Data Challenge 1 (DC1)

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Description

- Consistency check for the full LEMAÎTRE pipeline
- Comprises simulated lightcurves and spectra from ZTF, SNLS and HSC
- The lightcurves were simulated from the real logs (real cadence)
- A spectrum is simulated for each SN at a given time where a lightcurve data point was measured

Description

- The data only contains measurement uncertainties and an error snake (variance noise)
- All of the data has been simulated with SALT3
- The cosmology used as input is astropy.cosmology.Planck 18 (Ωm=0.31)
- Another DC1 with perfect sampling has been simulated and we call it DC1 fakelogs

Main goals

- Consistency check : reconstruct input distances and cosmology after running 100 realizations of this simulation

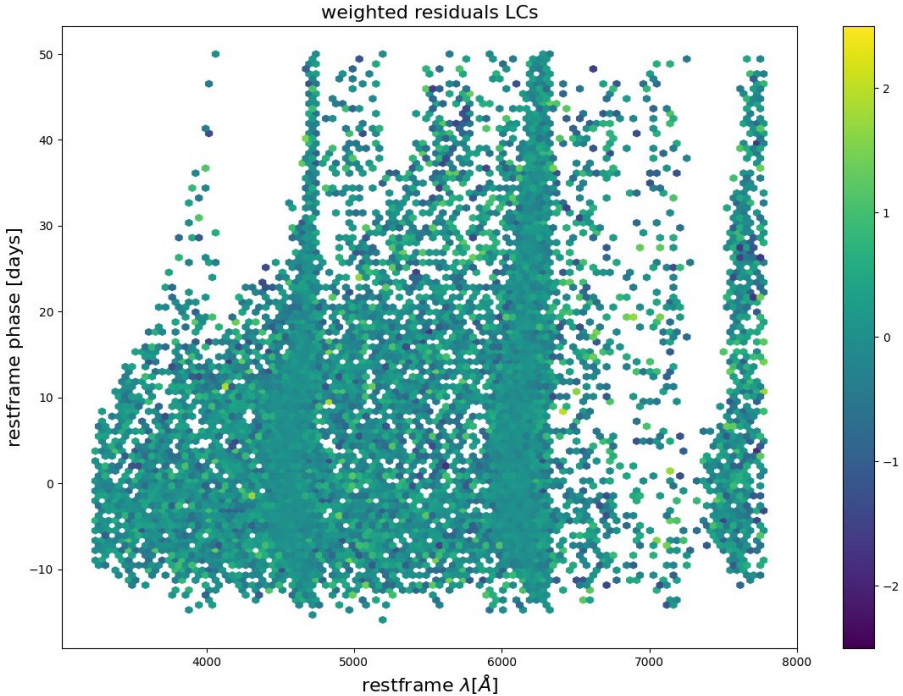
- Reconstruct Ωm, distances and predict accurate uncertainties (coverage tests)

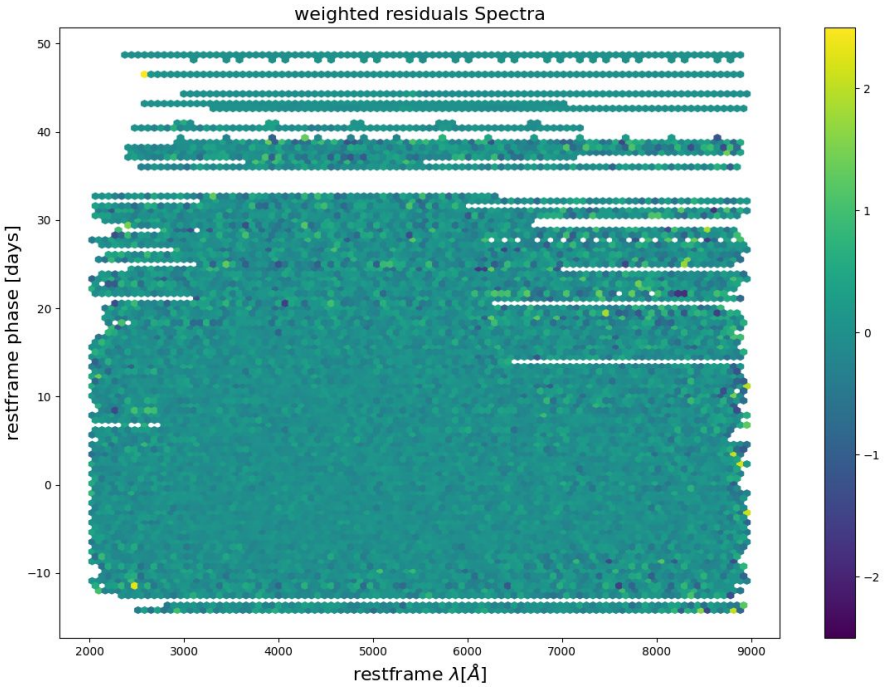
Main obstacles going into DC1

Pre-DC1 simulations:

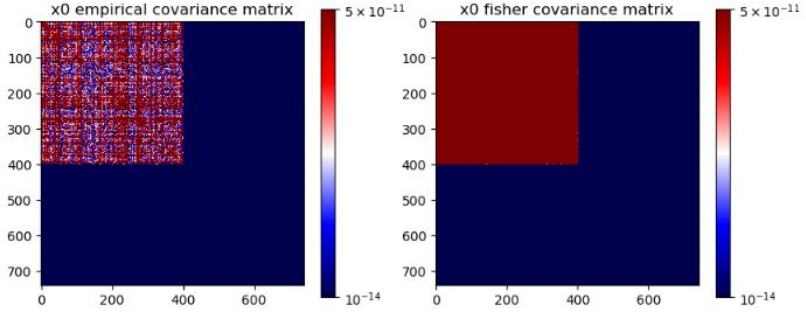
- Only NaCl (no PeTS, no EDRIS)
- Generate with SALT2
- Results were promising

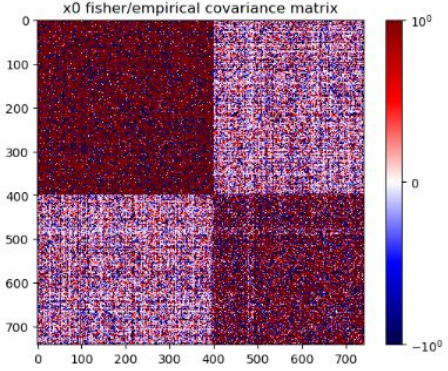
Main obstacles going into DC1 : pre DC1

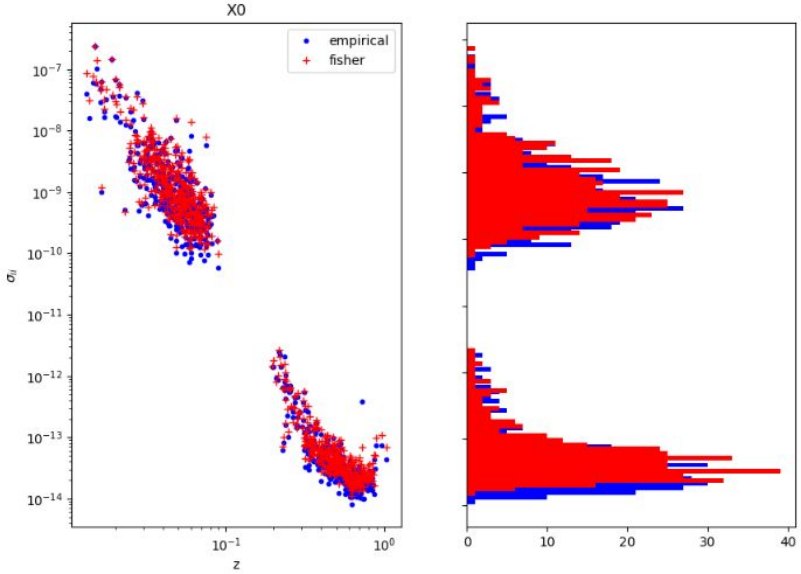


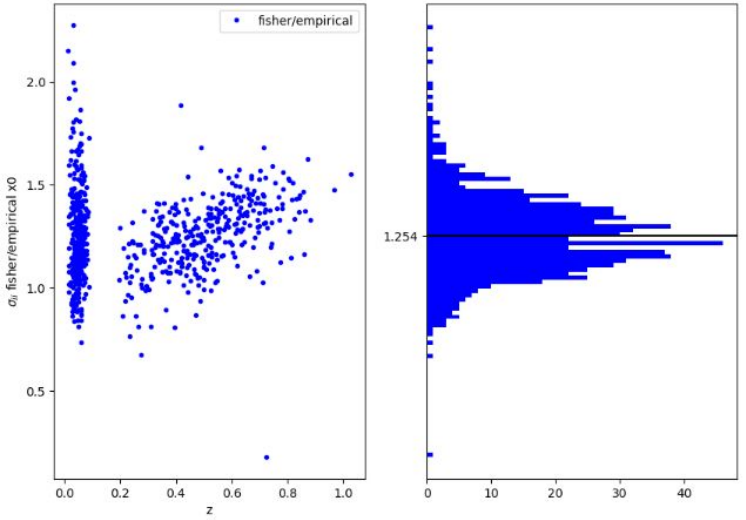


Main obstacles going into DC1 : pre DC1

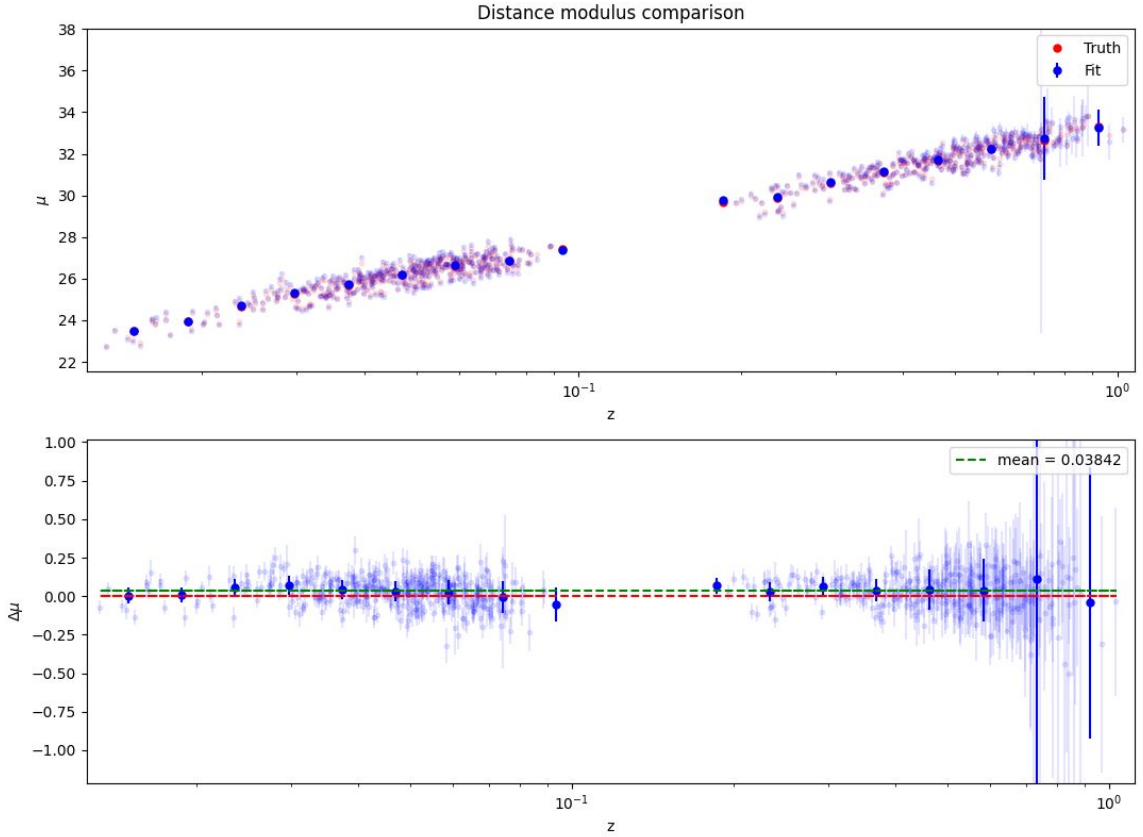








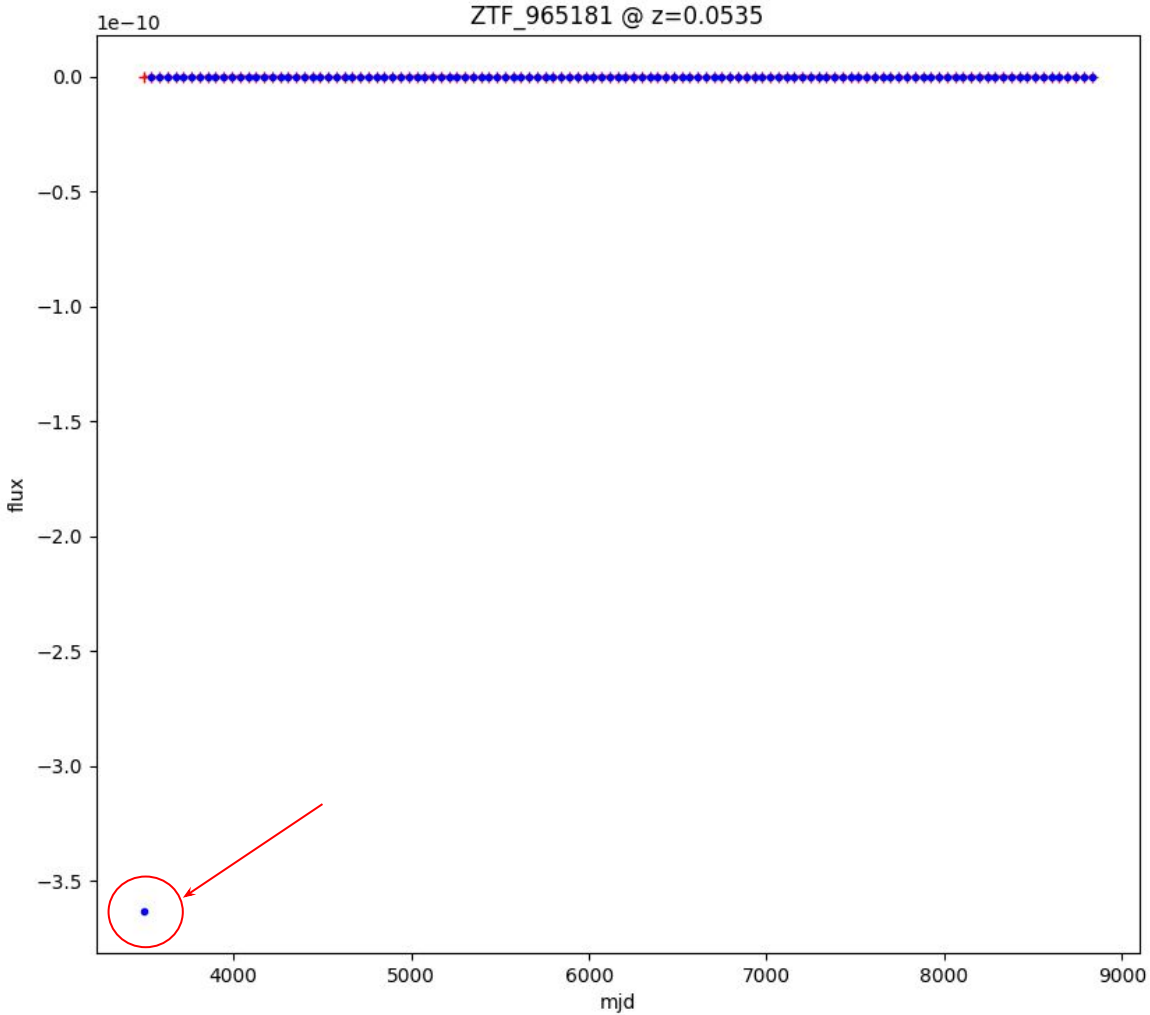
Main obstacles going into DC1 : pre DC1



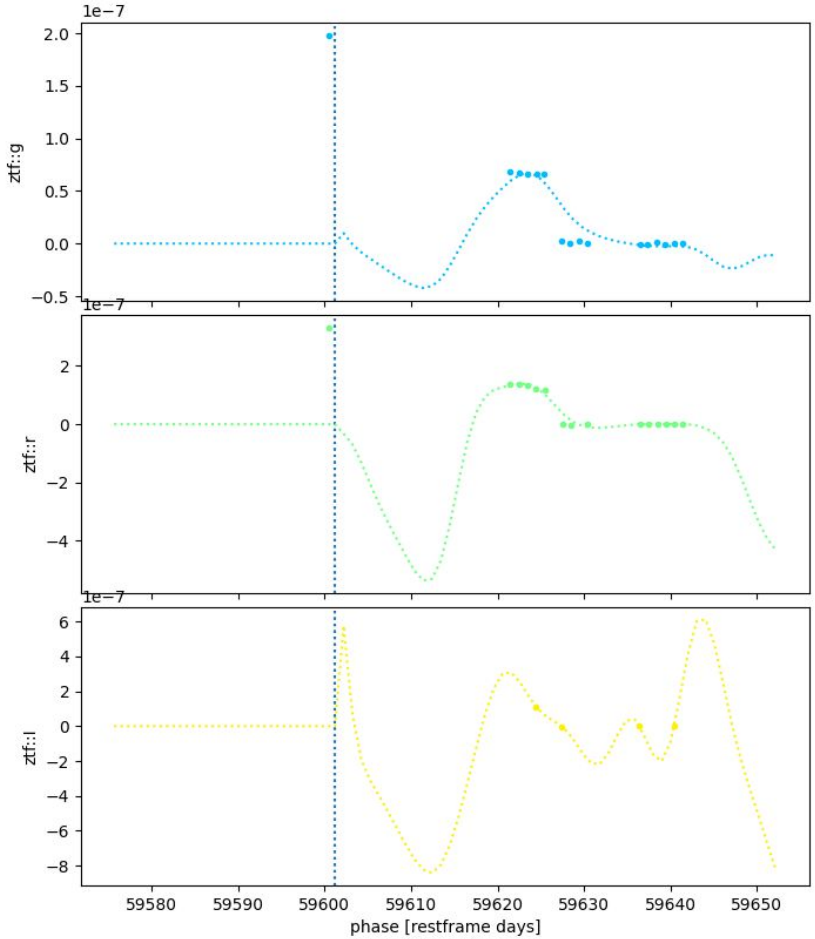
Main obstacles going into DC1

Outlier contamination:

- Bug during spectra compression which makes the initial or final point in the spectra completely off
- Spectra after compression defined outside of initial SALT2 model
- A few LCs that were poorly measured
- SNLS and HSC SNe at $z<0.1$


ZTF_965181 @ z=0.0535
1e−10
0.0
−0.5
−1.0
−1.5
−2.0
−2.5
−3.0
−3.5
flux
4000
5000
6000
7000
8000
9000
mjd

ZTF_3911072 @ z=0.0213



DC1 current status
Results :D

PeTS : results
1) ZTF

CUTS	DISCARDED	REMAINING
Total	-	7386
2 bands, 5pts +- 50 days from t0	2593	4793
sncosmo convergence	165	4628
σ_t0 < 1	331	4297
symmetric	288	4009
1 minimum at 3σ	8	4001
σ_x1 < 1	3	3998
σ_c < 0.3	2	**3996**

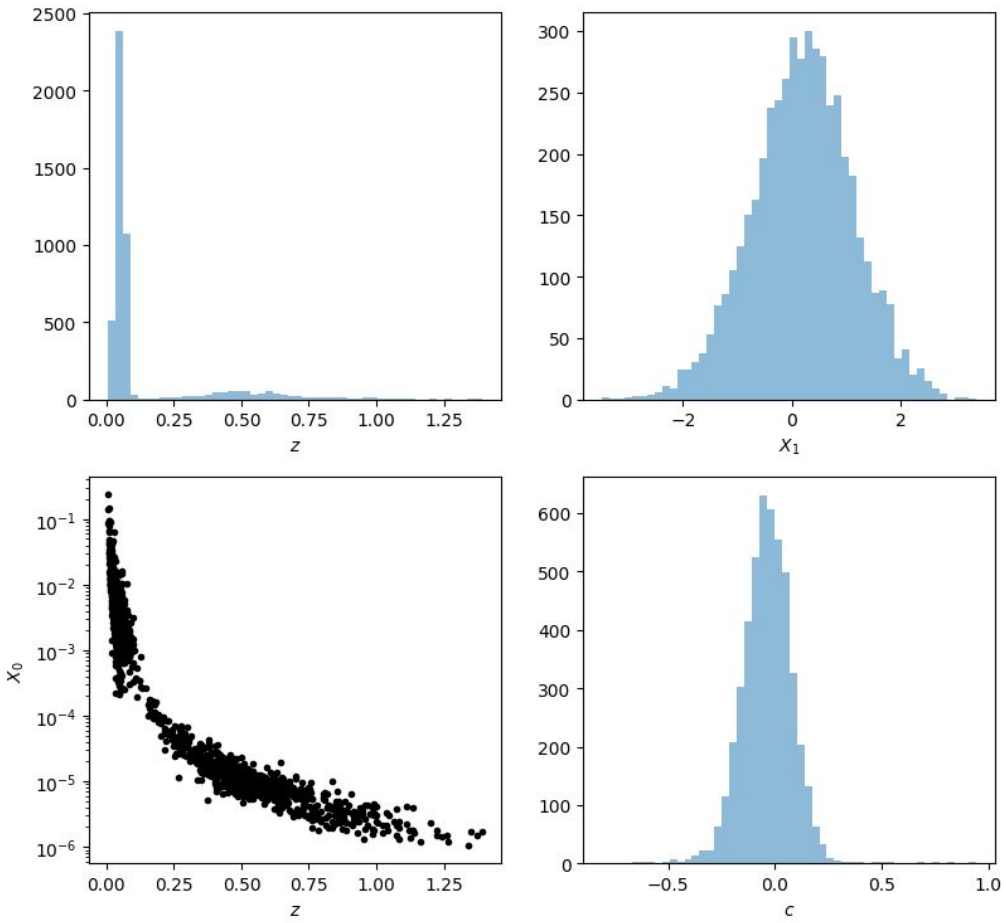
PeTS : results
1) SNLS

CUTS	DISCARDED	REMAINING
Total	-	1452
2 bands, 5pts +- 50 days from t0	768	684
sncosmo convergence	70	614
σ_t0 < 1	97	517
symmetric	51	466
1 minimum at 3σ	1	465
σ_x1 < 1	3	462
σ_c < 0.3	1	**461**

PeTS : results
1) HSC

CUTS	DISCARDED	REMAINING
Total	-	375510
2 bands, 5pts +- 50 days from t0	35554	1956
sncosmo convergence	410	1546
σ_t0 < 1	755	791
symmetric	262	529
1 minimum at 3σ	9	520
σ_x1 < 1	161	359
σ_c < 0.3	6	**353**

PeTS : final dataset



NaCl : results

- Unforeseen bugs happened when running NaCl on the full DC1 so results won’t be shown of the 4k SN today :(

- However we’ve done a lot of work on a subsample of DC1 containing 999 SNe

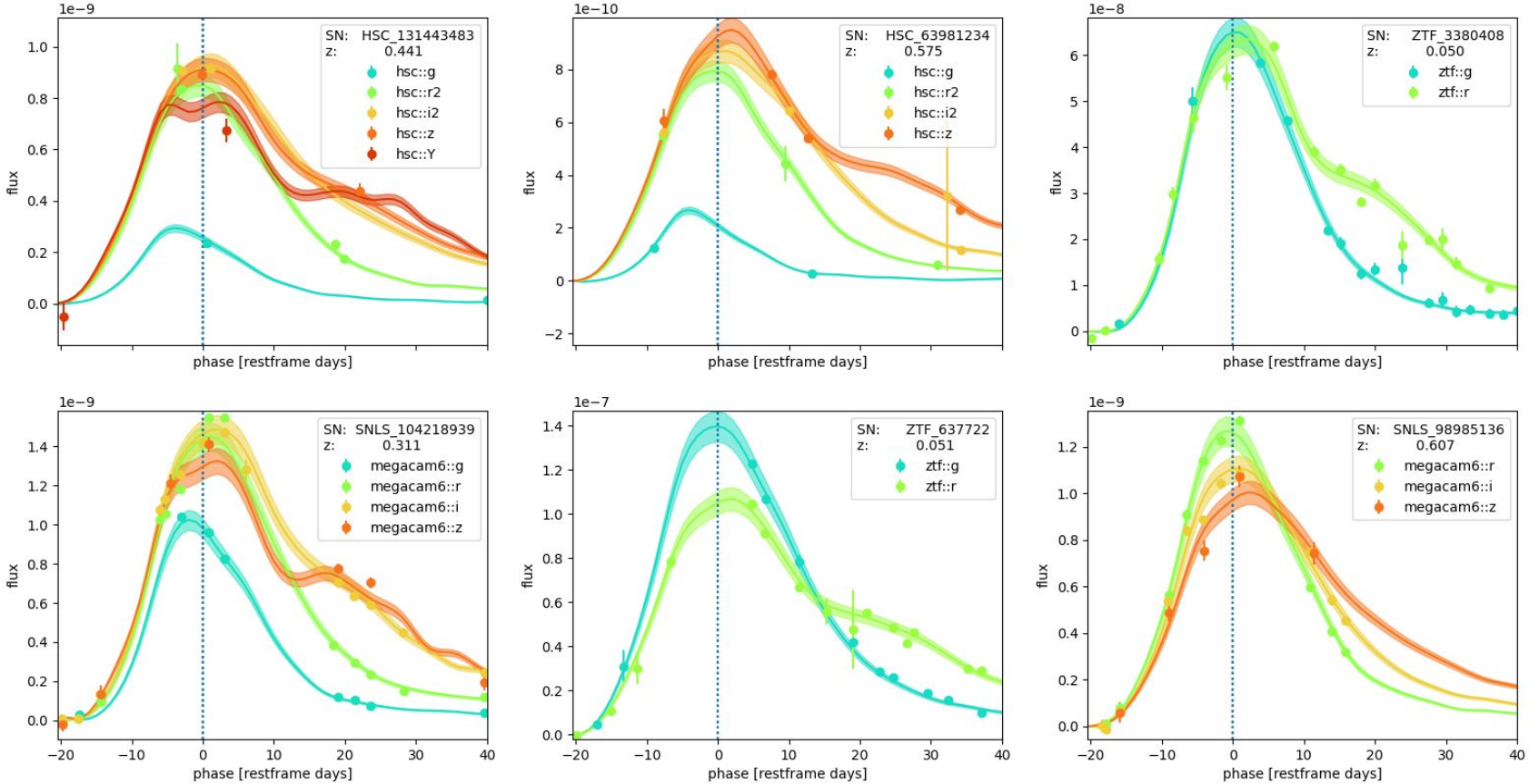
- We can show results on 24 realizations of the noise on this subsample. The remaining realizations are still running…

NaCl : results - overall fit

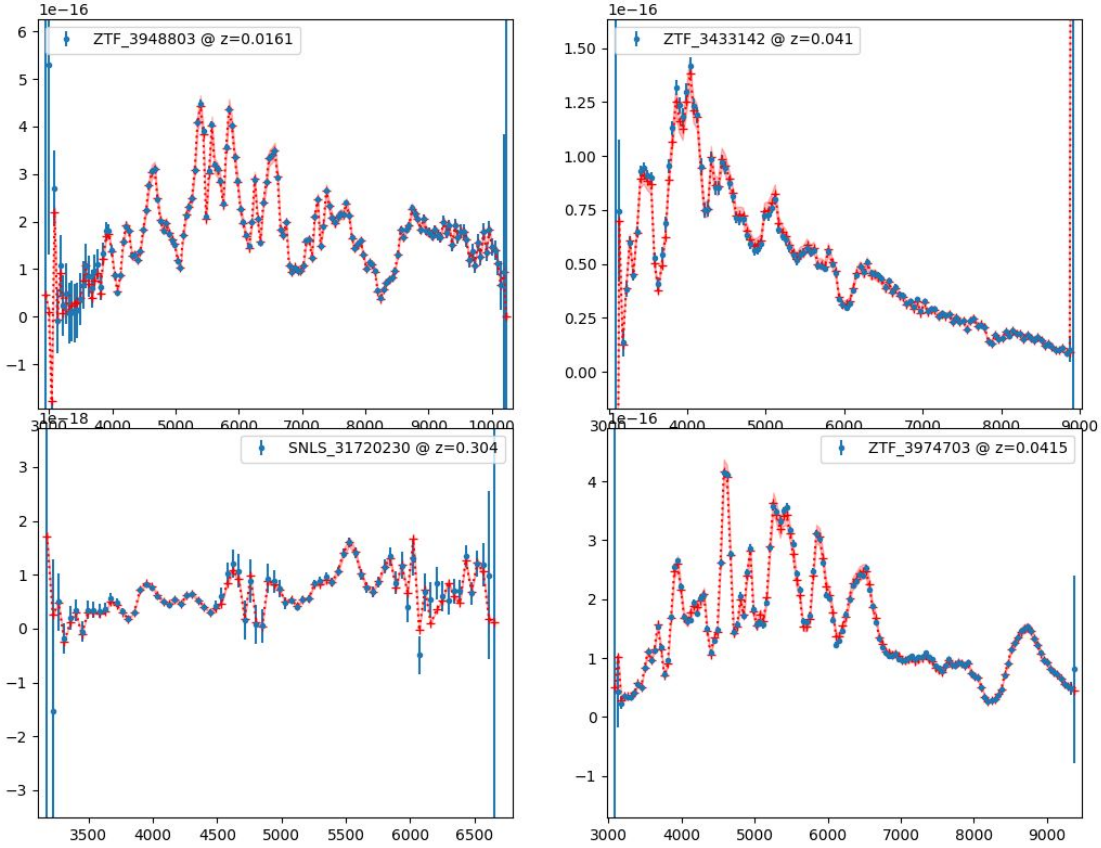
□²/ndof = ~1.02

time = on laptop 36 mins/fit

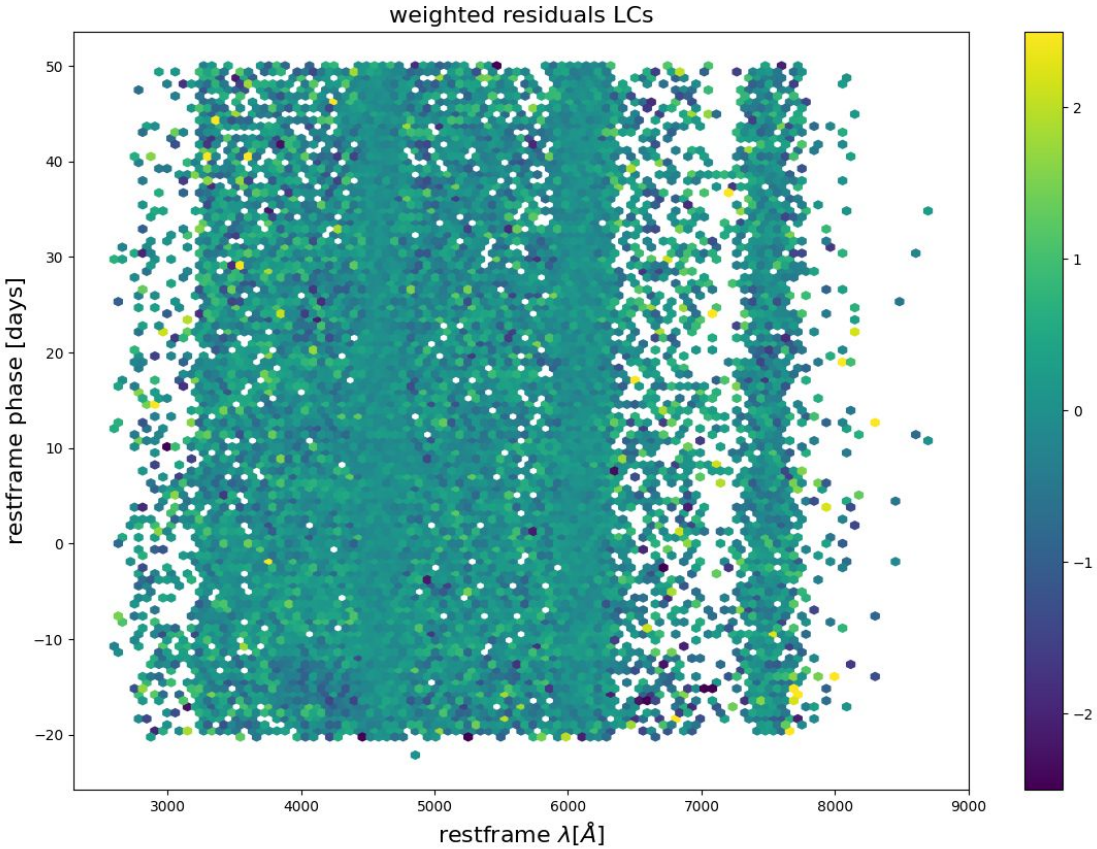
NaCl : results - lightcurves



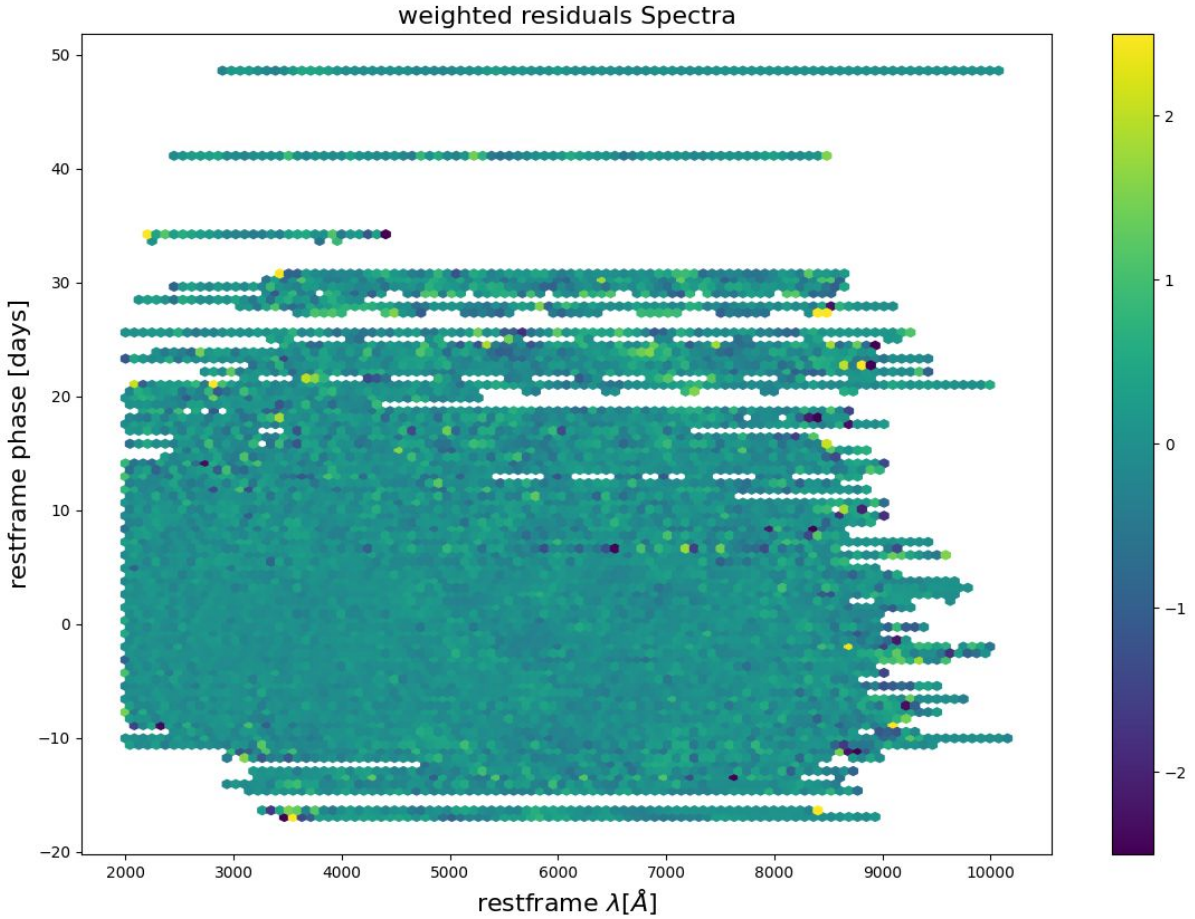
NaCl : results - spectra



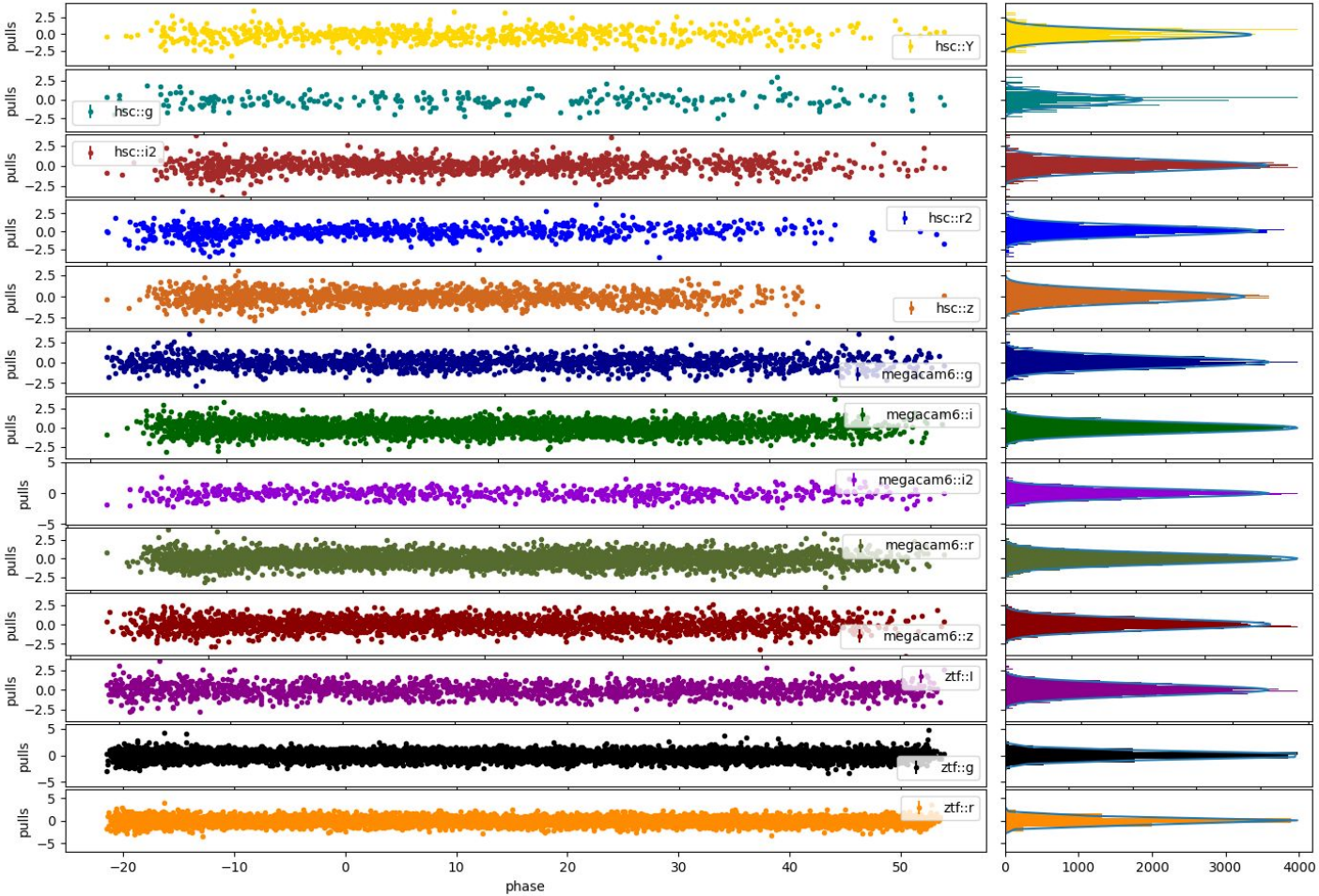
NaCl : results - residuals LCs



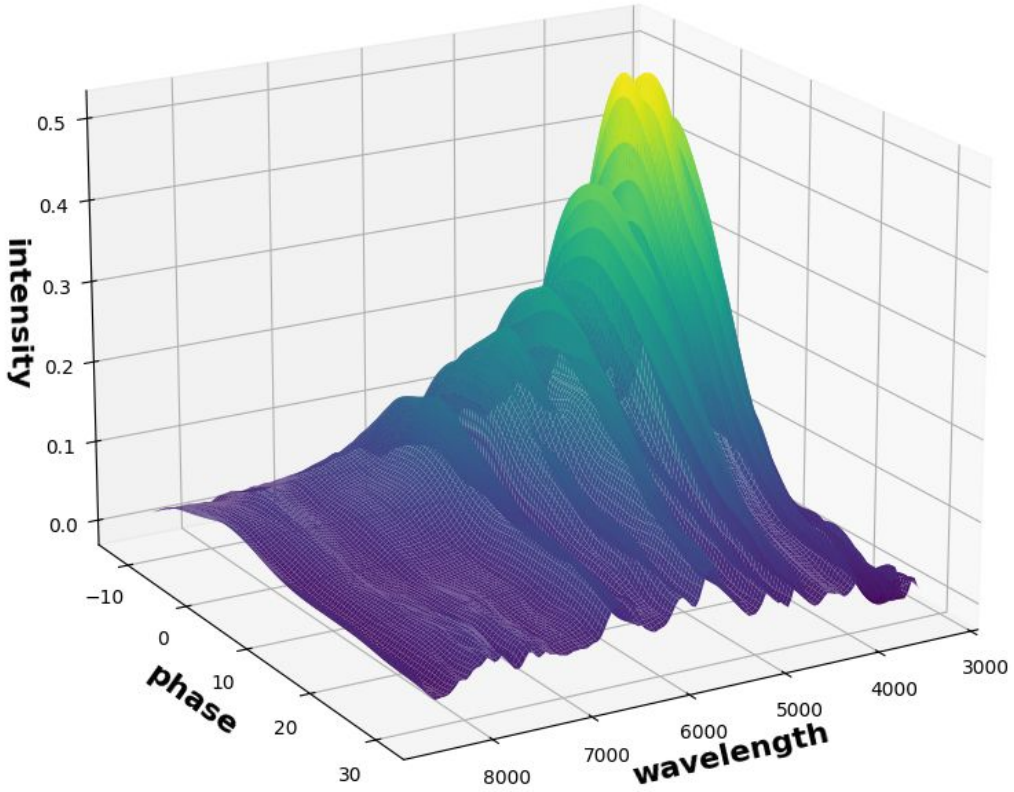
NaCl : results - residuals spectra



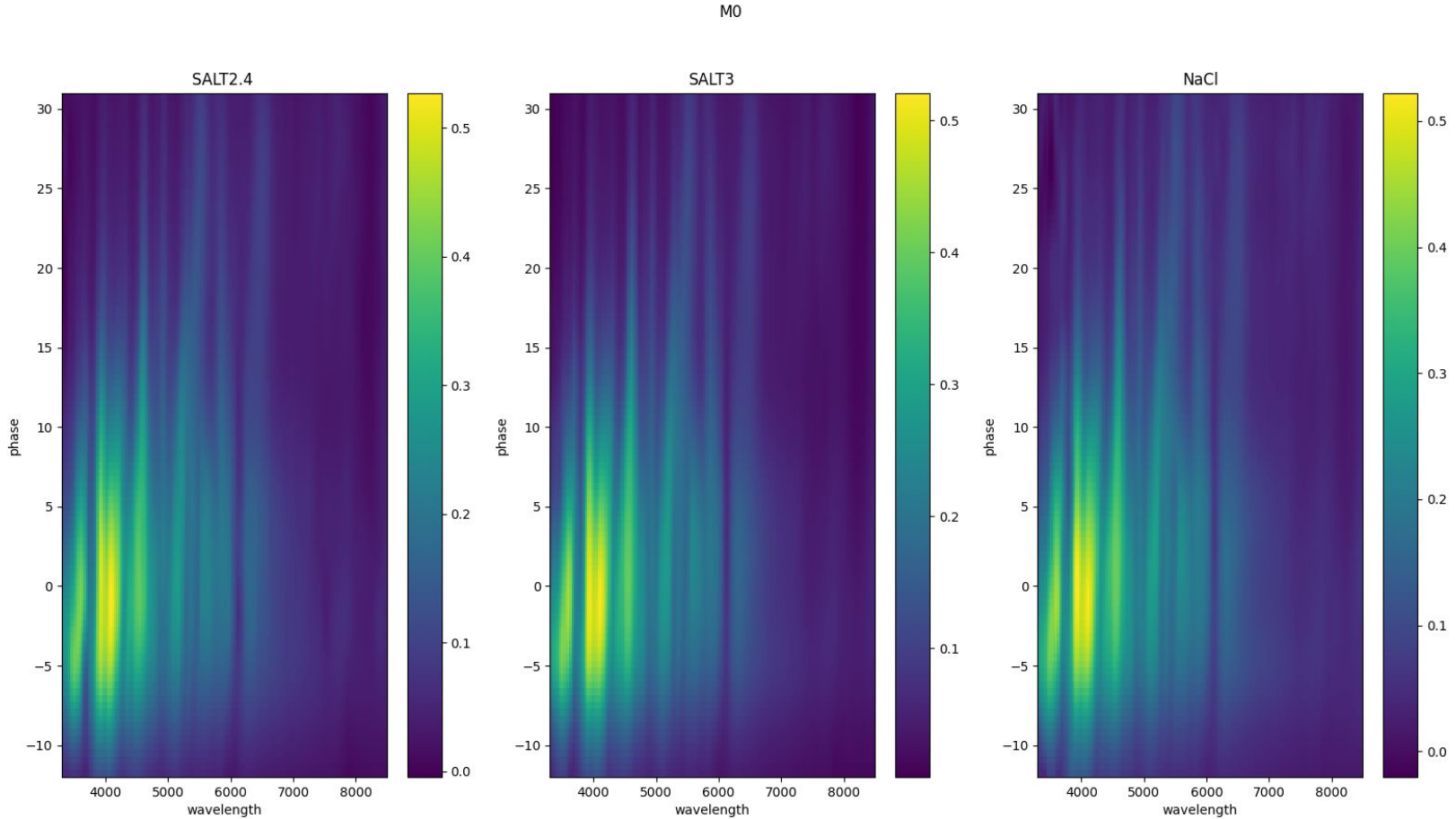
NaCl : results - pulls per band



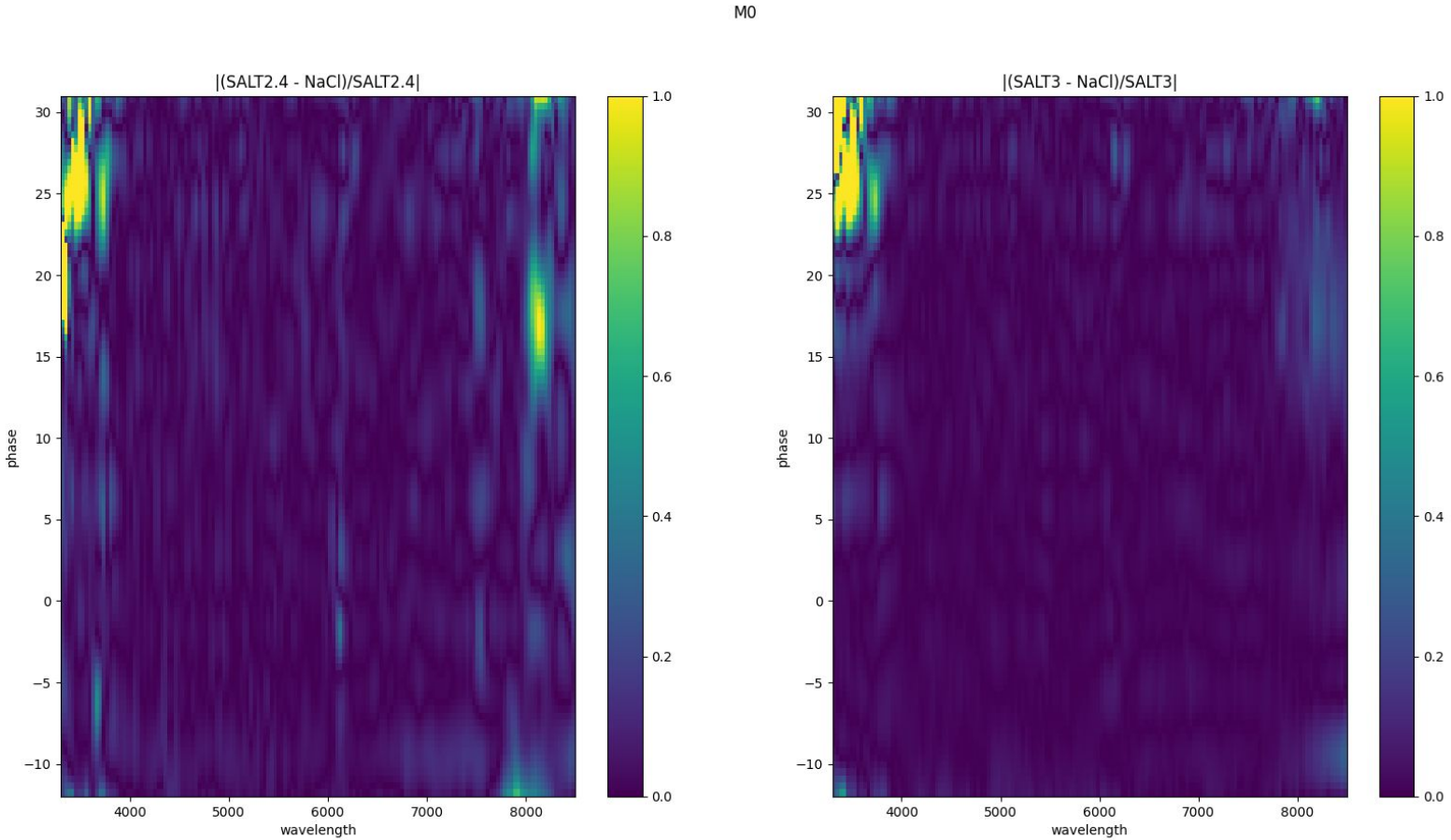
NaCl : results - model



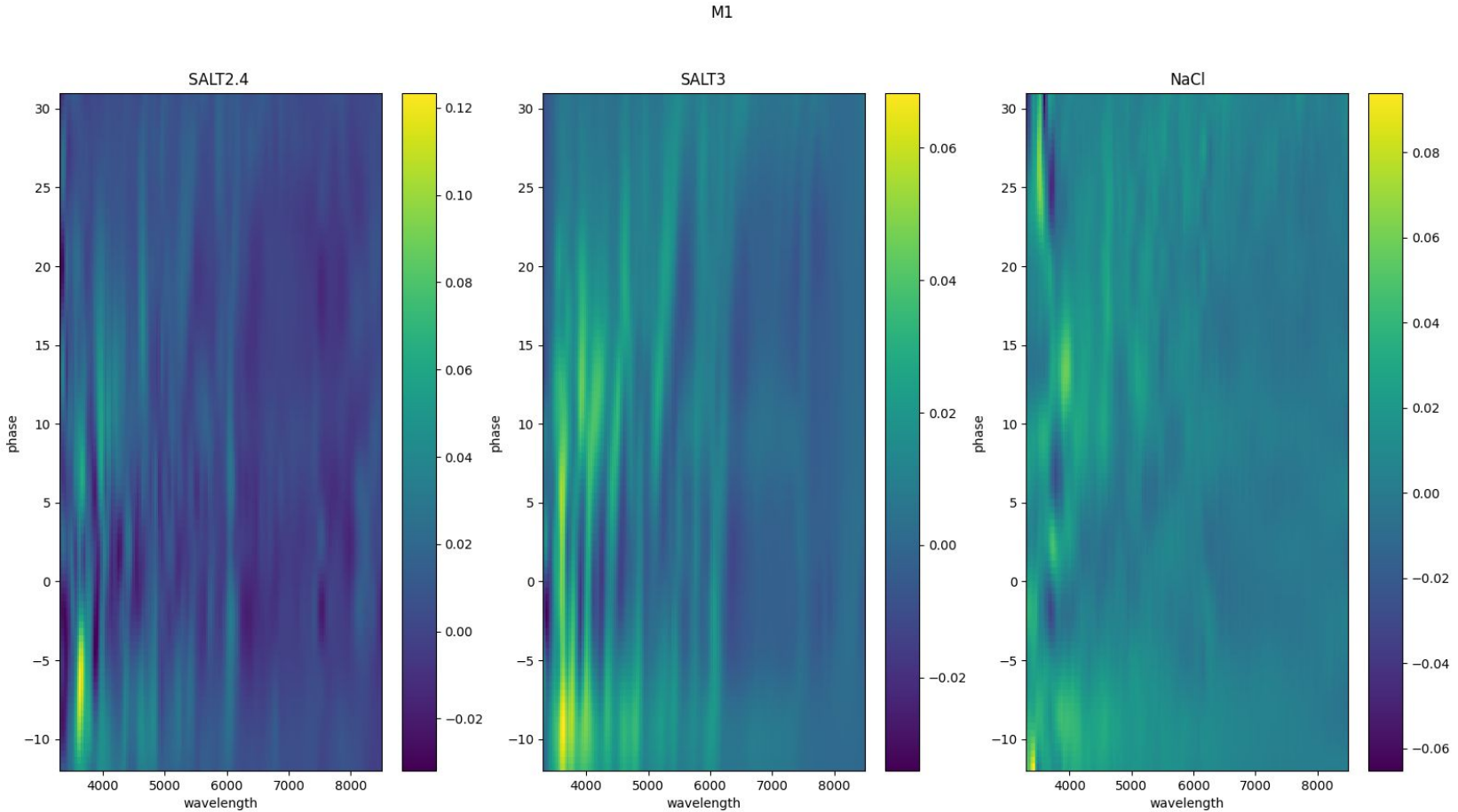
NaCl : results - NaCl vs SALT models



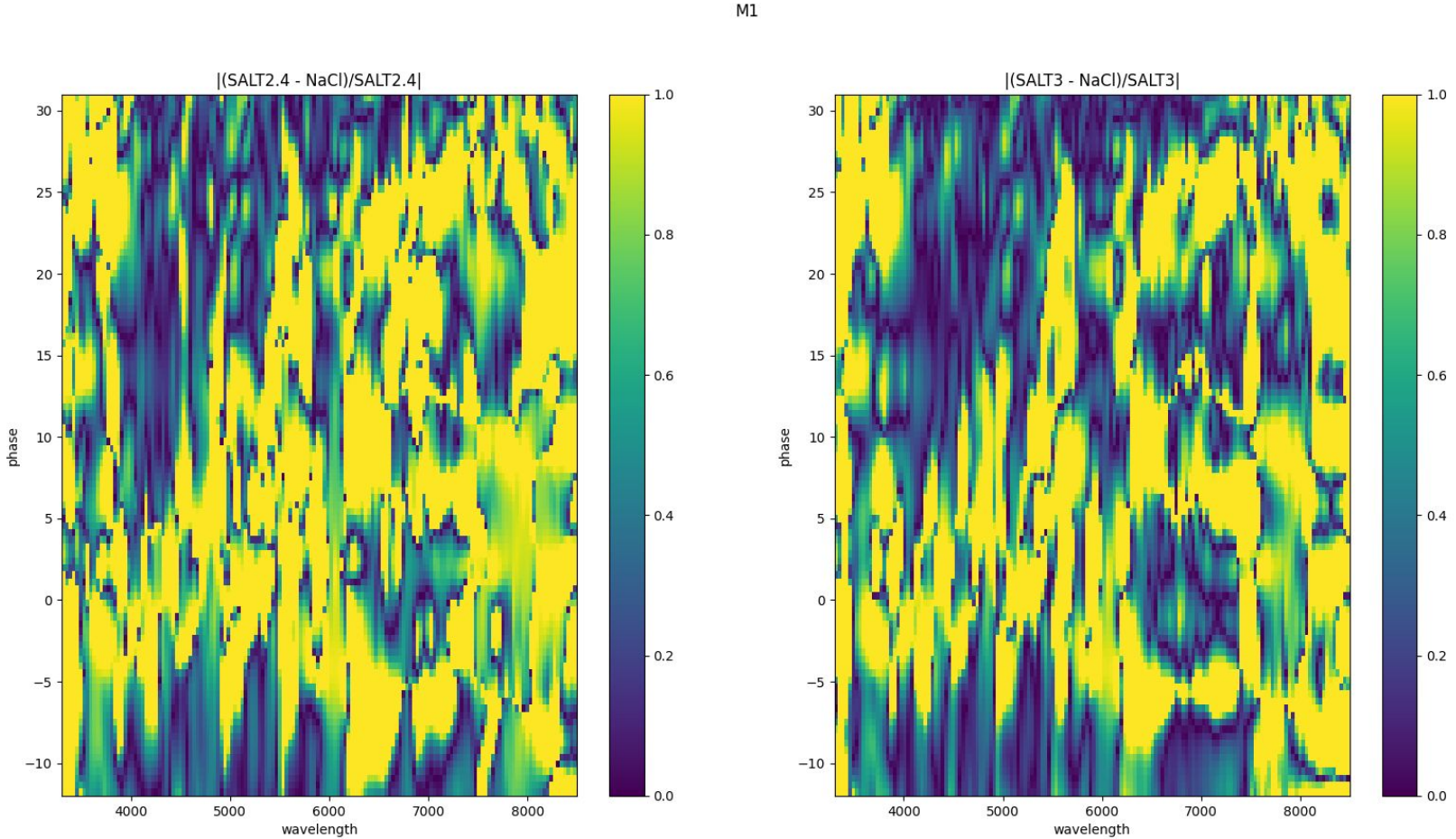
NaCl : results - NaCl vs SALT models



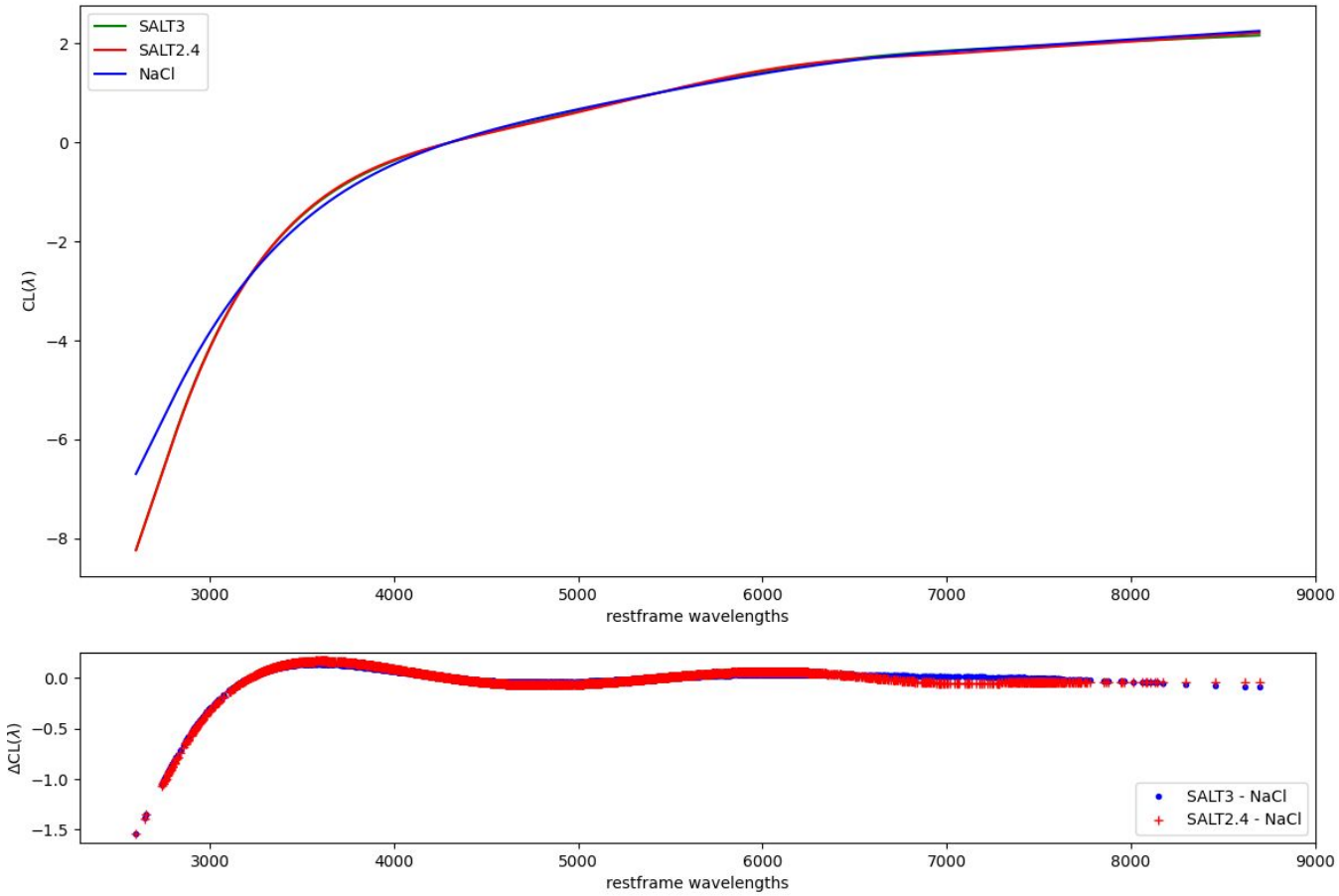
NaCl : results - NaCl vs SALT models



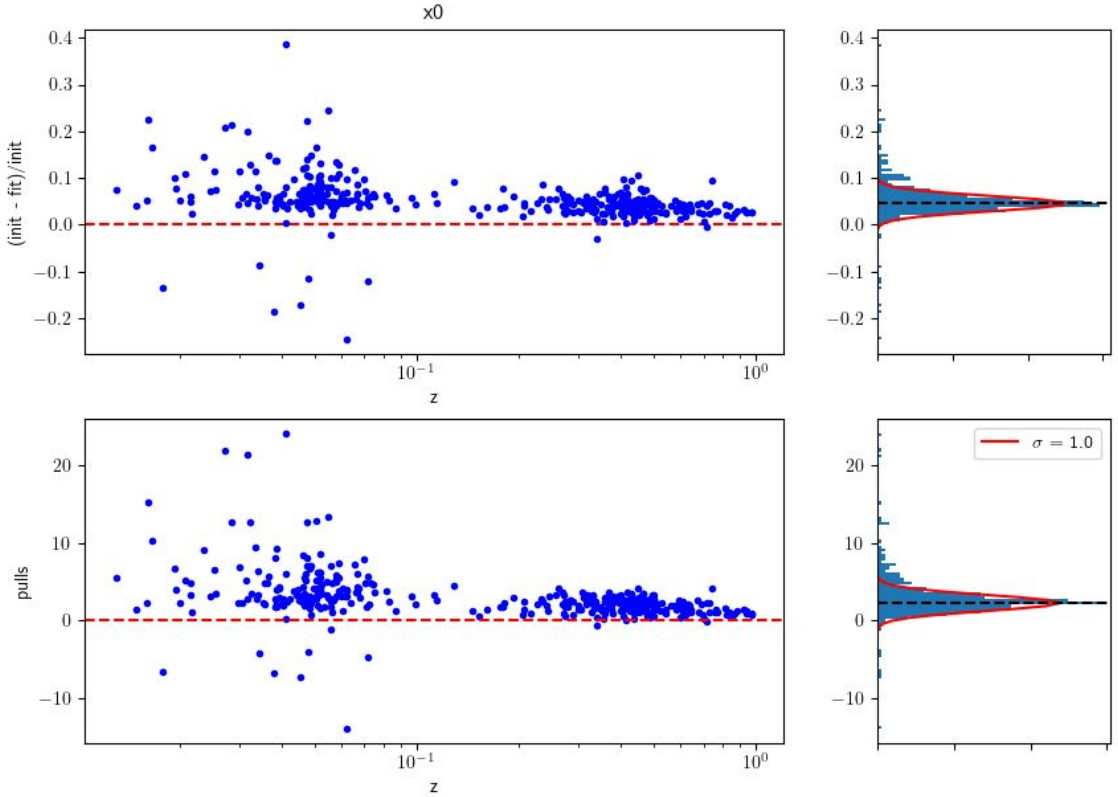
NaCl : results - NaCl vs SALT models



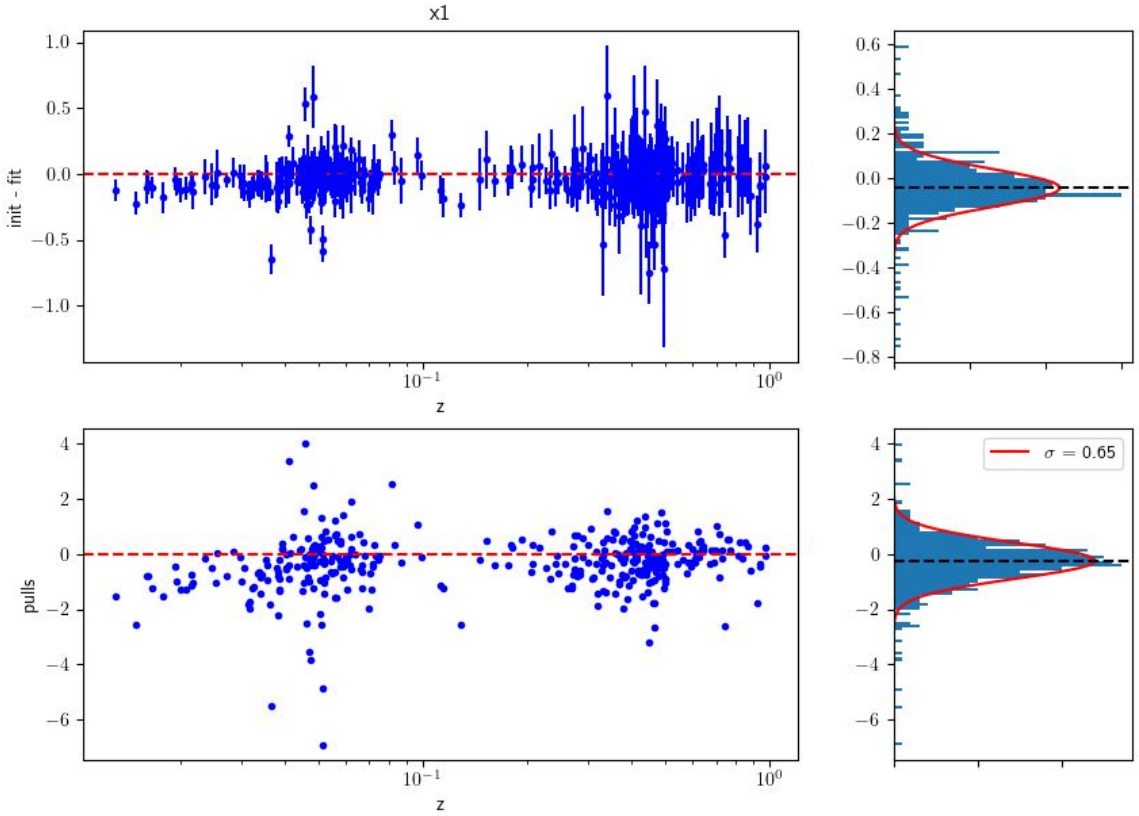
NaCl : results - NaCl vs SALT CL



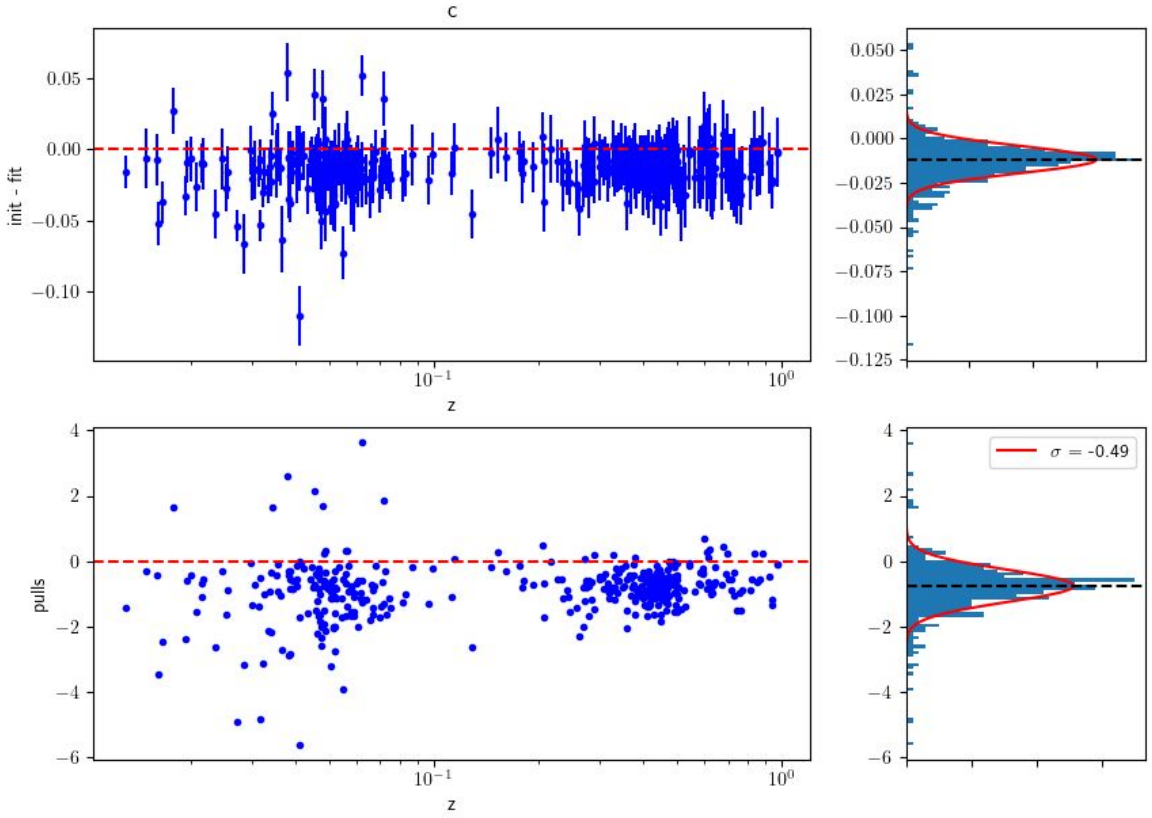
NaCl : results - parameters



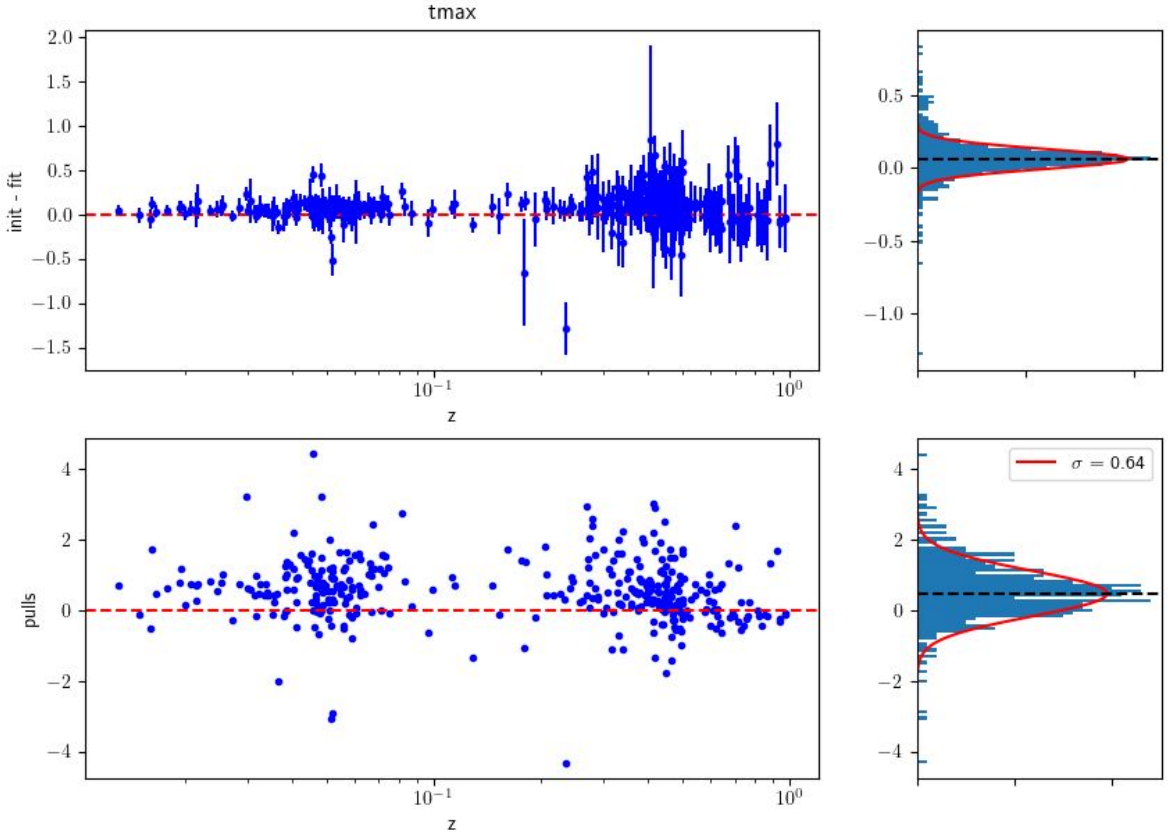
NaCl : results - parameters



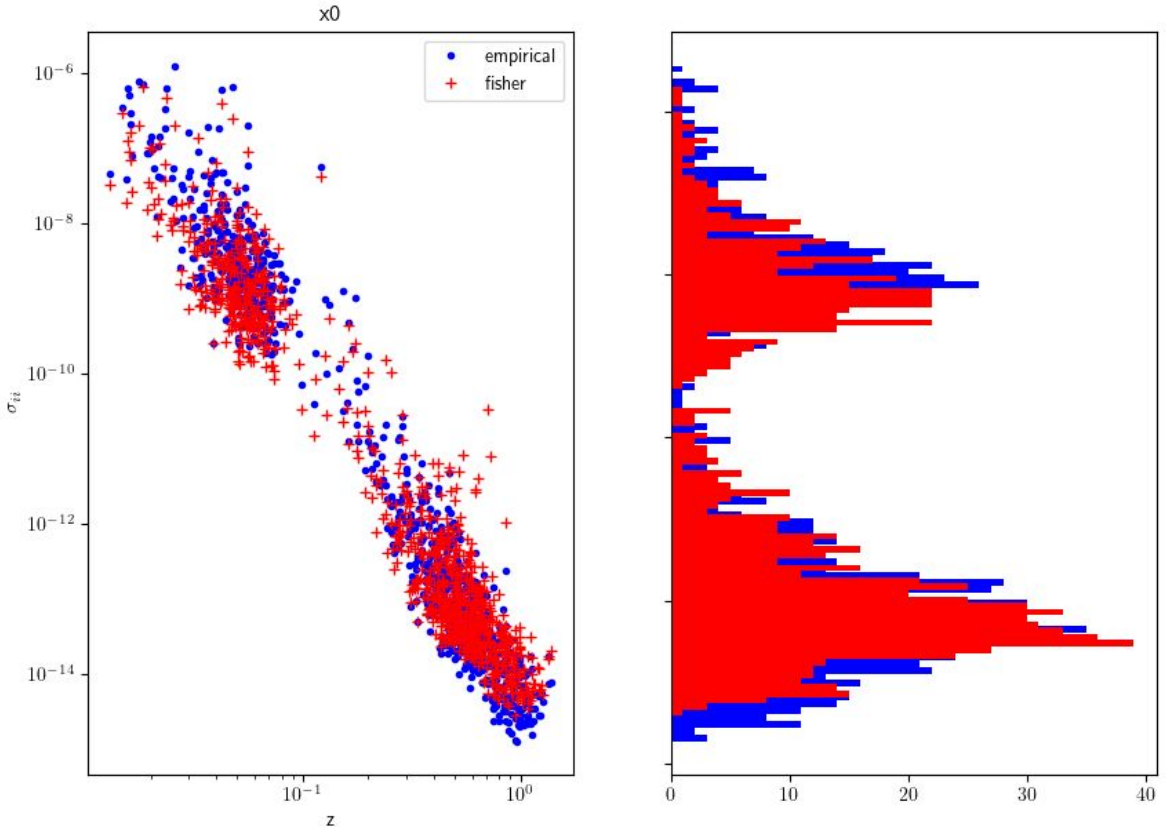
NaCl : results - parameters



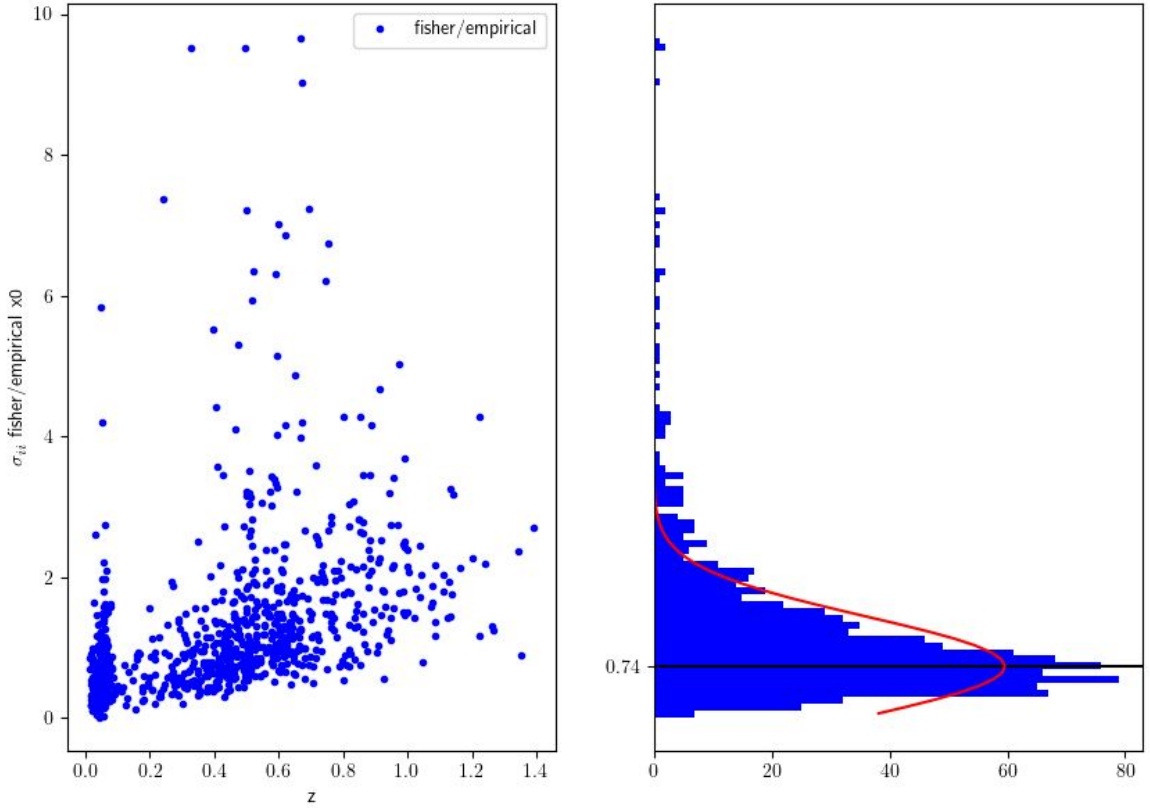
NaCl : results - parameters



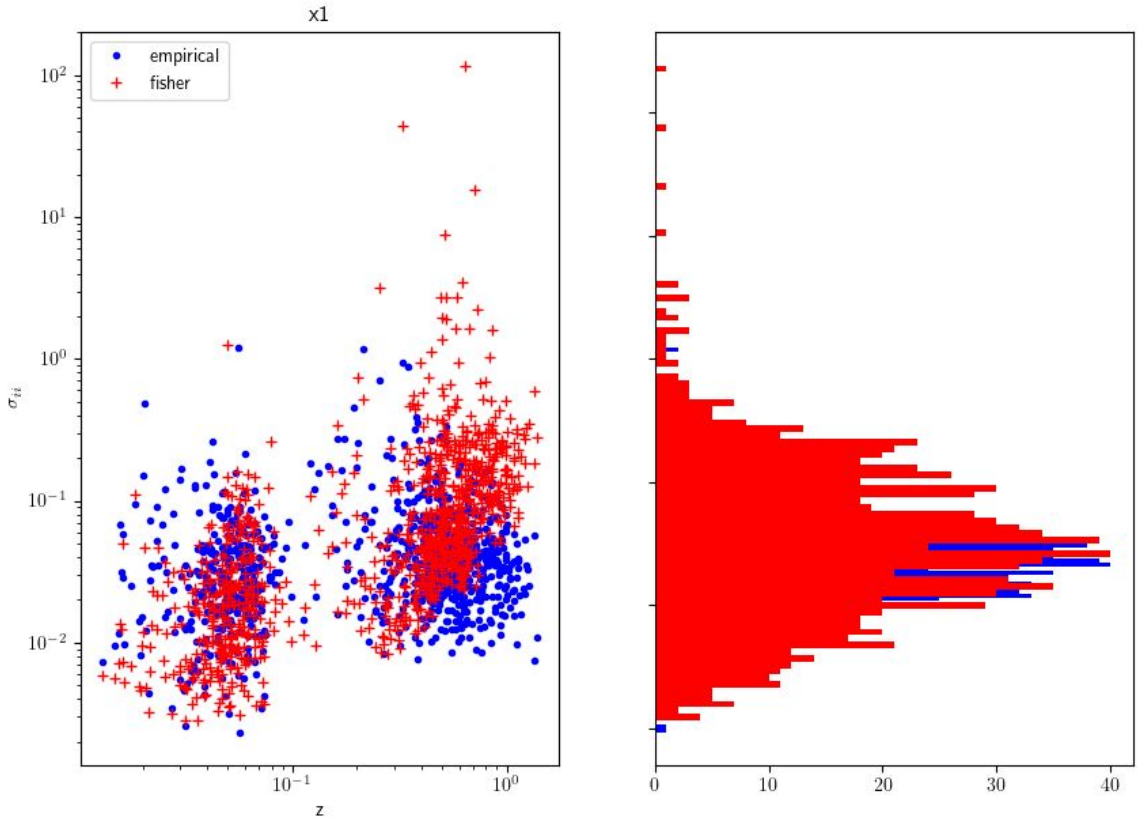
NaCl : results - coverage x0



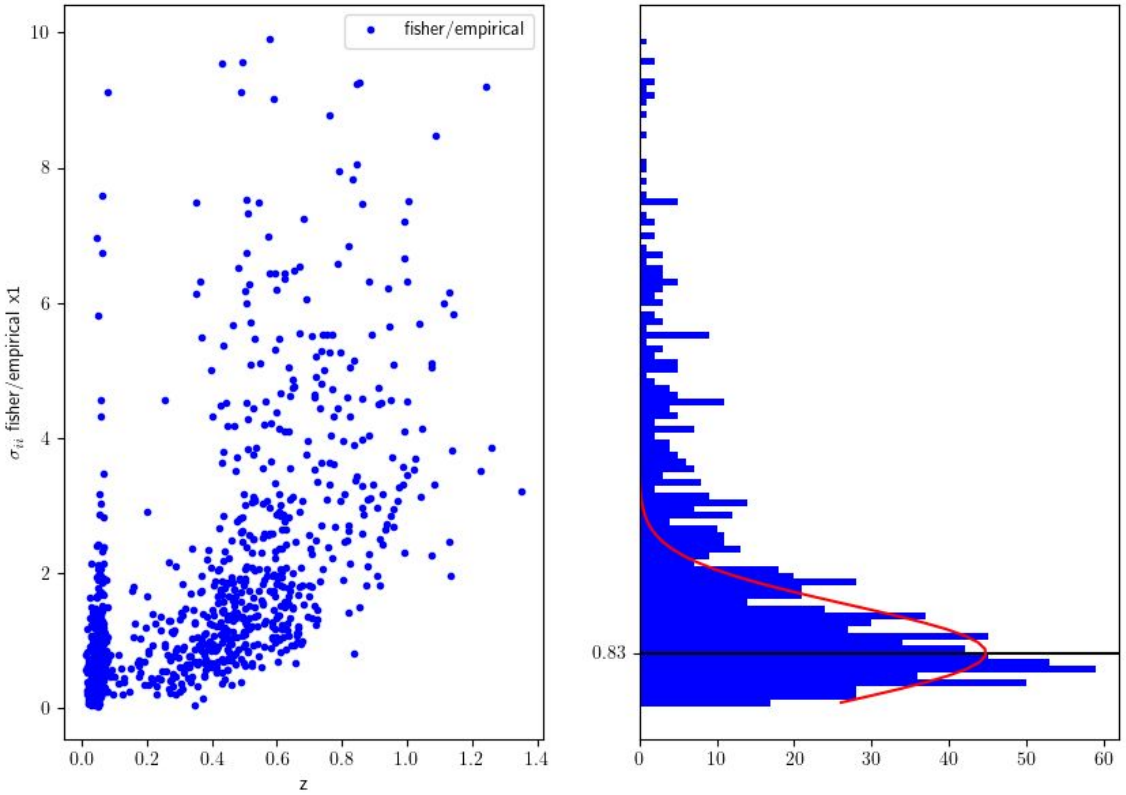
NaCl : results - coverage x0



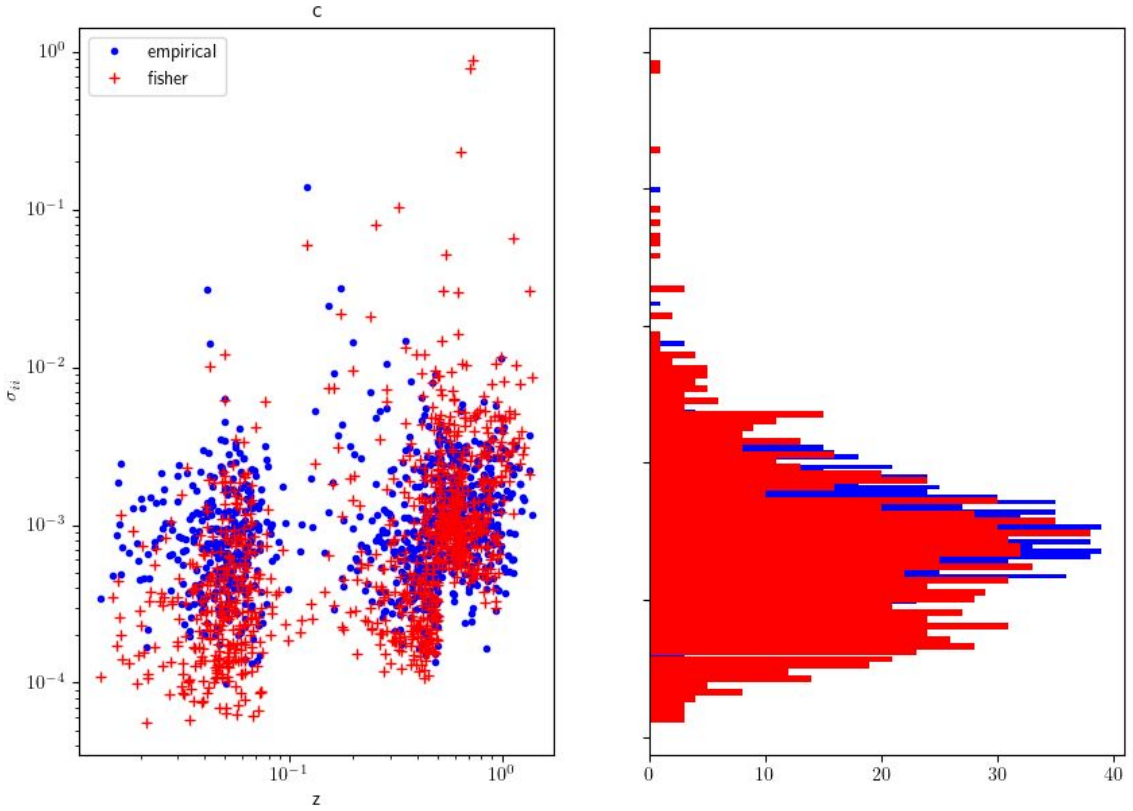
NaCl : results - coverage x1



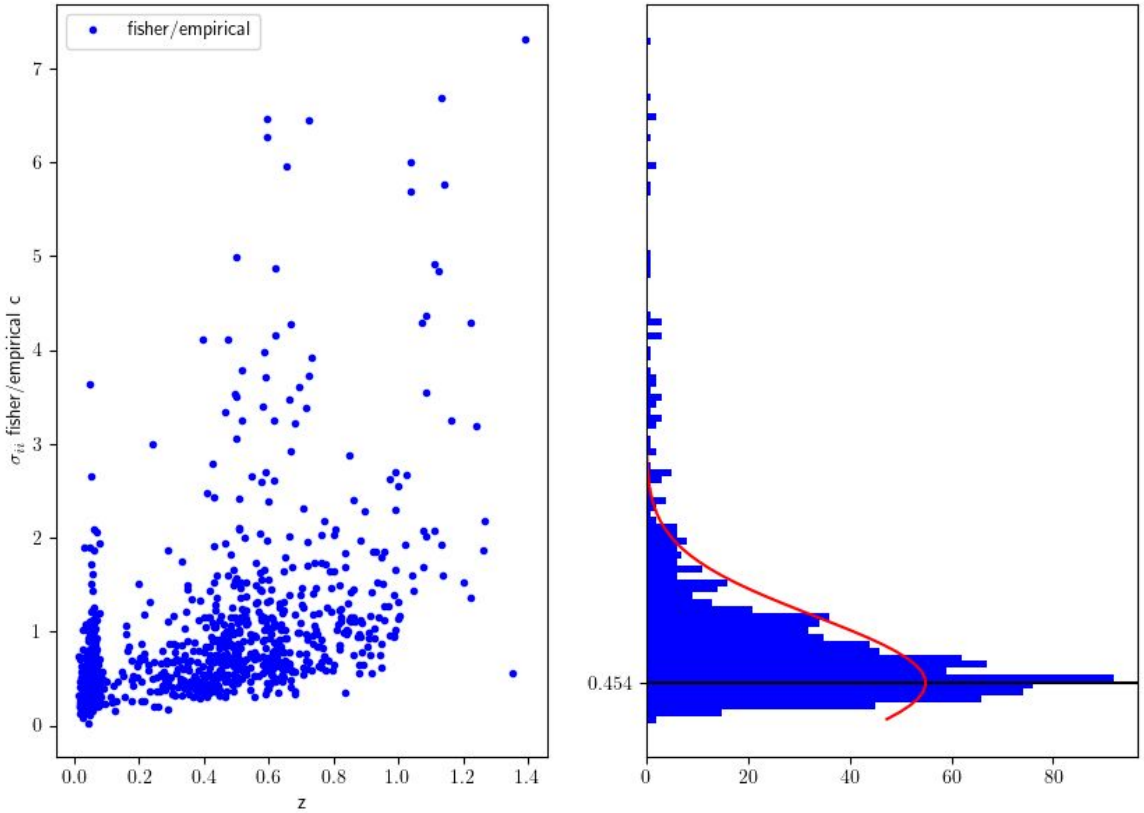
NaCl : results - coverage x1



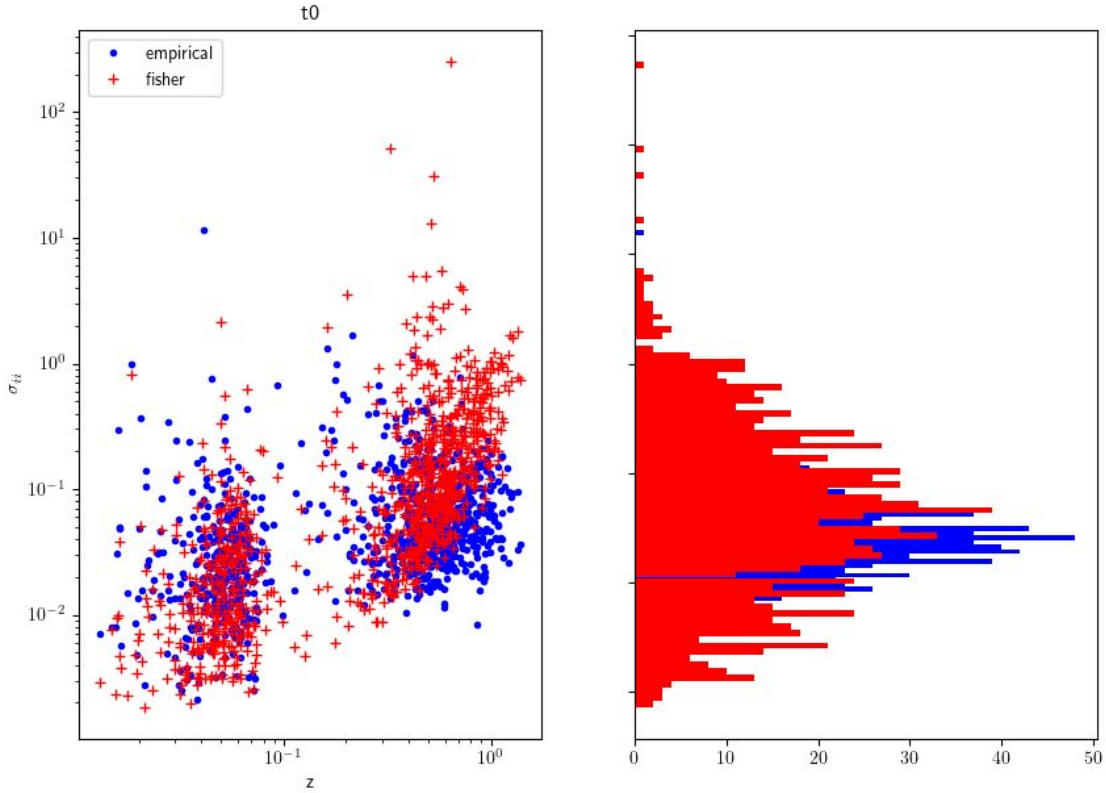
NaCl : results - coverage c



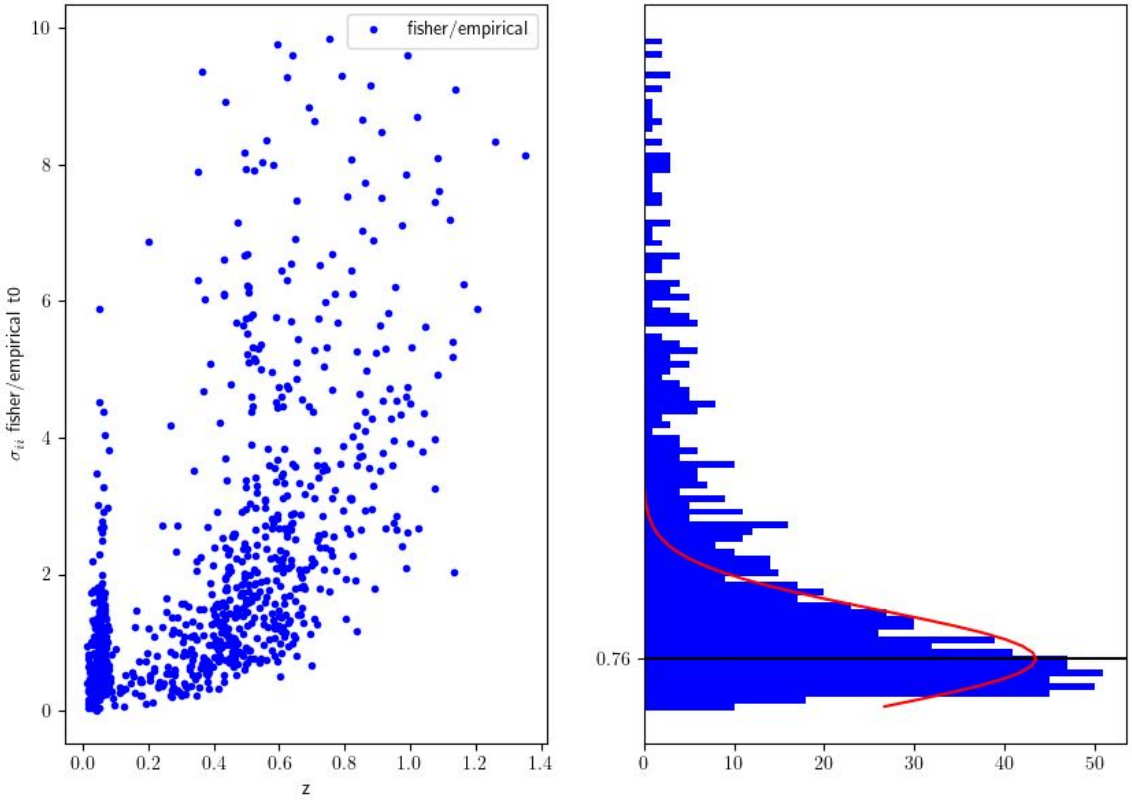
NaCl : results - coverage c



NaCl : results - coverage t0



NaCl : results - coverage t0

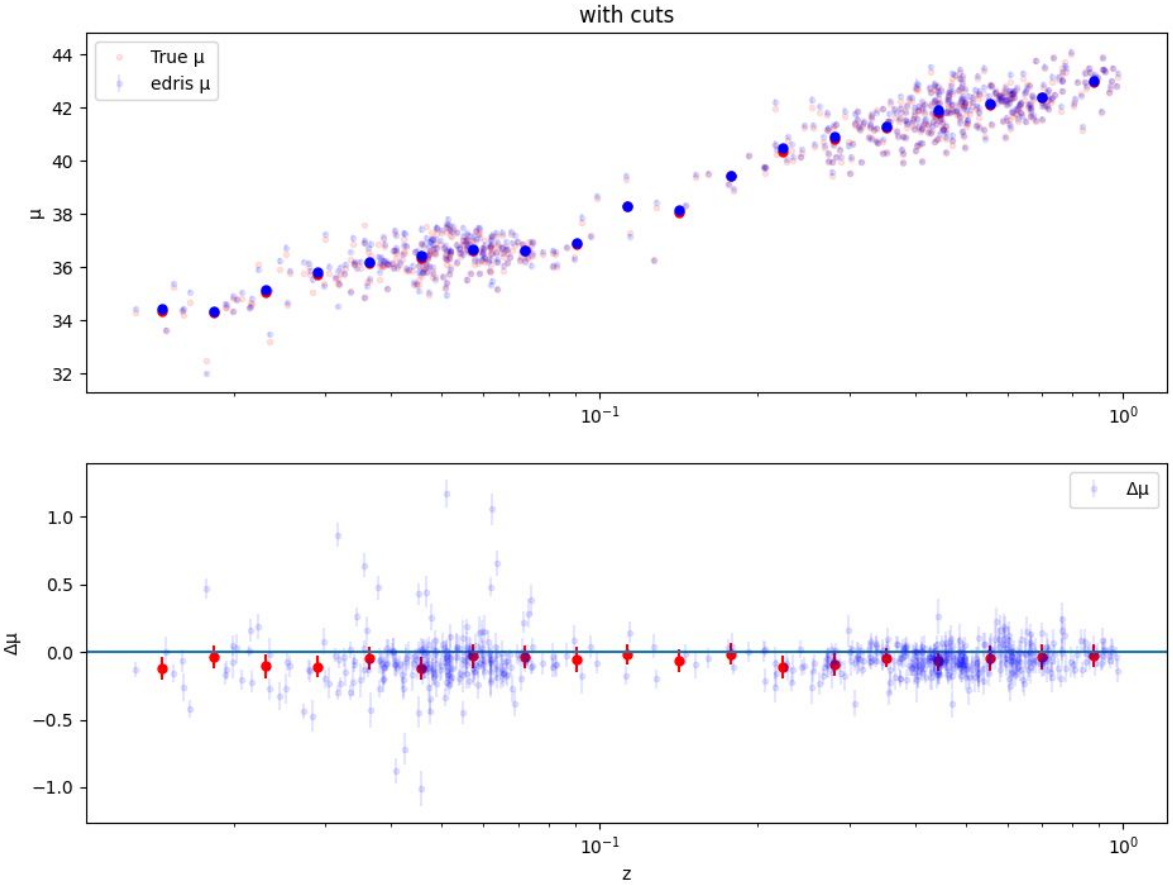


EDRIS : results - overall fit

□²/ndof = 0.96

time = less than a minute

EDRIS : results - Hubble diagram



Conclusions…

- Results aren’t yet conclusive, still need to run the 100 realizations on the full DC1

- Tests on the subsamples are starting to show interesting results, still waiting on the remaining realization to finish running