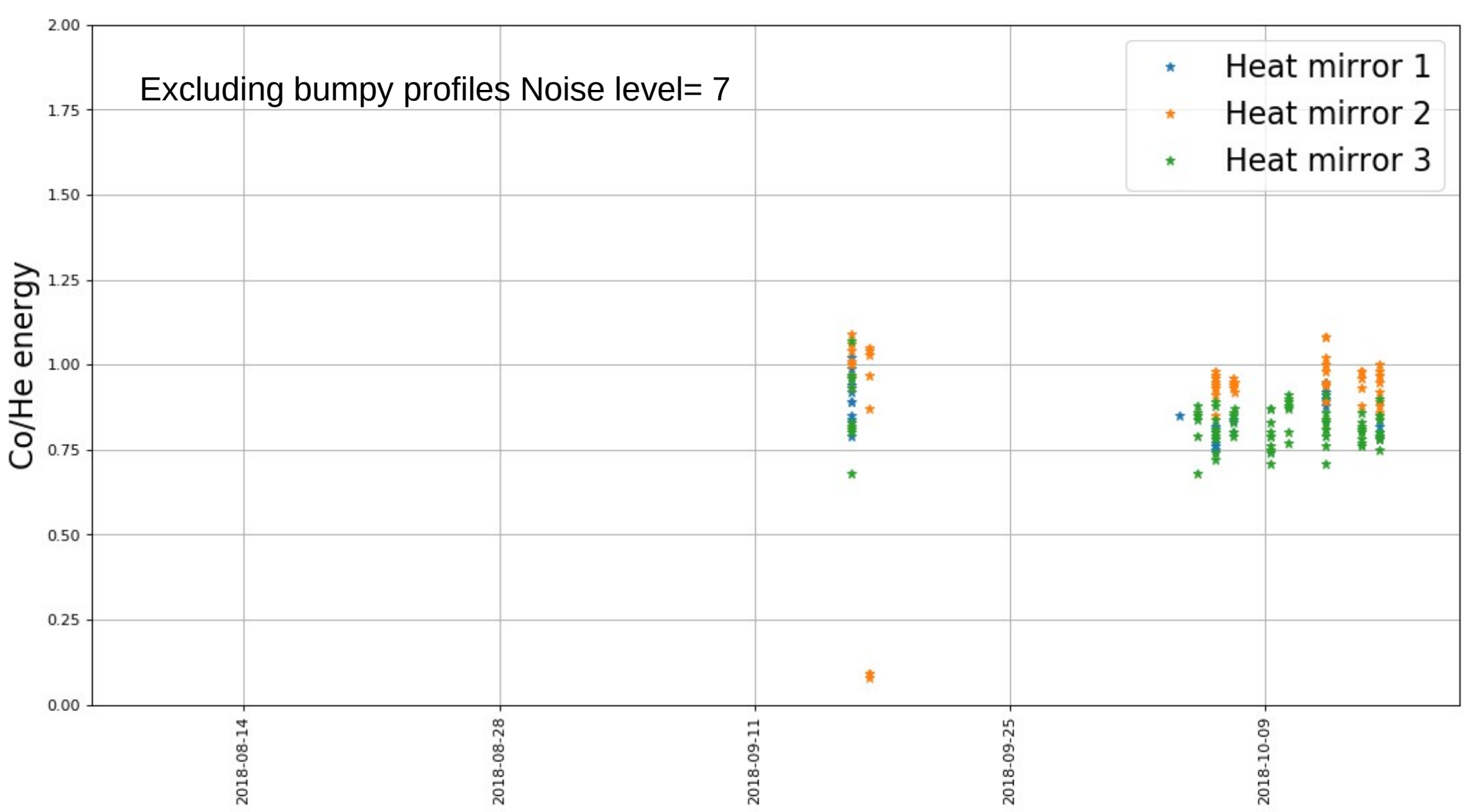


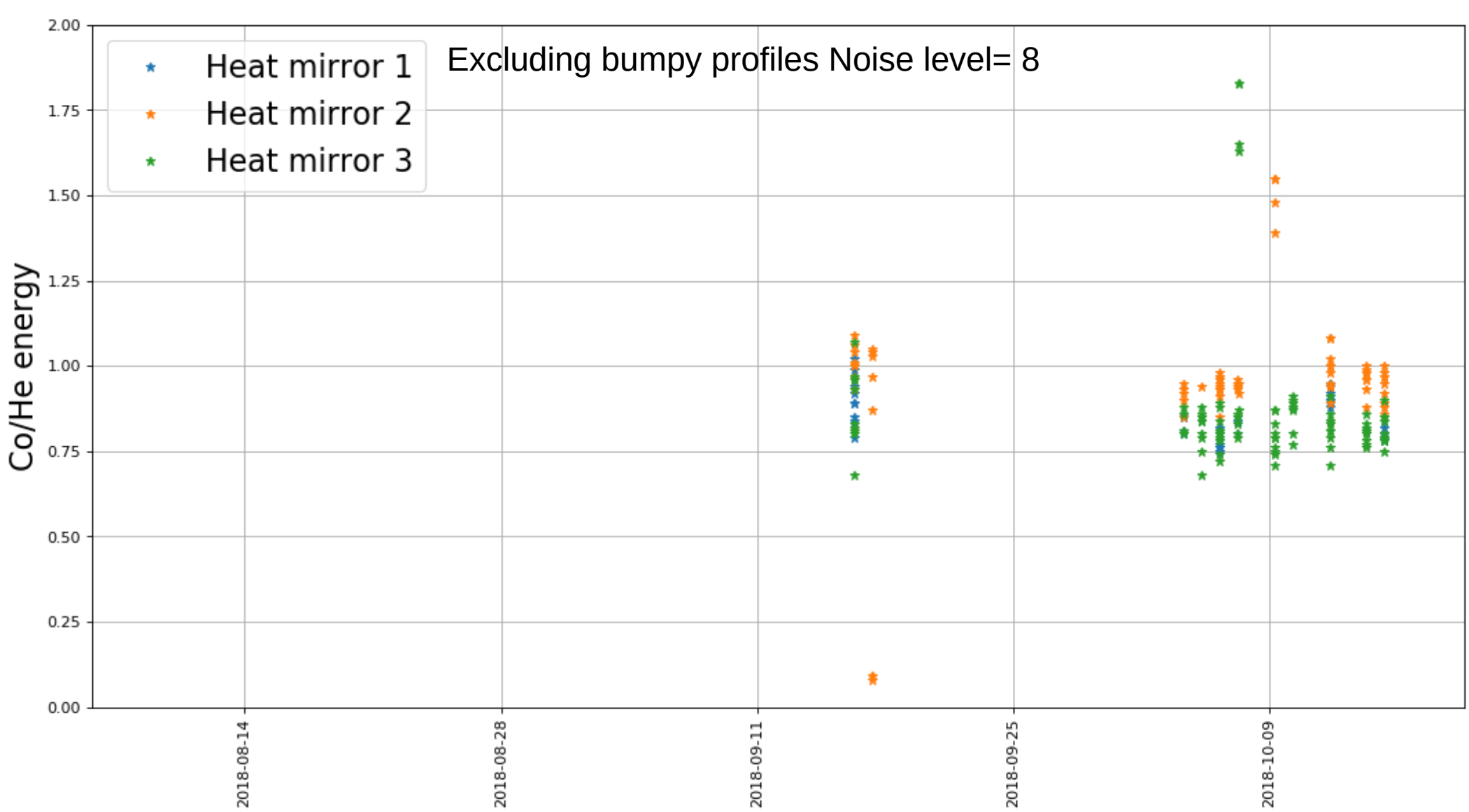
Real Data

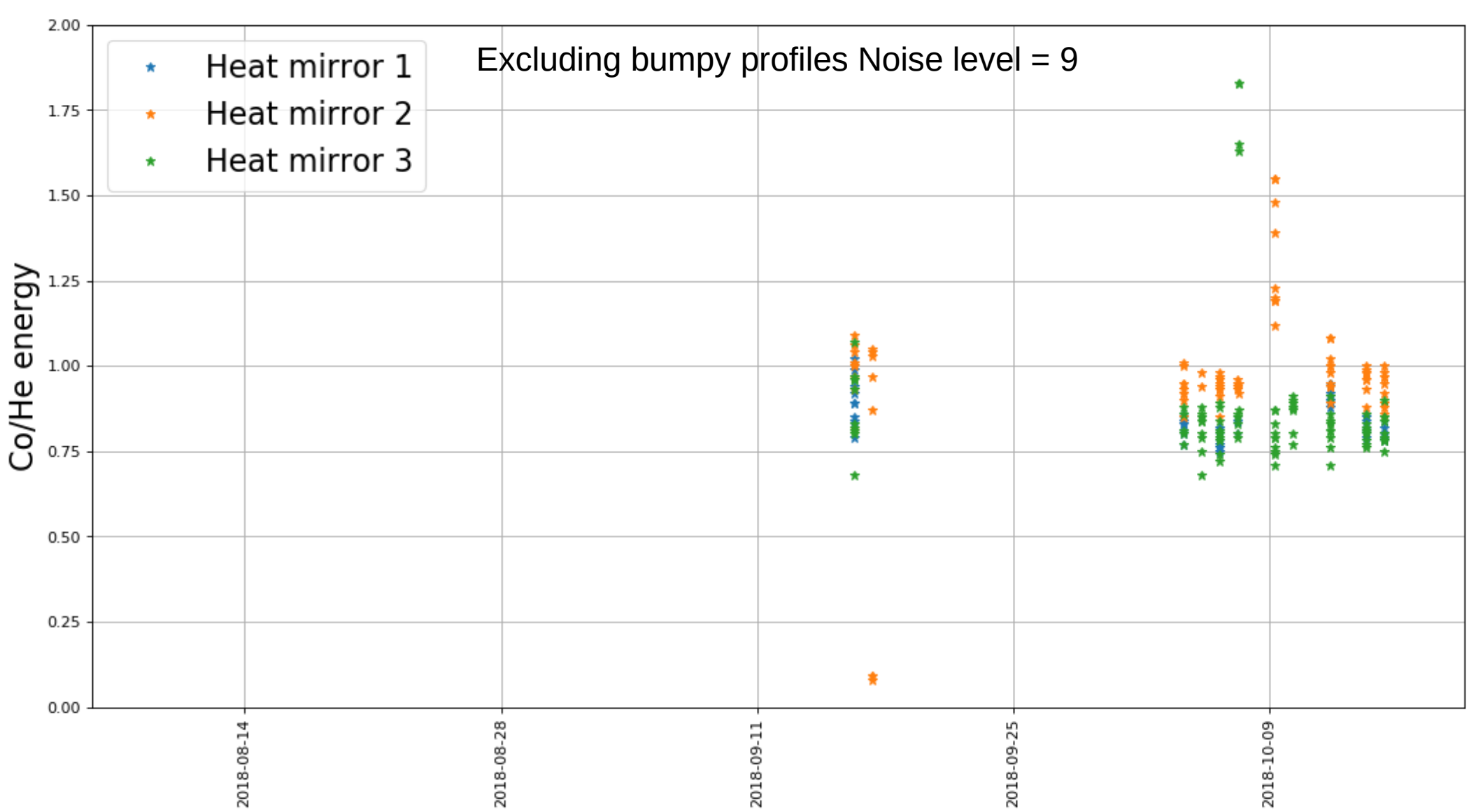
Testing a more inclined laser (10° elevation)



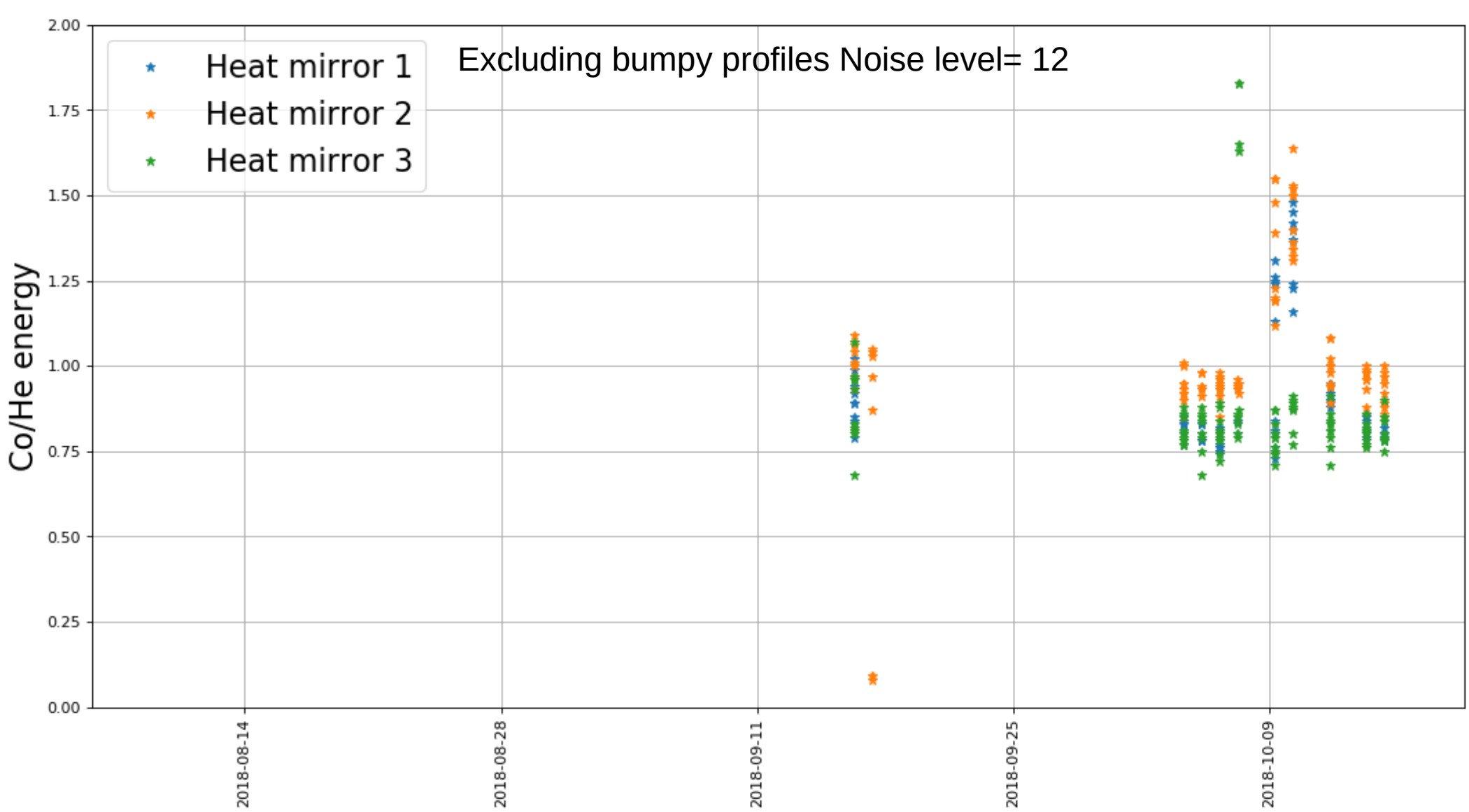


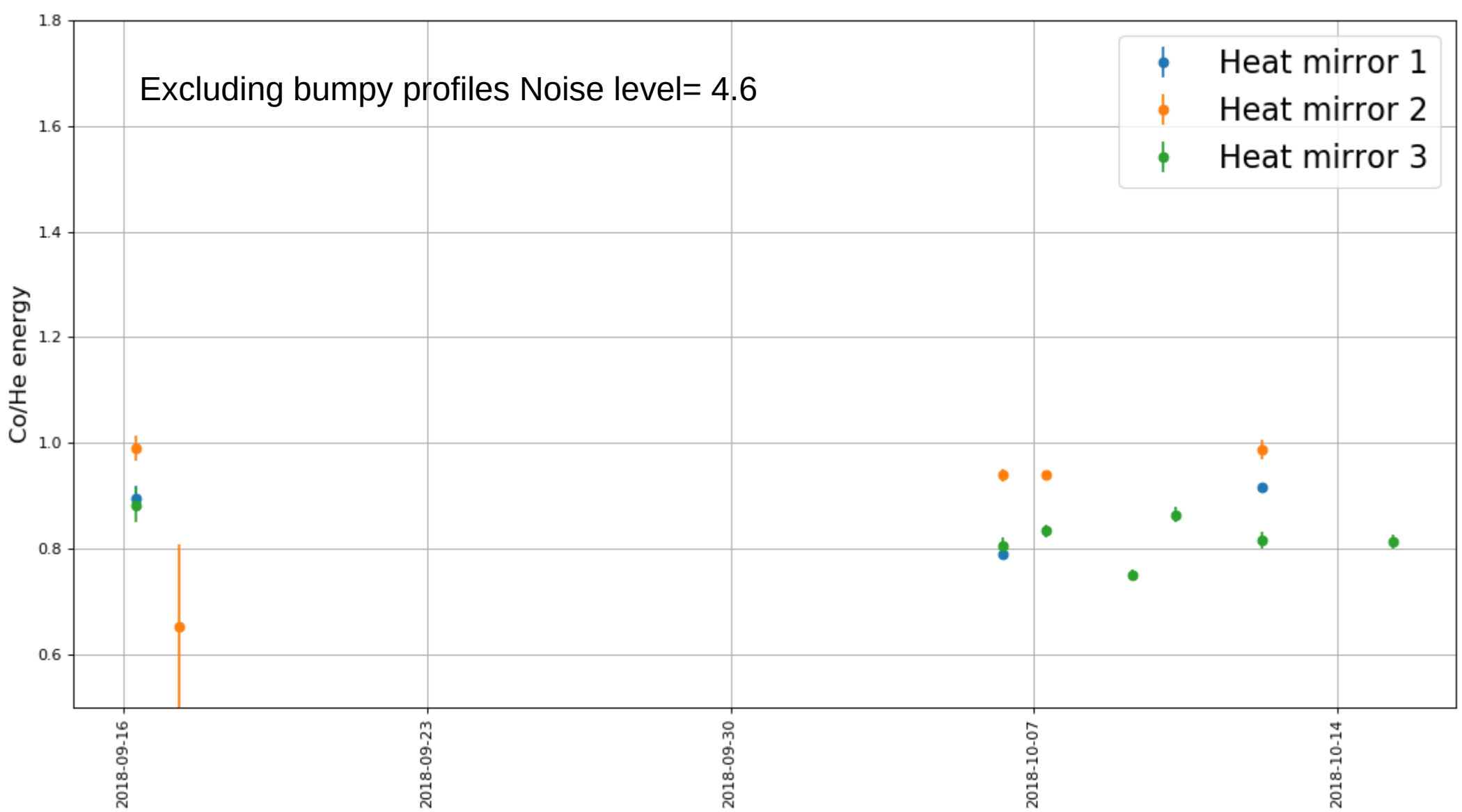


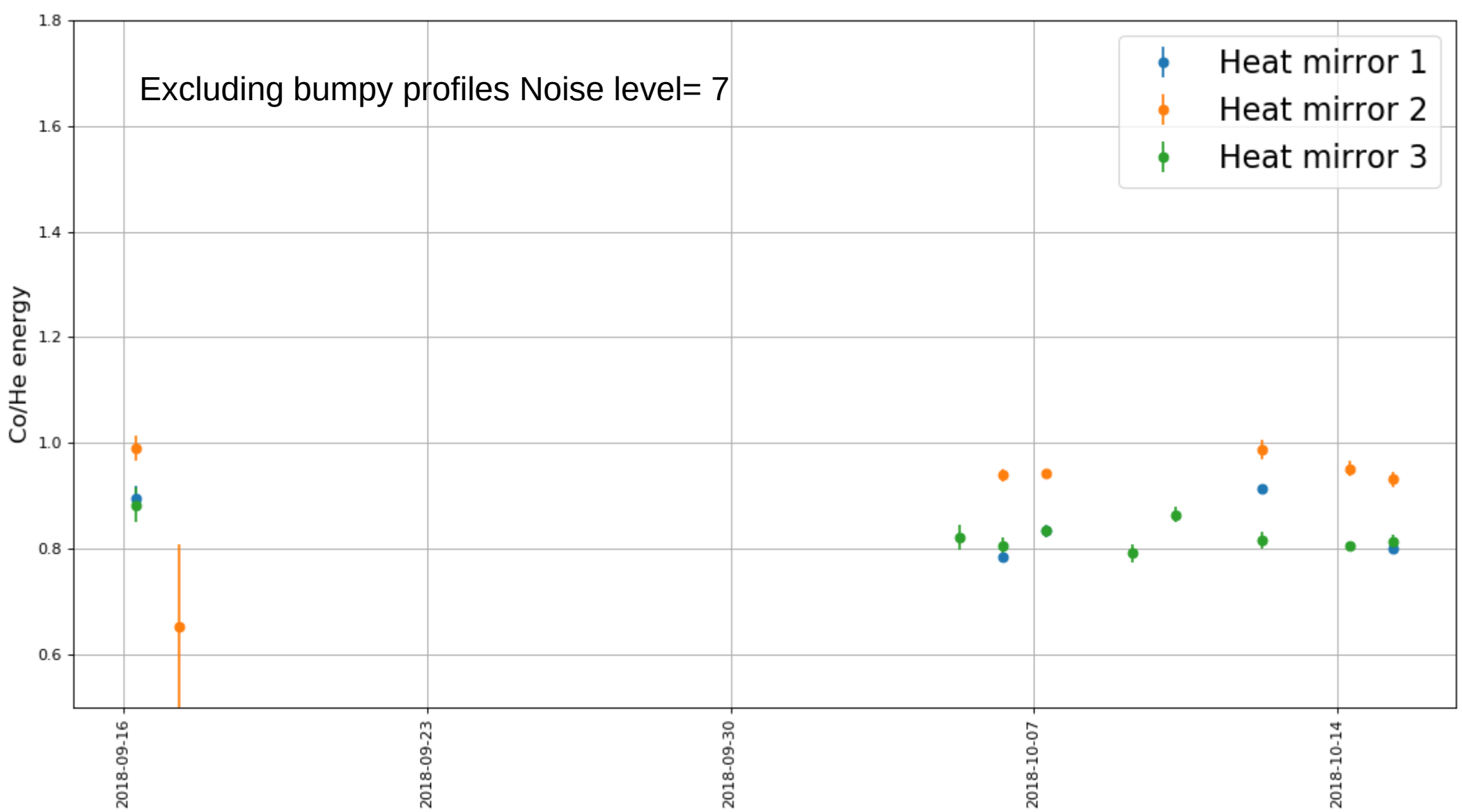


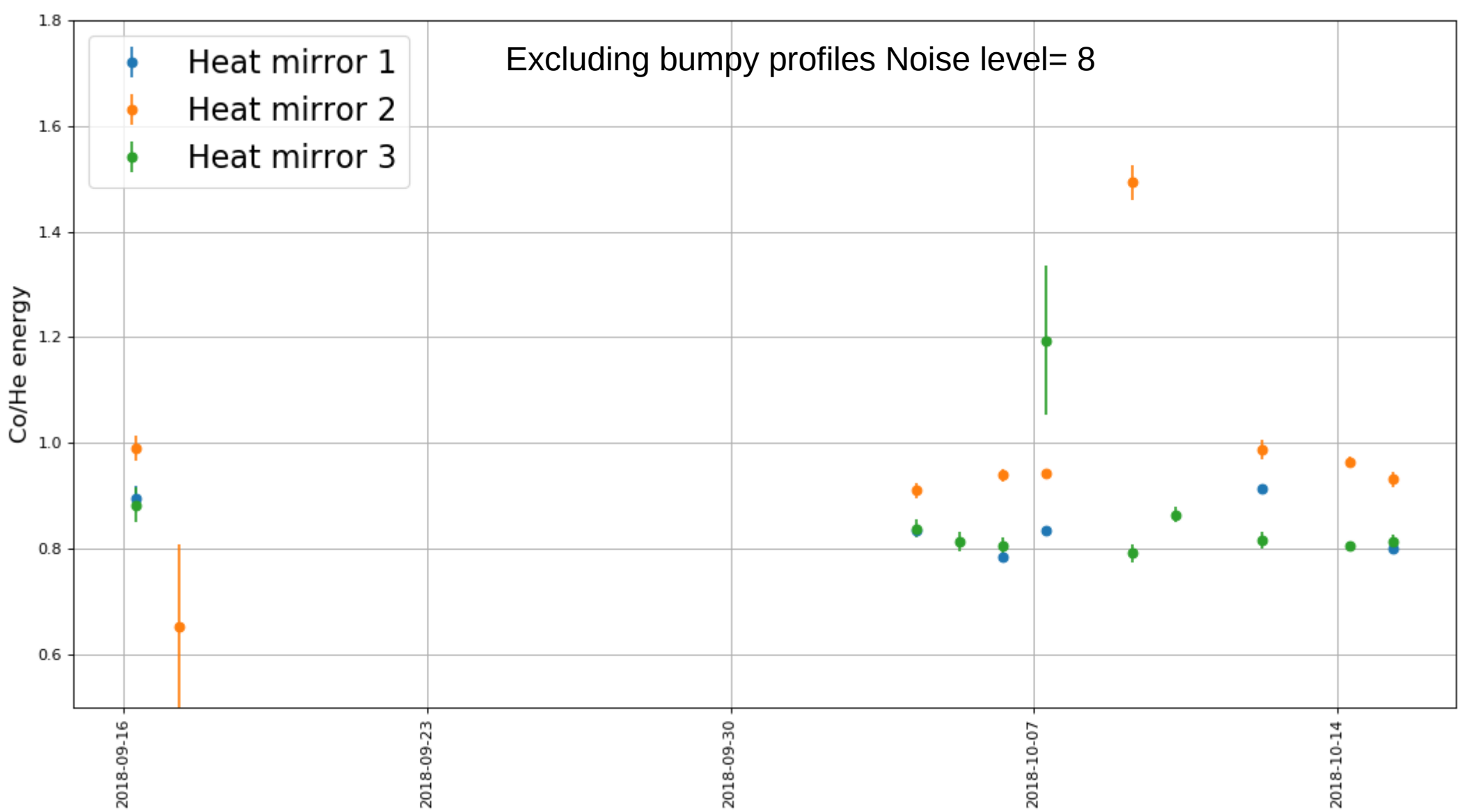


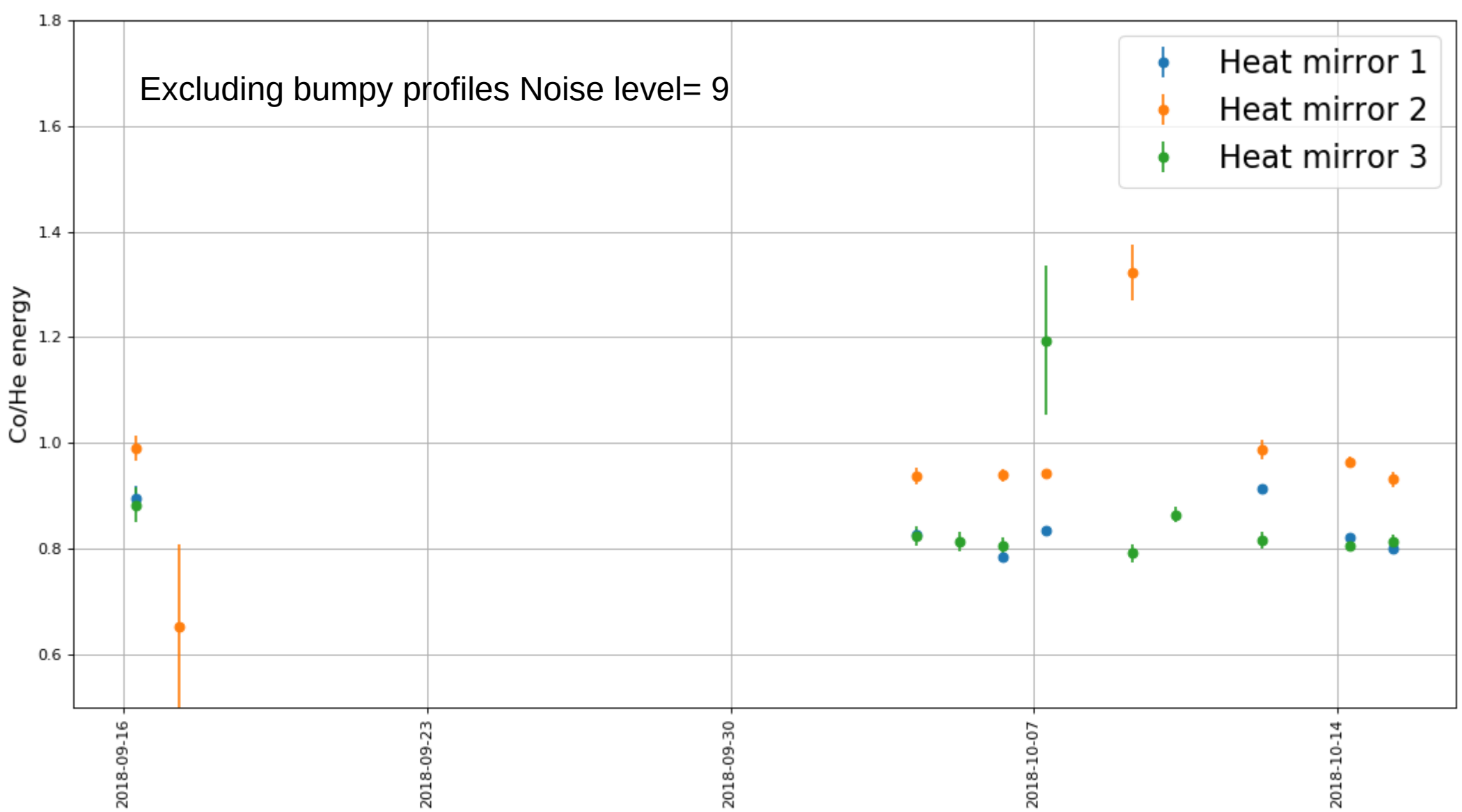


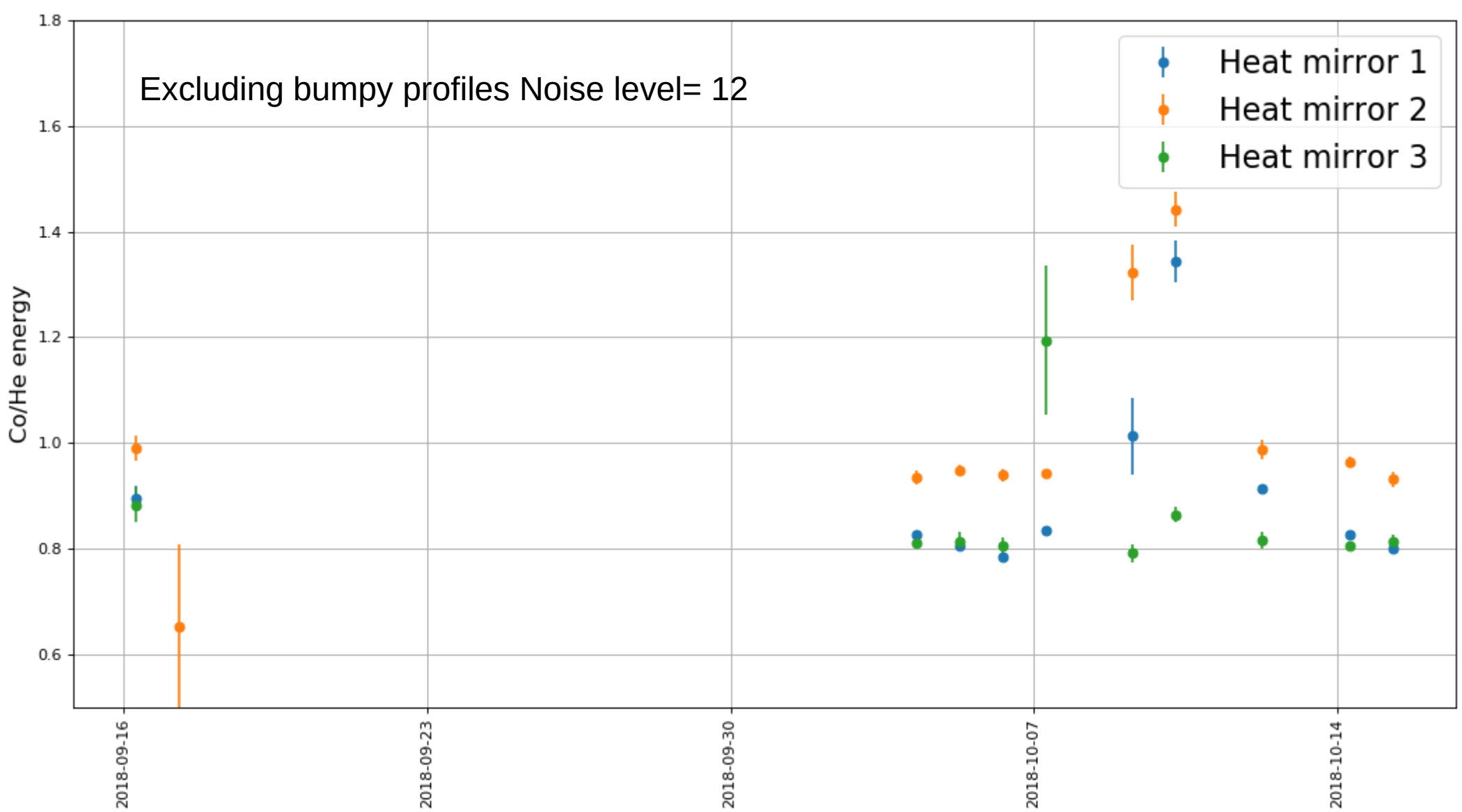












# Example of an outlier light profile

