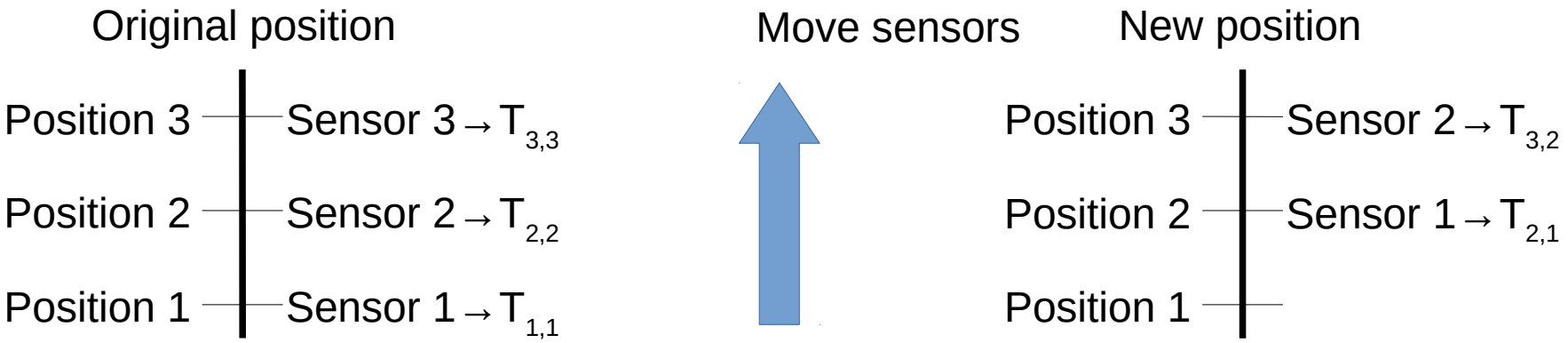
Temperature analysis

Dynamic Calibration

Miguel A. García-Peris (IFIC-Valencia)
Anselmo Cervera (IFIC-Valencia)

How dynamic calibration works

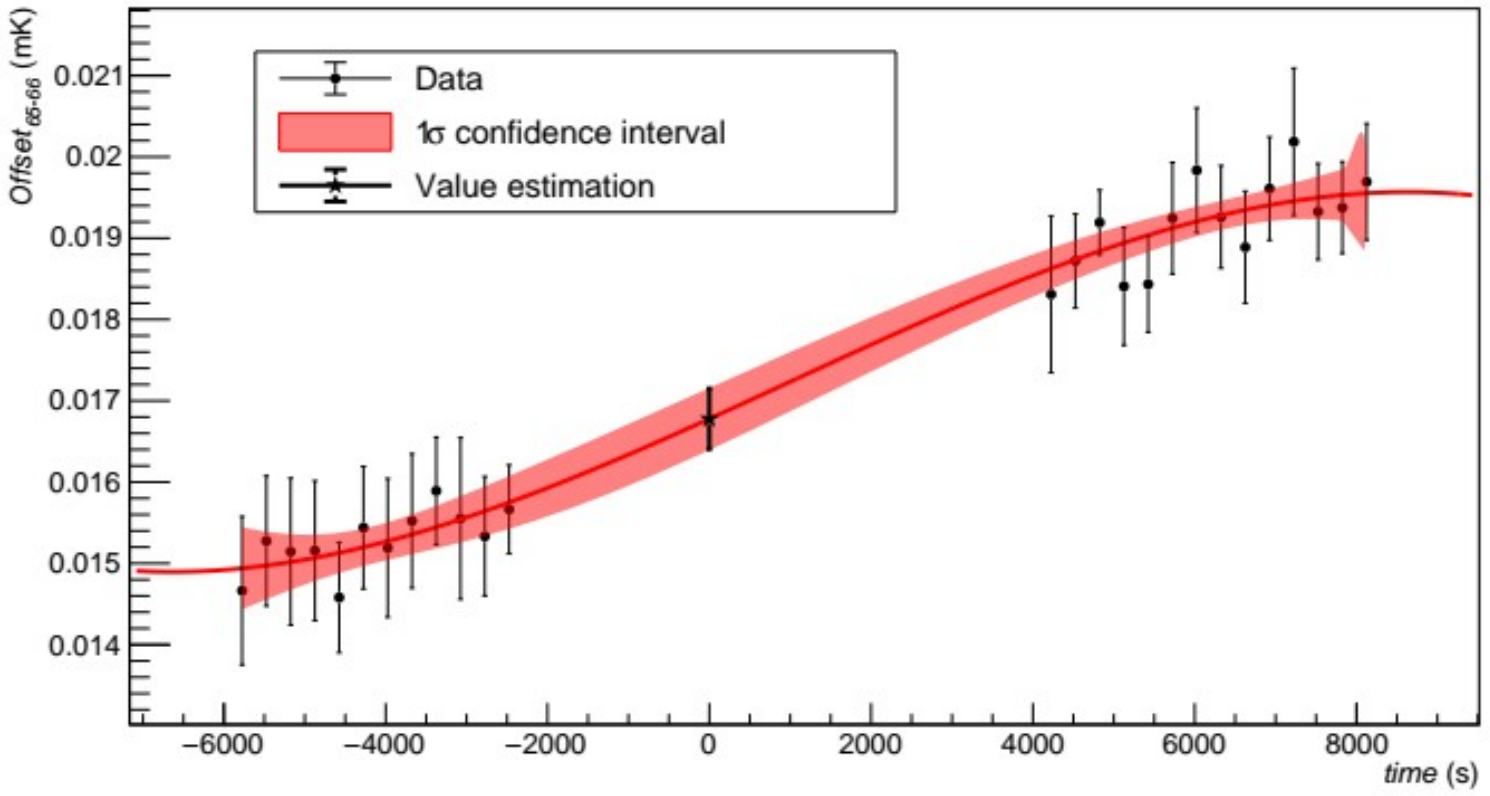


Assuming constant temperature during process, calibration constants can be computed as $T_{2,2}$-$T_{2,1}$ or $T_{3,3}$-$T_{3,2}$.

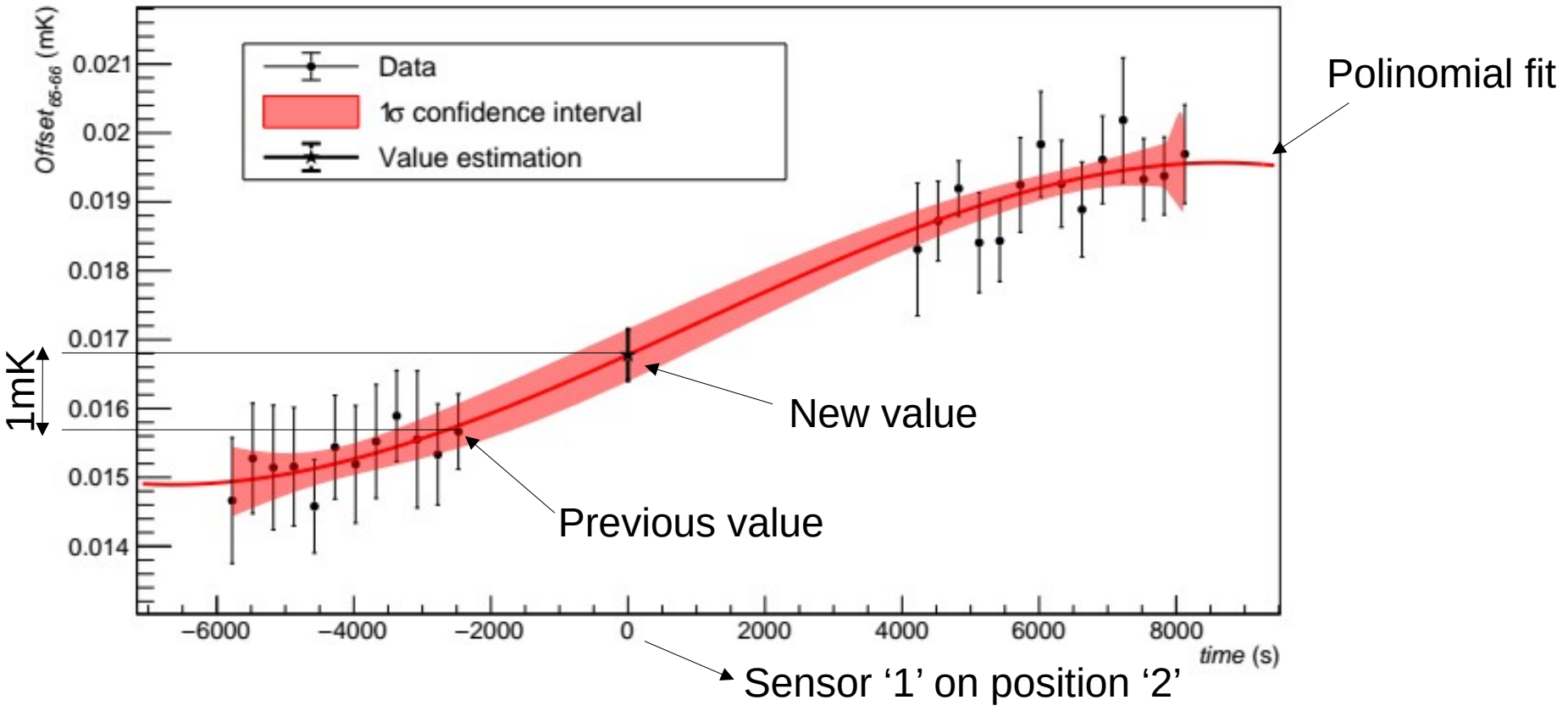
This assumption should work better when ‘original position’ and ‘new position’ are as closer as posible in time.

New approach: study how calibration constants vary as a function of time between both positions → perform fits, reduce uncertainties...

Fit example


Data
1σ confidence interval
Value estimation
Offset$_{\alpha 5\text{-}\alpha 6}$ (mK)
0.021
0.02
0.019
0.018
0.017
0.016
0.015
0.014
−6000
−4000
−2000
0
2000
4000
6000
8000
time (s)

Fit example


Data
1σ confidence interval
Value estimation
Offset$_{\delta 5\text{-}\delta 6}$ (mK)
0.021
0.02
0.019
0.018
0.017
0.016
0.015
0.014
1mK
−6000
−4000
−2000
0
2000
4000
6000
8000
time (s)
Polinomial fit
New value
Previous value
Sensor ‘1’ on position ‘2’

Using all available data

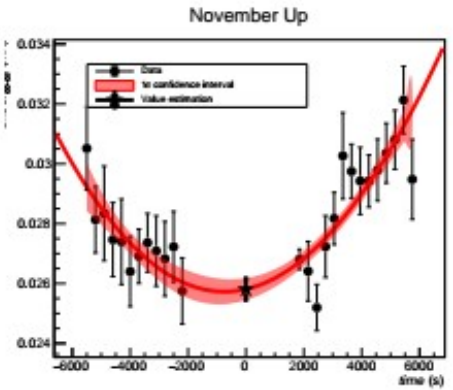
Three calibrations:

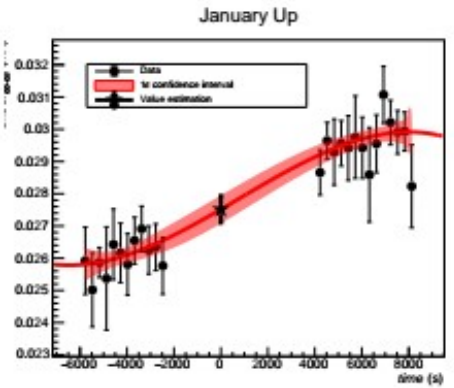
Upwards move
Downwards move

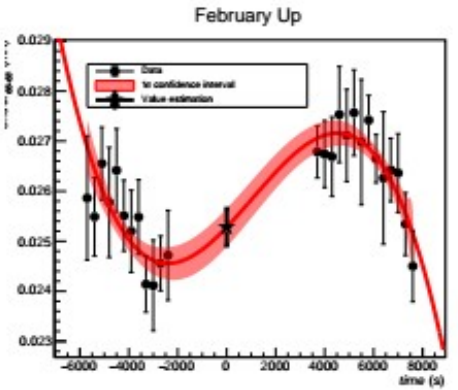
SIX VALUES

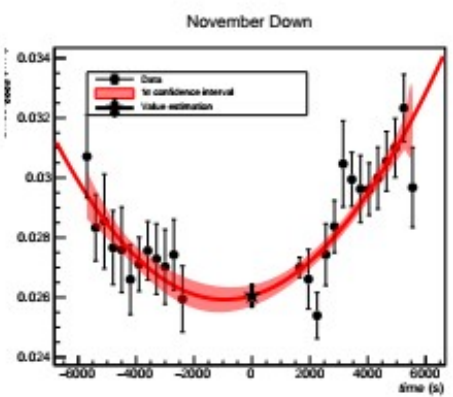
Error is statistical. A systematic should be estimated (from the model?).

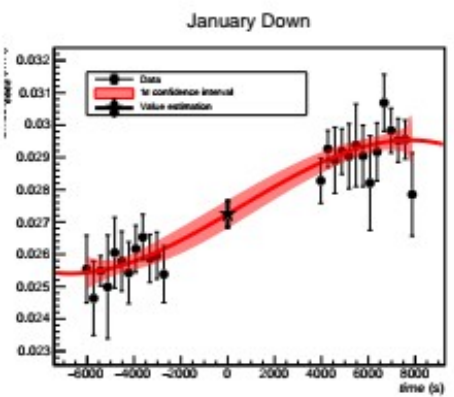
Sensors: 68 and 66

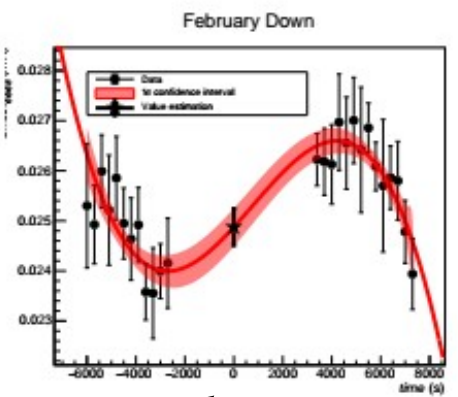








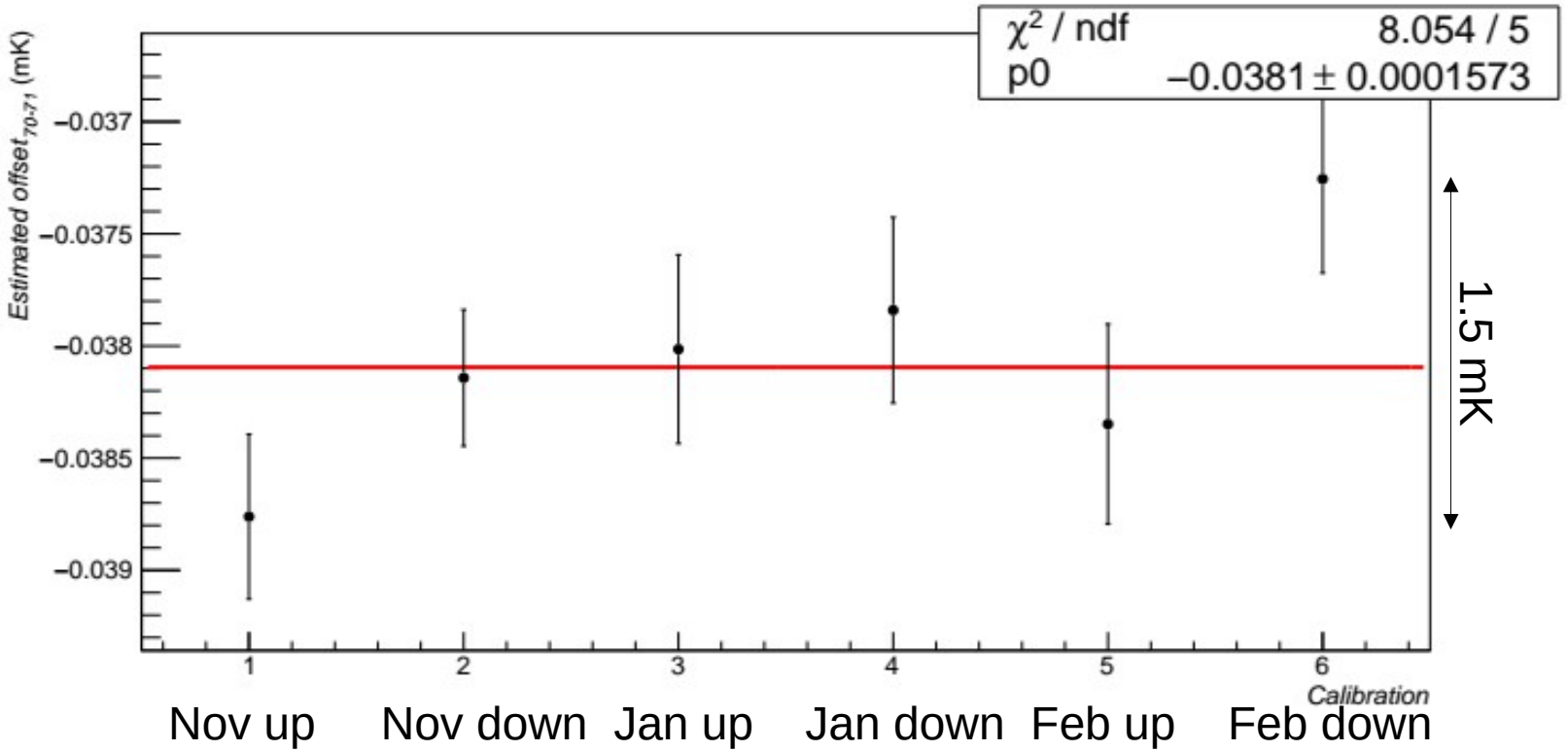




Strange behaviour

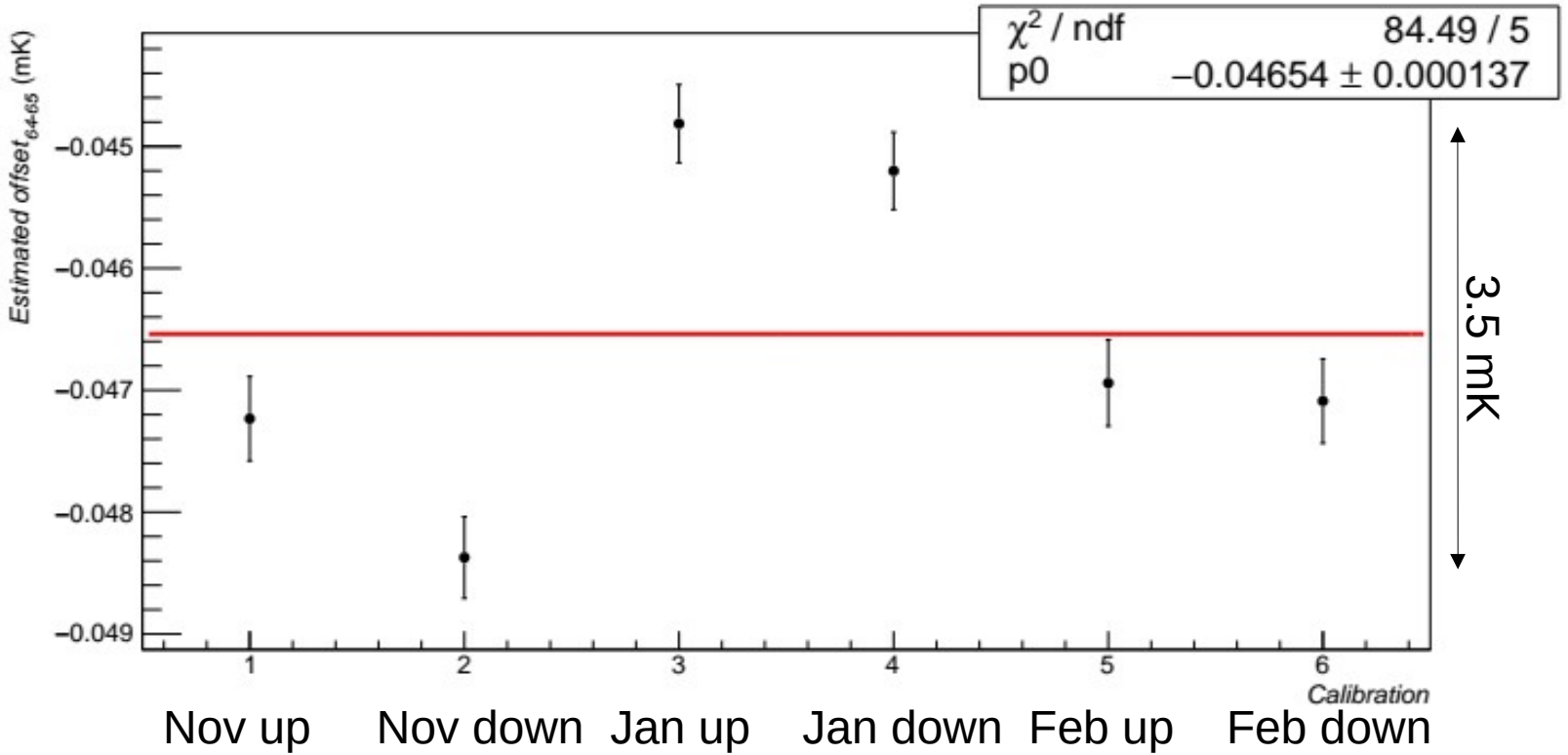
Compute a mean value?

Some calibration constants are similar for all 6 independent calibrations

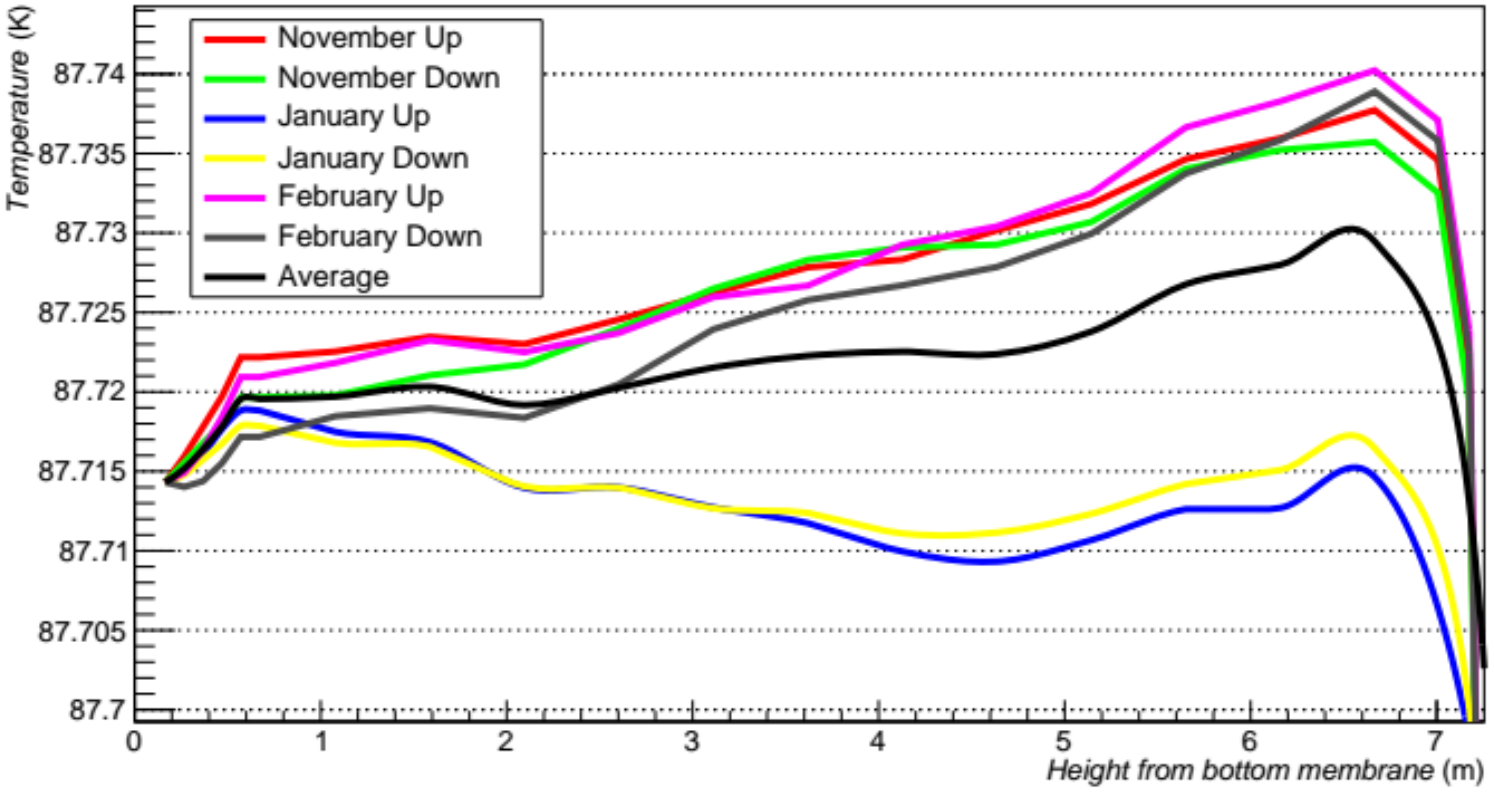


Compute a mean value?

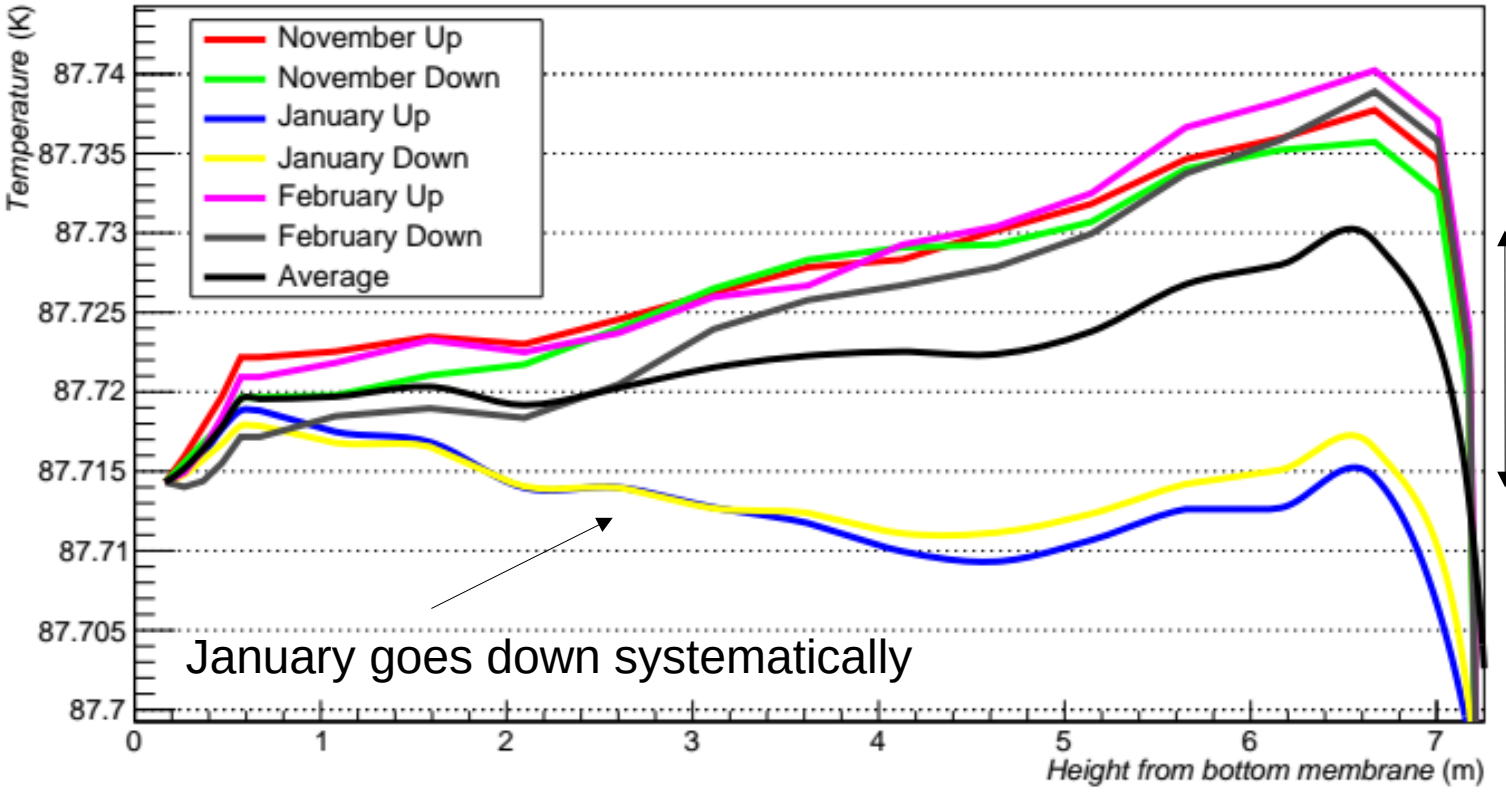
Others show bigger differences between calibrations. Calibration constants for middle sensors are bigger systematically on January calibration



Compute resulting profile



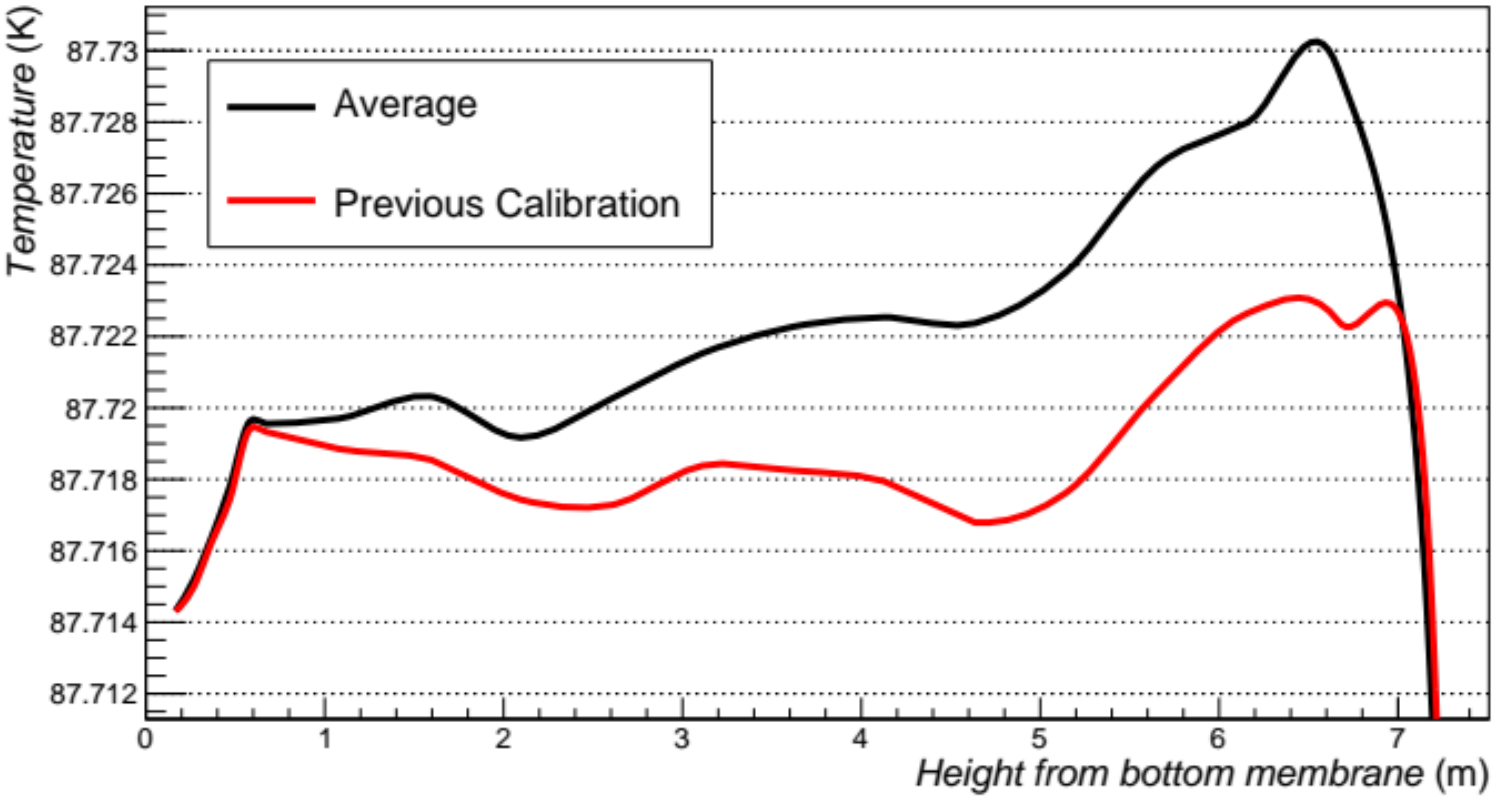
Compute resulting profile



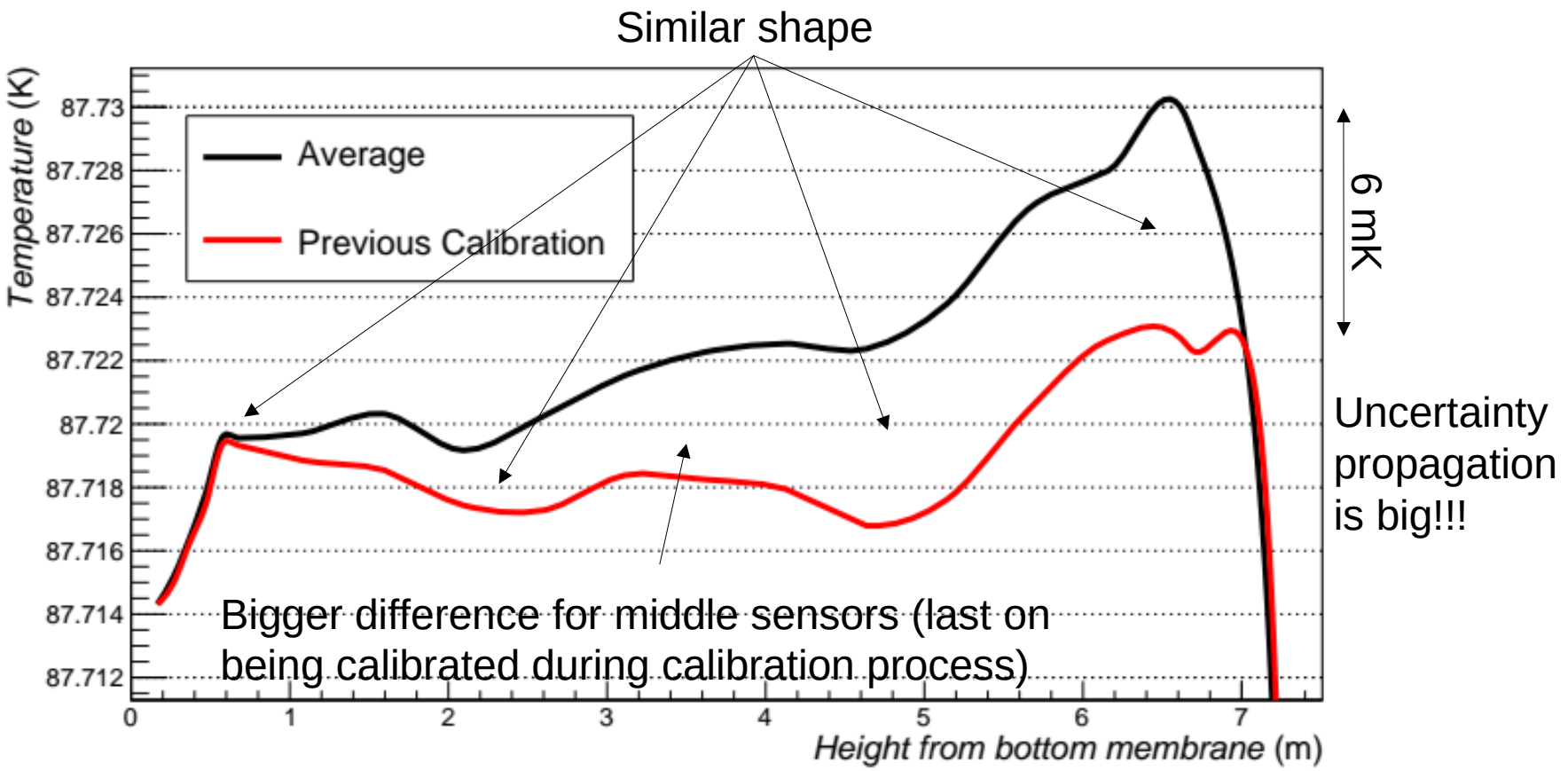
Bigger than before!!!

Similar to Valencia!!!

Comparative with previous one

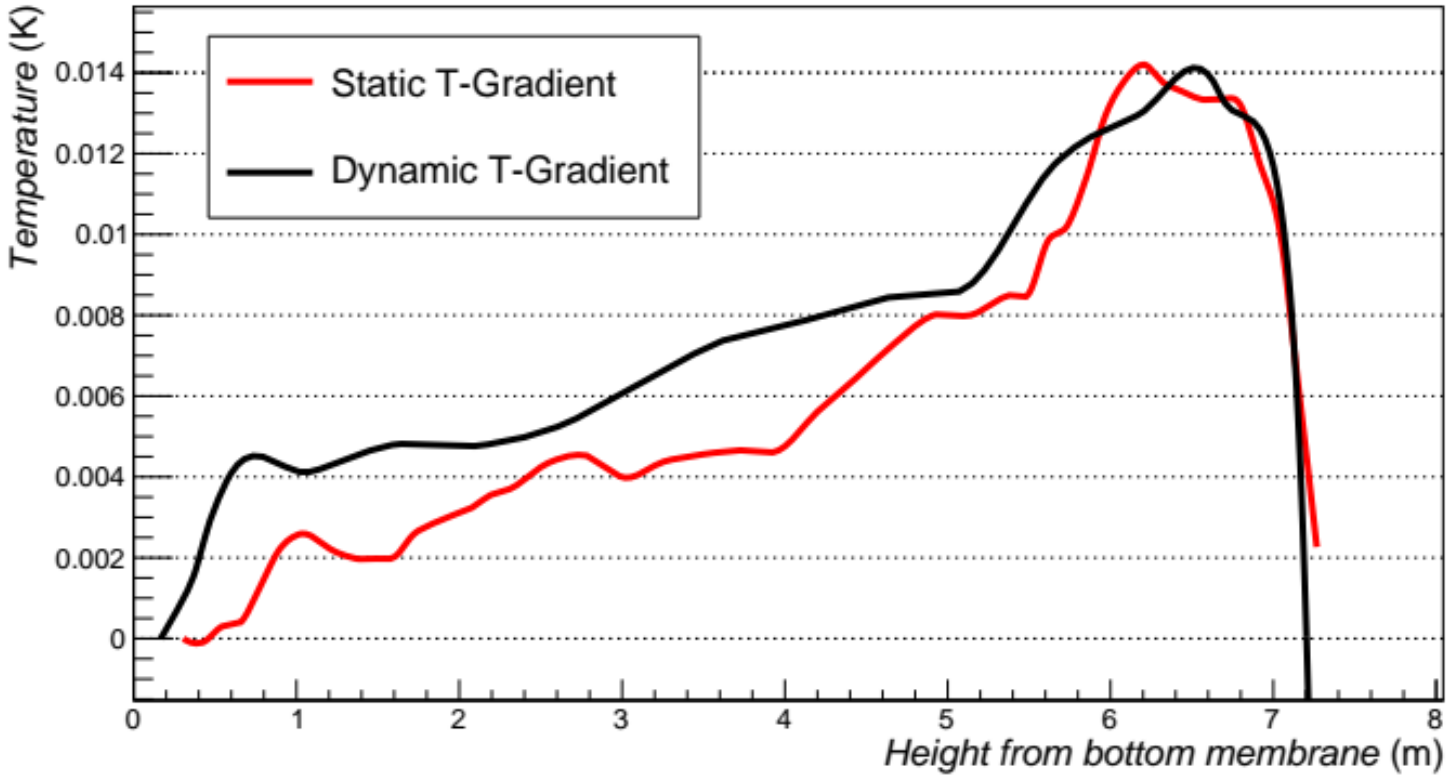


Comparative with previous one



Comparative with Valencia

Similar shape



Conclusions

Doing a more exhaustive analysis on dynamic calibration has resulted in a bigger profile. This new profile is similar to Valencia.

Big discrepancies exist between calibrations (November and February vs January). How to solve them?

The accumulated bias during the process can be big, it should be minimized.