First production of LiteBIRD Simulations

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on behalf of the Simulation Production Team
22/05/2023

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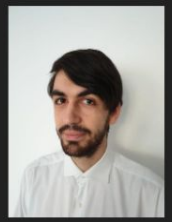

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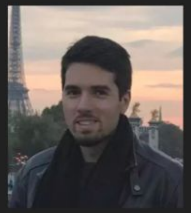

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… and many more!

IMO implementation team

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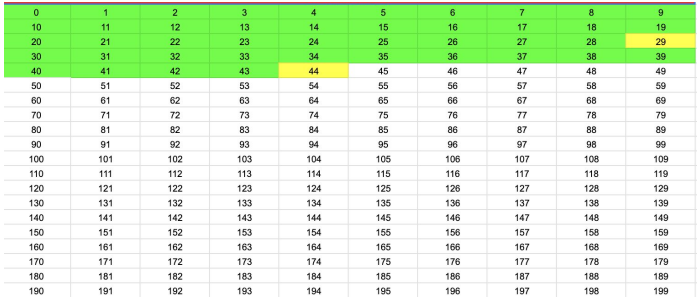
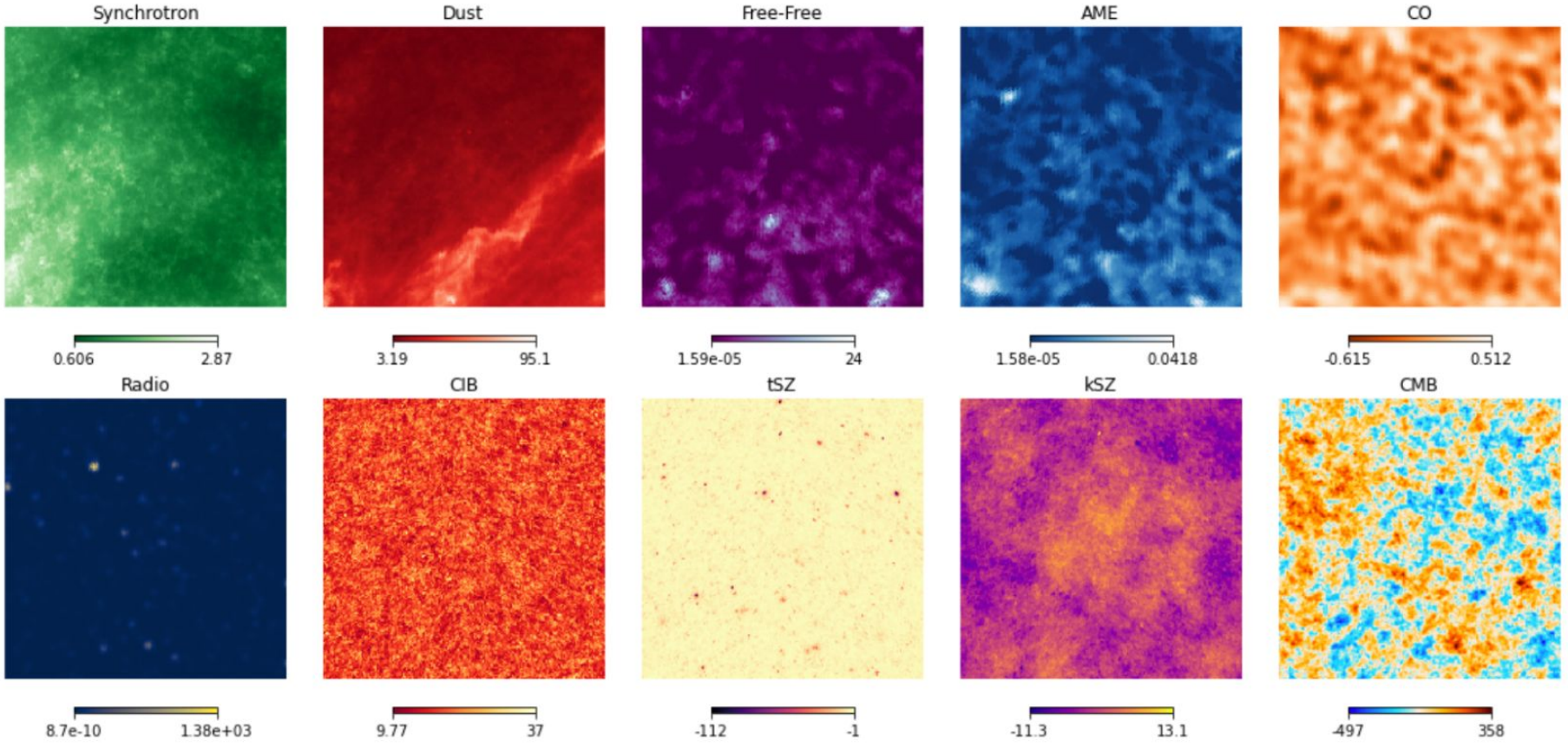
Quick review

- GOAL: to produce and provide a realistic inputs for Project Study Groups
- May 2023: *Post-ptep* Simulations produced **@CINECA** !
- LB wiki : https://wiki.kek.jp/display/~gpuglisi/Post-PTEP++Simulations
- **Unprecedented effort**: ⅓ focal plane, 1/f + white inhomogenuous noise
- cost: ~345 kCPUh, 38 TB (mainly due to time-ordered data storage!)
- Initially planned 50 simulations, now expect 200
- Sims will be described in a paper to be referred from the other Post-PTEP publications
- 48 out of 200 sims produced today see Status of production live webpage



Inputs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Free-Free
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AME
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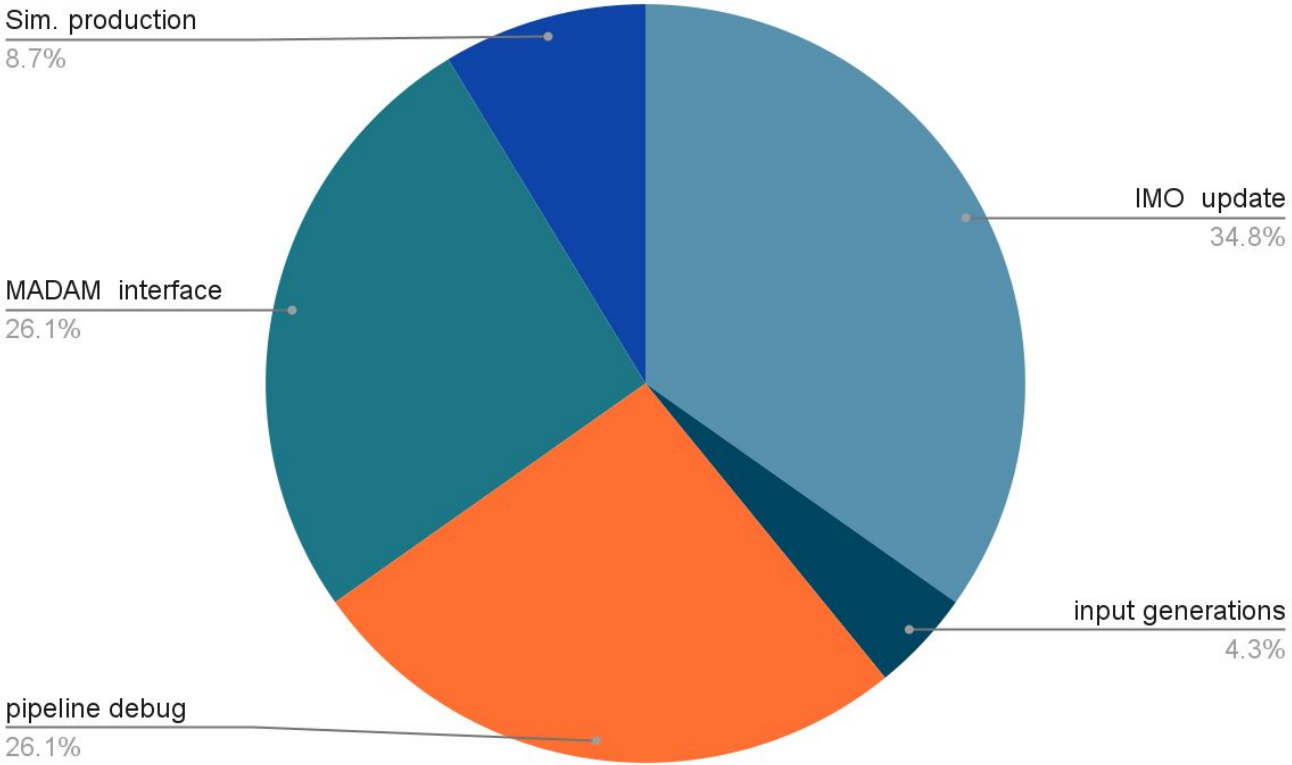
CO
-0.615
0.512
Radio
8.7e-10
1.38e+03
CIB
9.77
37
tSZ
-112
-1
kSZ
-11.3
13.1
CMB
-497
358

Simulation production time - As of May 2023

Contingencies :

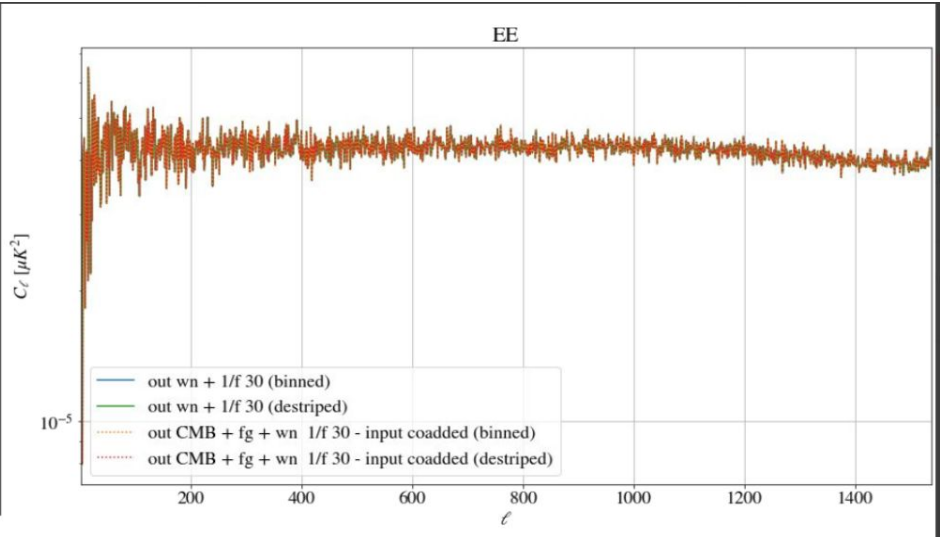
- restrictions on resources allocation
- E2E Pipeline Debug and map-maker interface
- IMO update
- Delay in the allocation at CINECA
-

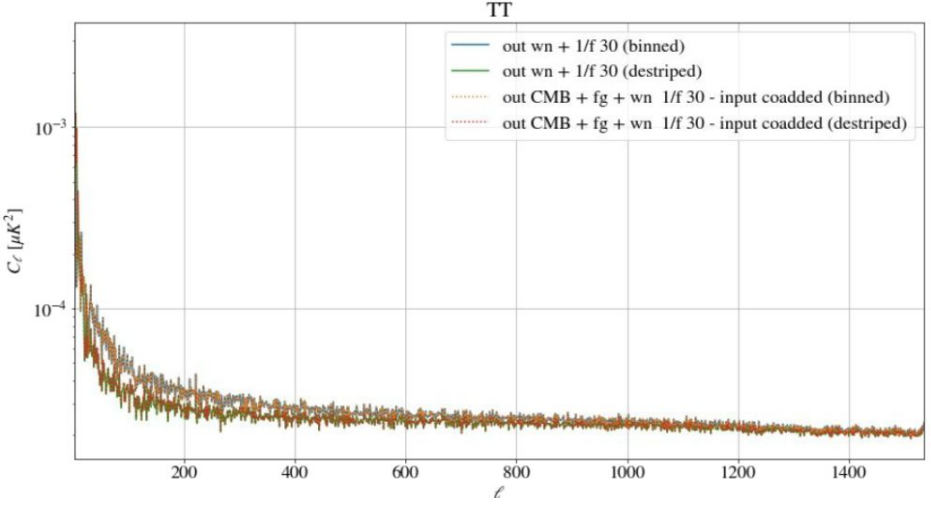


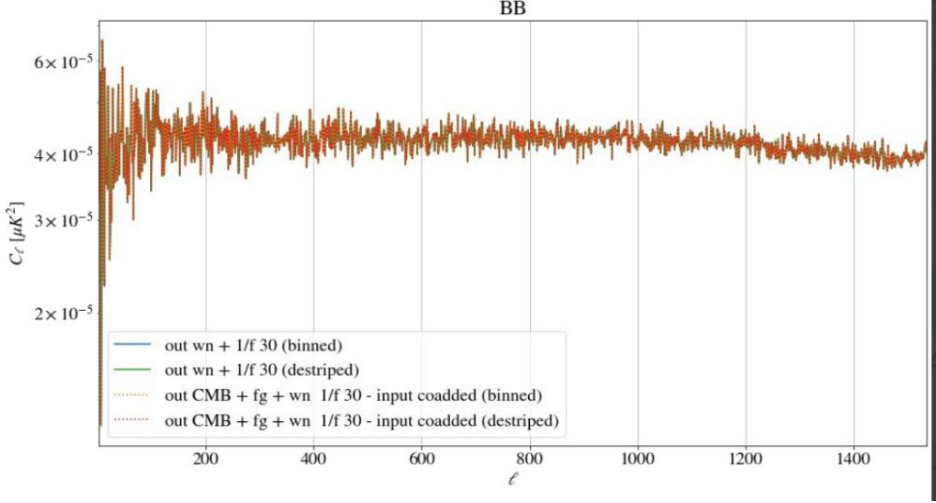
Validation tests

Spectra (L2-050):

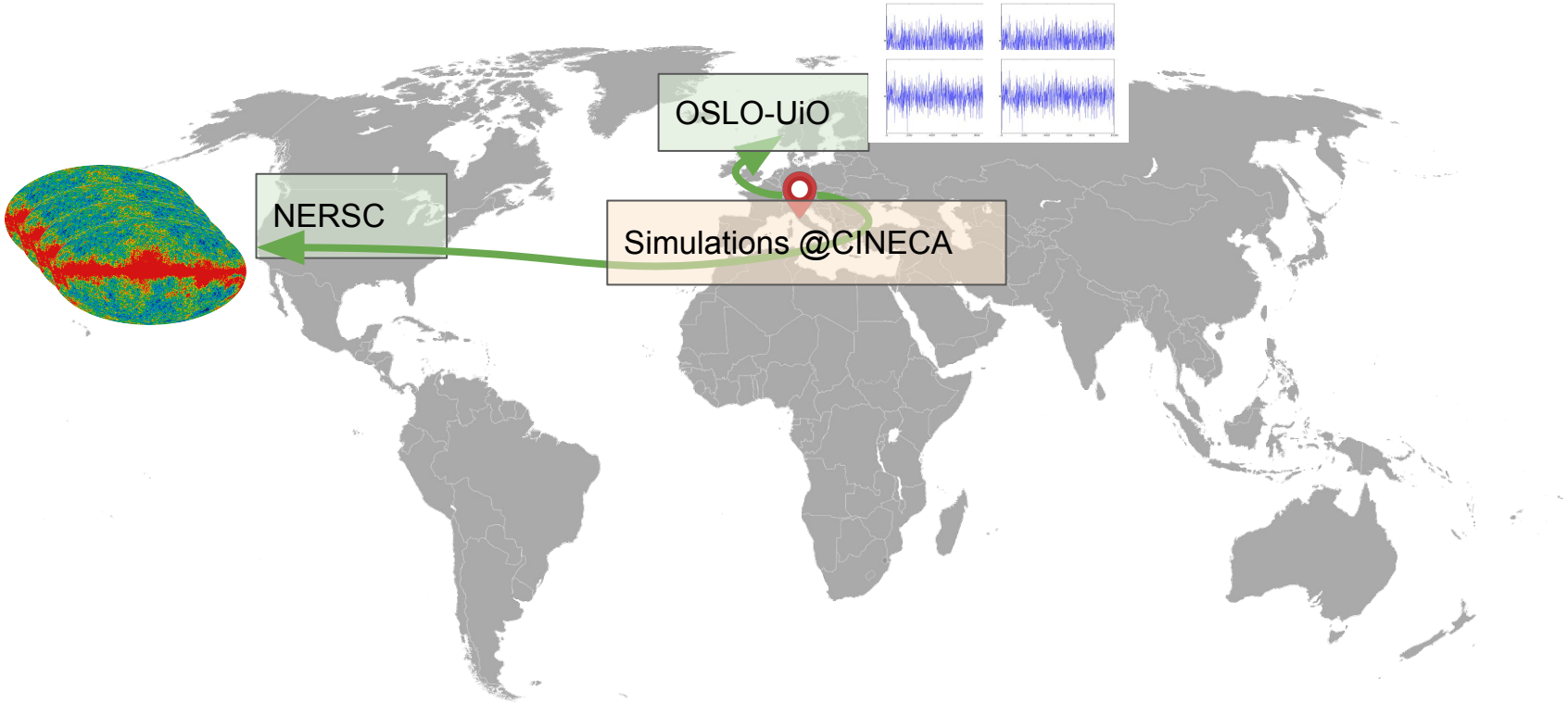
- output wn + 1/f 30mHz
- output (CMB + fg + wn + 1/f 30mHz) - input coadded





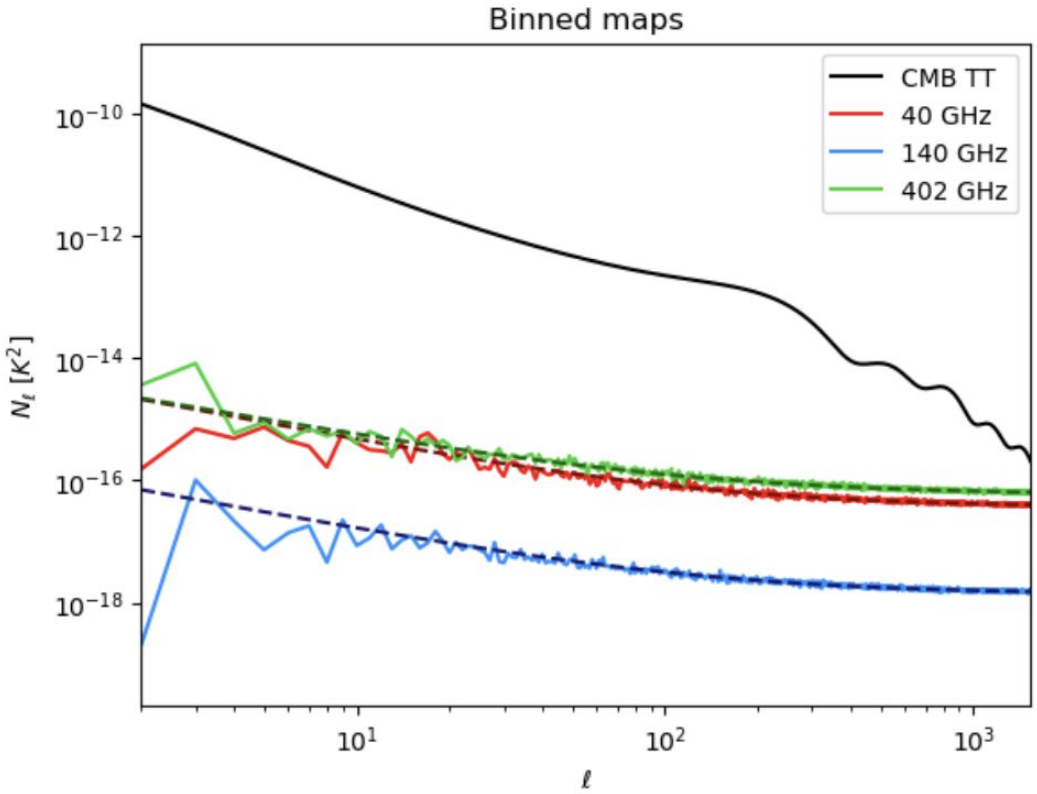


Computation and storage



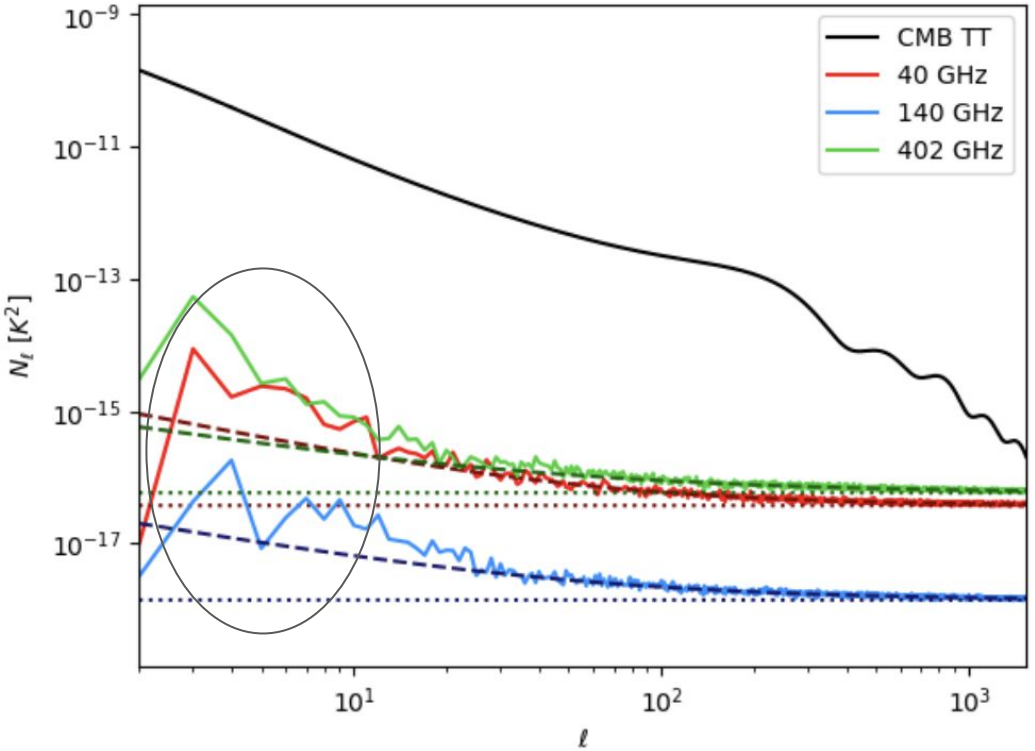
Studies on T data - Giacomo Galloni @ UToV

[Wiki page]

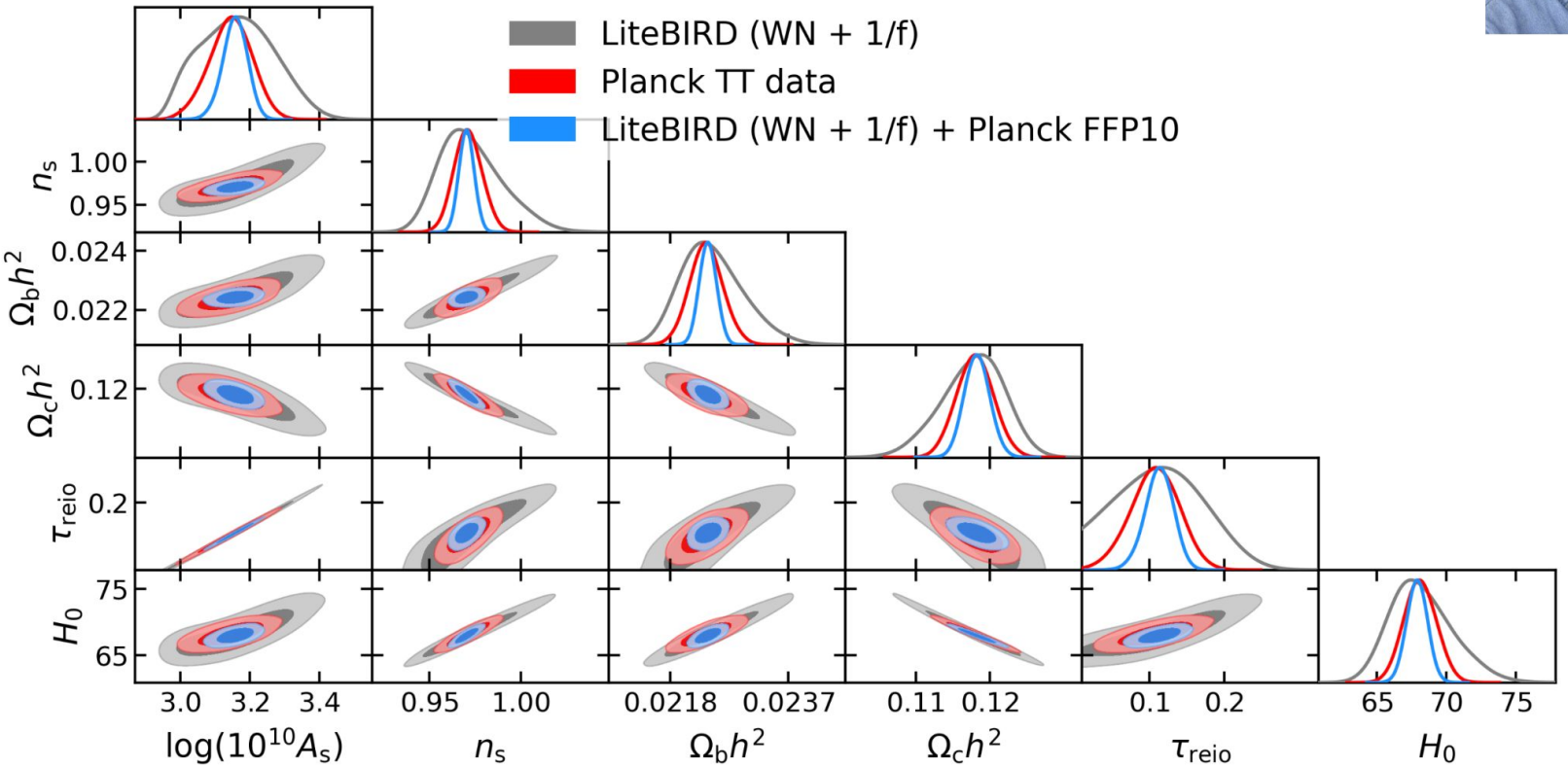


Studies on T data - Giacomo Galloni @ UToV

Destriper lowers 1/f noise **but seems not to be converging at ell<20.**



Studies on T data - Giacomo Galloni @ UToV



What we have learned

- We have now an **end to end pipeline** that simulates LB data from official IMO database to timelines and maps
- **Unprecedented** TODs are being analysed with Commander3 (Beyond Planck group- OSLO)
- **Unprecedented** maps with Inhomogenuous noise maps +1/f , useful for forecast techniques (e.g. Fisher matrix, HWP descoping, etc..) and correlated extra-galactic foregrounds
- We have demonstrated **HWP** mitigating E and B spectra

Outlooks

- 2023 Full focal plane simulations -> which map-maker ?
- 2023 Beam convolution simulations -> IMO updates with GRASP inputs(C. Franceschet), several convolution methodologies implemented (D. Maino, G. Puglisi) or under validation (M. Bortolami, Y. Nagano, M. Reinecke).

But….

Outlooks

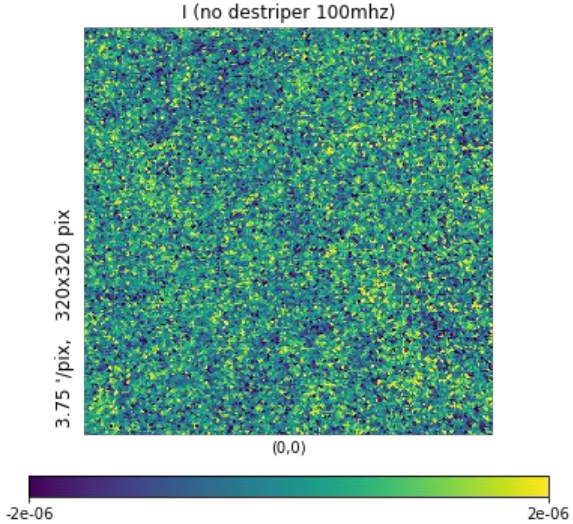
- 2023 Full focal plane simulations (exp. 12k-nodeh) -> which map-maker ?
- 2023 Beam convolution simulations (exp. 5k-nodeh)-> GRASP inputs, several convolution methodologies implemented (D. Maino, G. Puglisi) or under validation (M. Bortolami, Y. Nagano, M. Reinecke).

But….

***Desiderata* for the next round of sims:**

- **computational resources**, for full focal plane sims we expect ~ cpuh
- **Optimization** of scanning strategy and/or map-making algorithm, there is warranty that the *Planck* map-maker to be the optimal for LB
- **Storage facility** where TOD + maps can be stored and easily accessed by all LB members

Backups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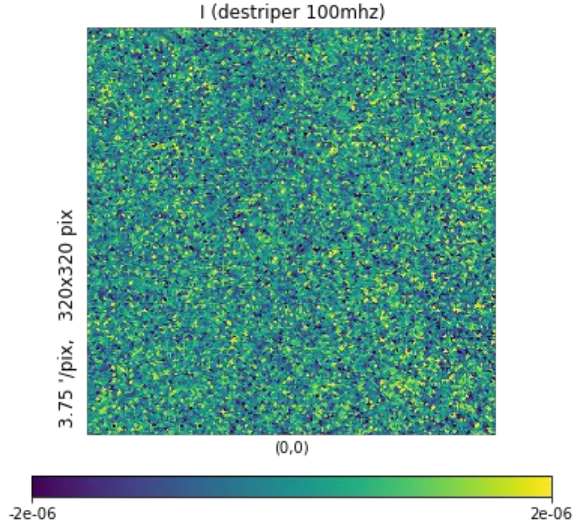
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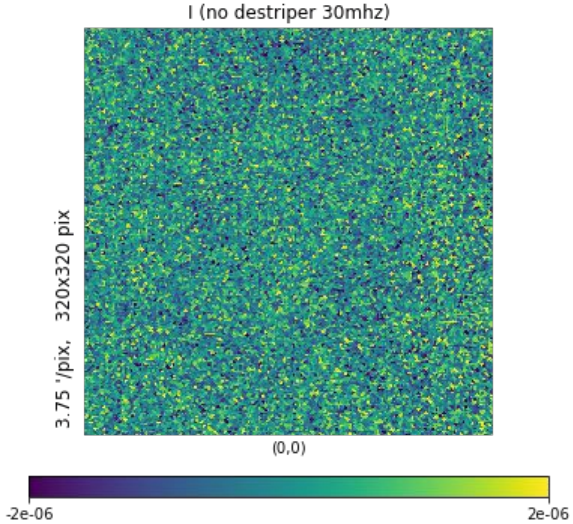
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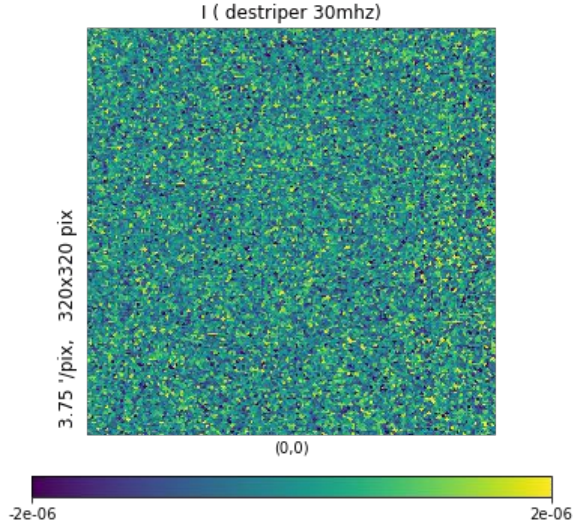
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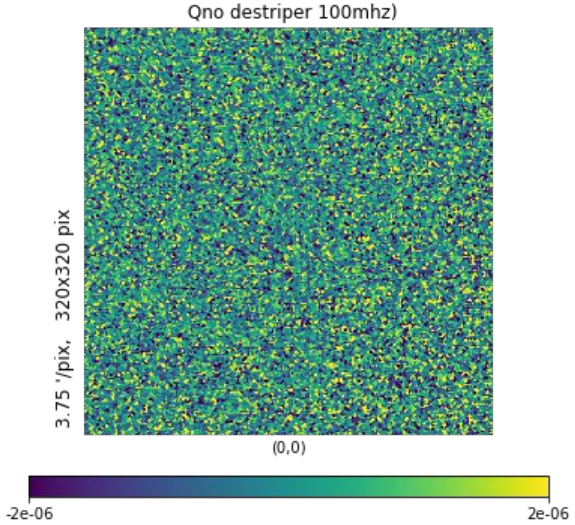
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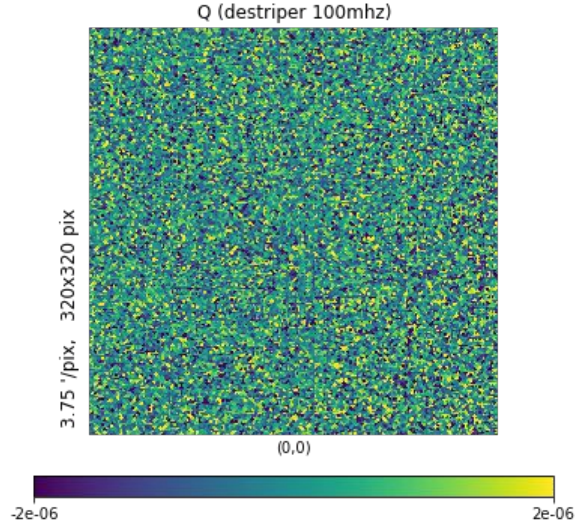
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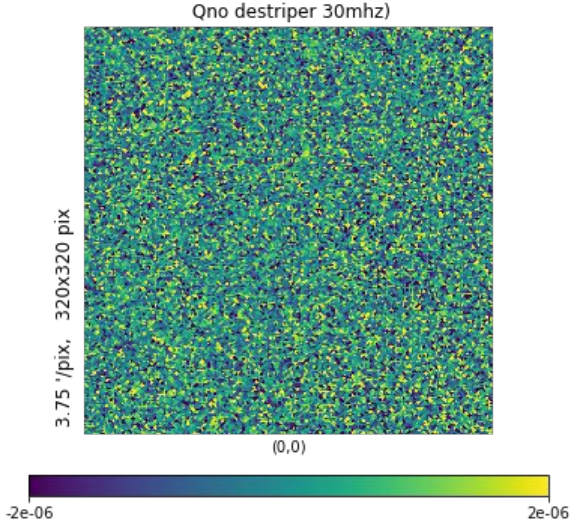
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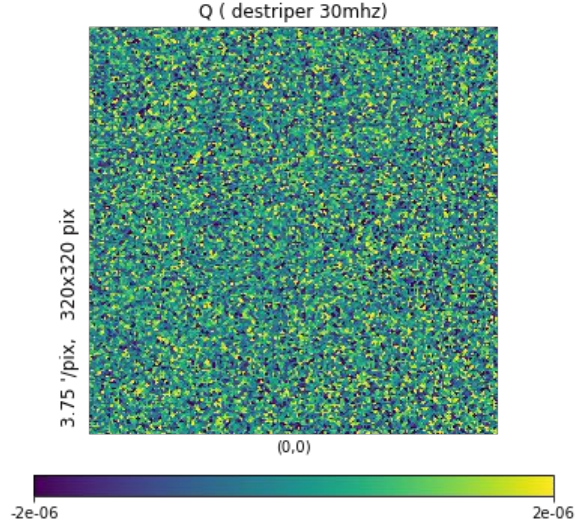
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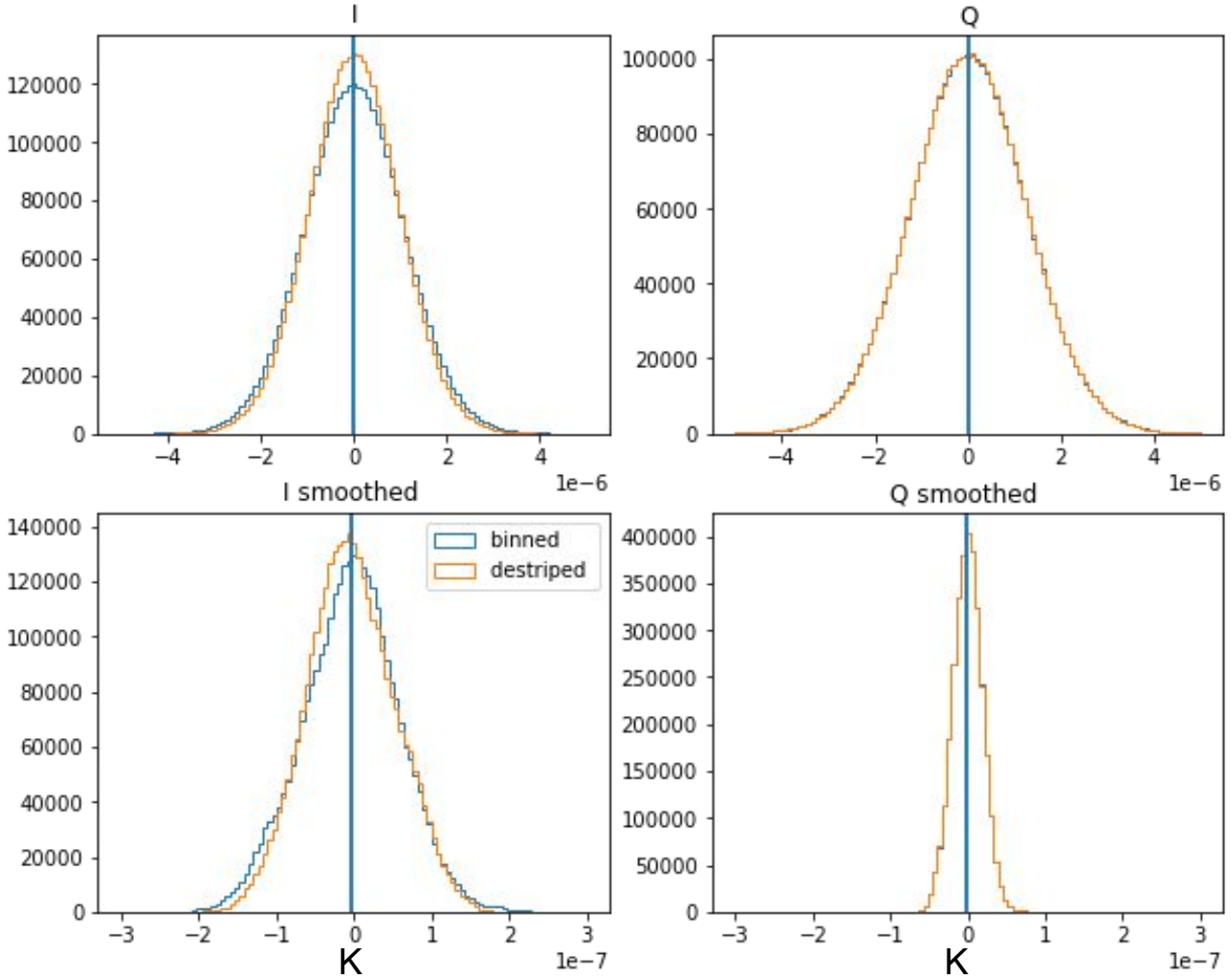
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Q smoothed
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K