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SURVEY

LSST Processing of DES data

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What is done:

1.Installed LSST stack v 7_2 on DES cluster.

2. Used obs_file to process DES coadded data.

3. Converted one DES i band tile to LSST format

4. Produced catalog of objects.

5. Processed the same tile with SExtractor

using the same parameters as DESDM but without separate detection image.

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The image looks like this

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RESULTS

- To compare DES and LSST magnitudes I calculate LSST magnitudes as

  Mag = Zp – 2.5*log10(flux)

- The zeropoint Zp value was set from DES fits header.
- To compare magnitudes of stars I used mag_psf for both LSST and DES.
- To compare magnitudes of galaxies I used mag_sinc for LSST and mag_aper for DES. The value of aperture was adjusted to be the same in both cases.

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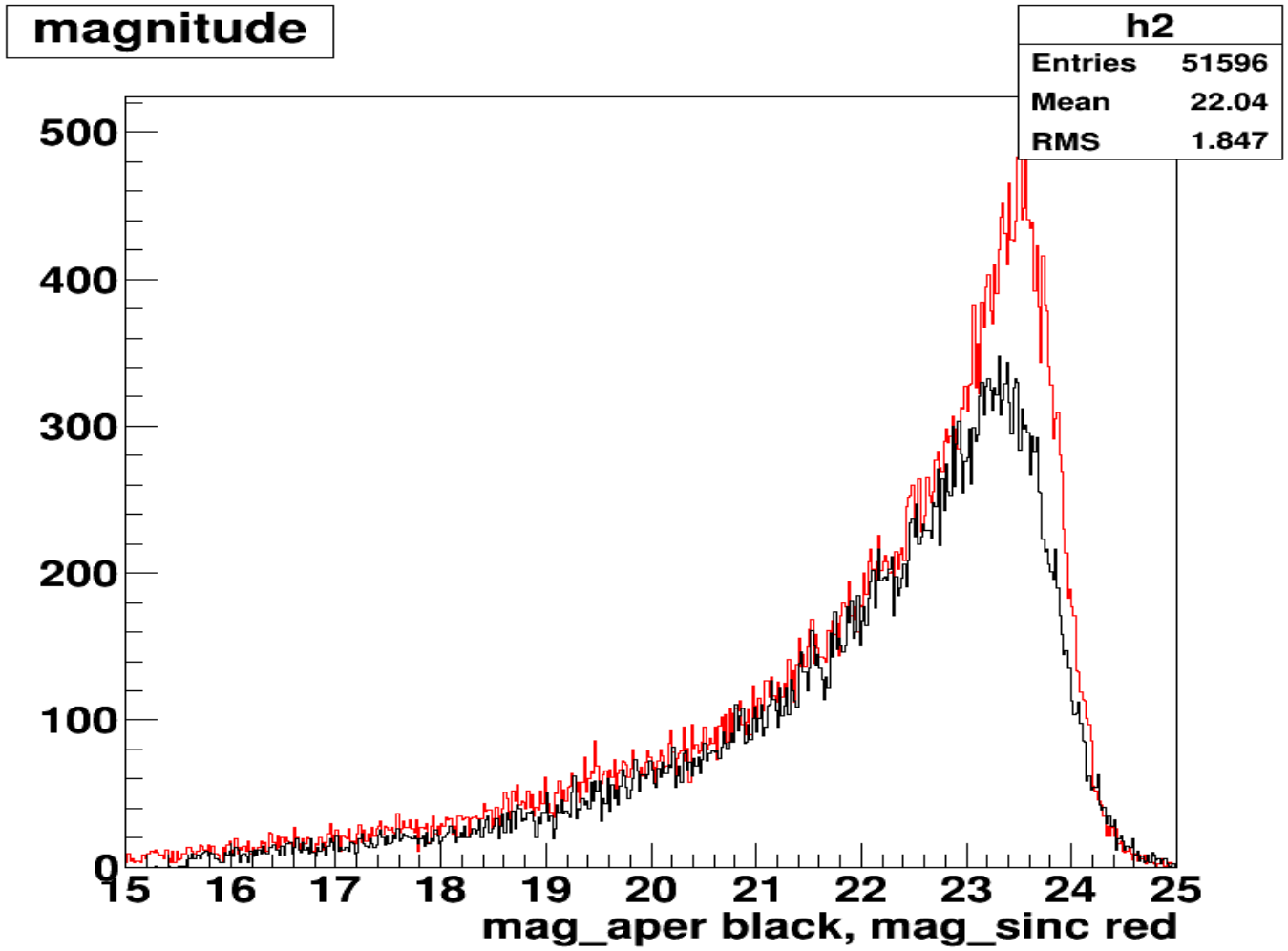
Distribution of magnitudes before matching



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- DES catalog contains 53370 objects.
- LSST catalog contains 67668 objects
- Used DES SExtractor flags=0 to select “good” objects. Selected 42312 objects.
- Created matching program using java healpix indexing.
- Matched objects in LSST catalog 41982
- Not matched 0.8% - faint objects

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Star-galaxy separation.

- For DES I have used spread_model parameter to distinguish stars. Accepted cuts on the function to select stars is {-0.002 ,0.002}. I also put cut on mag_psf to be >16 and < 21.
- For LSST class_ext variable is used. Its value 0 for stars and 1 for galaxies.
- To demonstrate how the selections are working I plot the spread_model distribution with accepted cuts.

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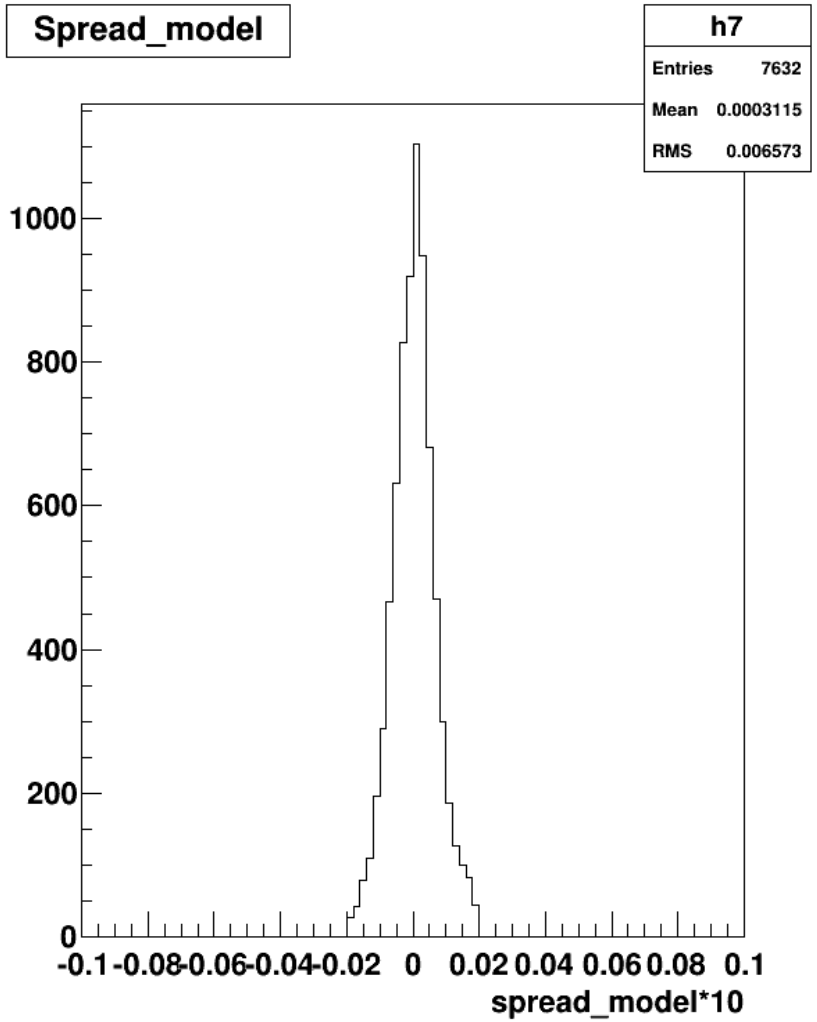
Spread_model for stars



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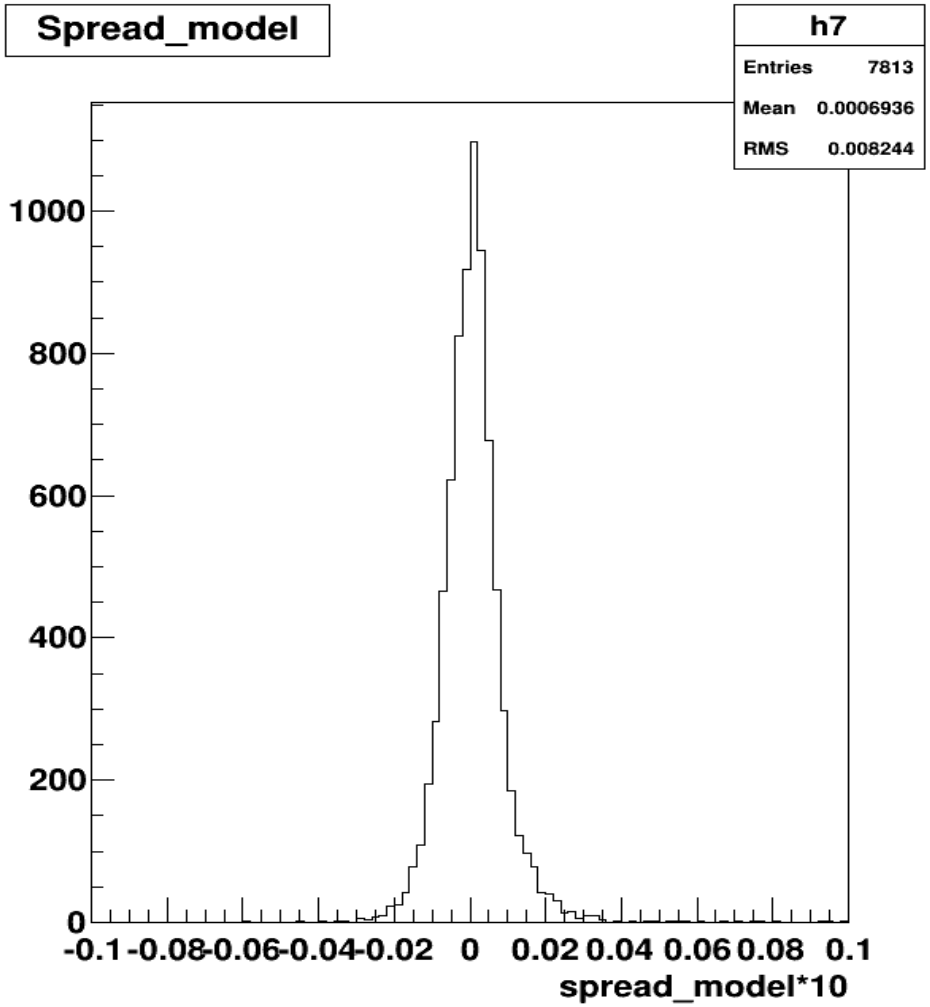
Spread_model with class_ext=0



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- These two plots show that both selectors are working almost equally well.
- To select a pure sample of stars I use both spread_model and class_ext simultaneously.
- Now, for selected stars I plot difference between DES mag_psf and LSST mag_psf

Delta mag_psf vs mag_psf

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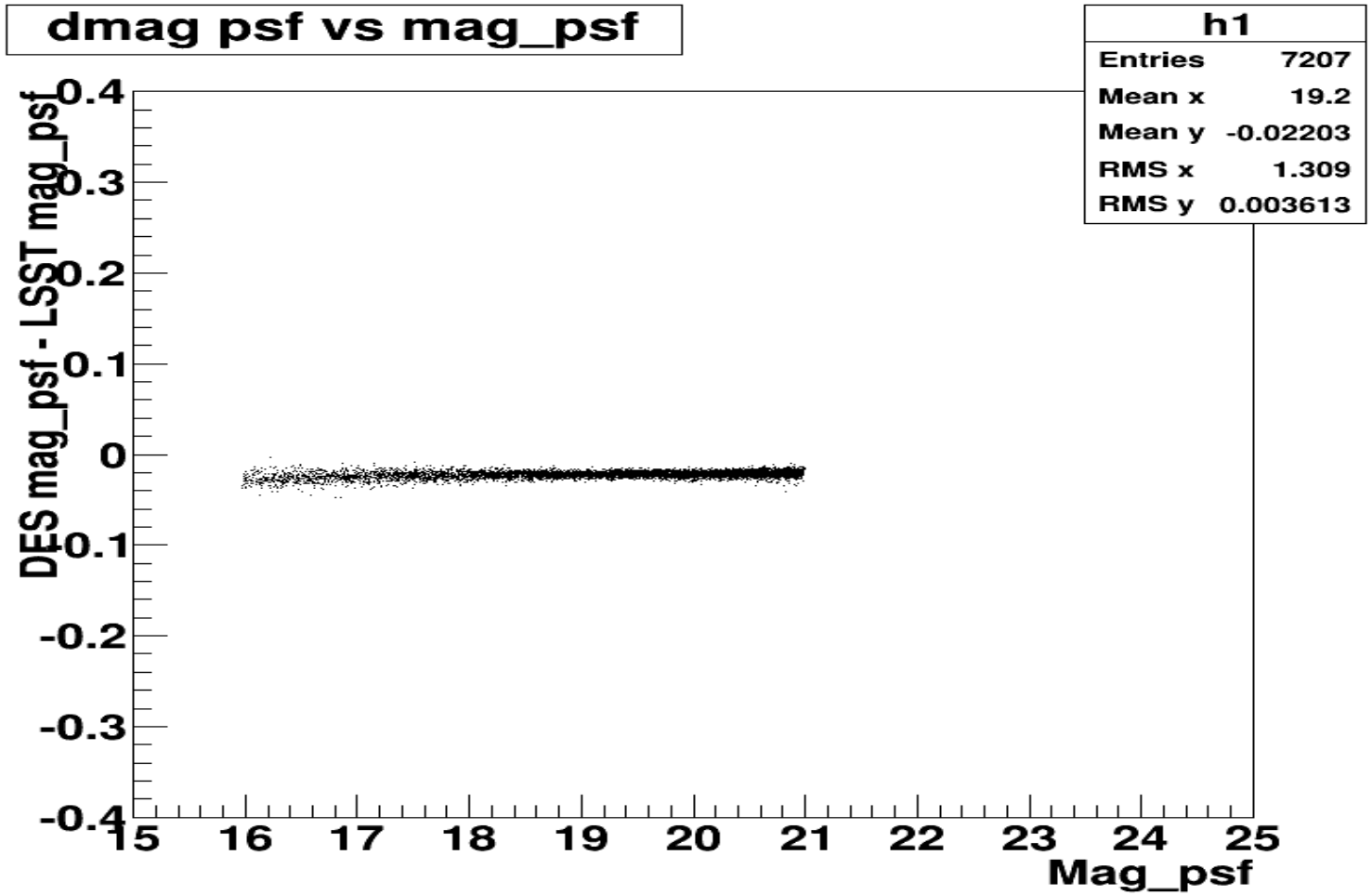

Converting the plot to graph and fitting

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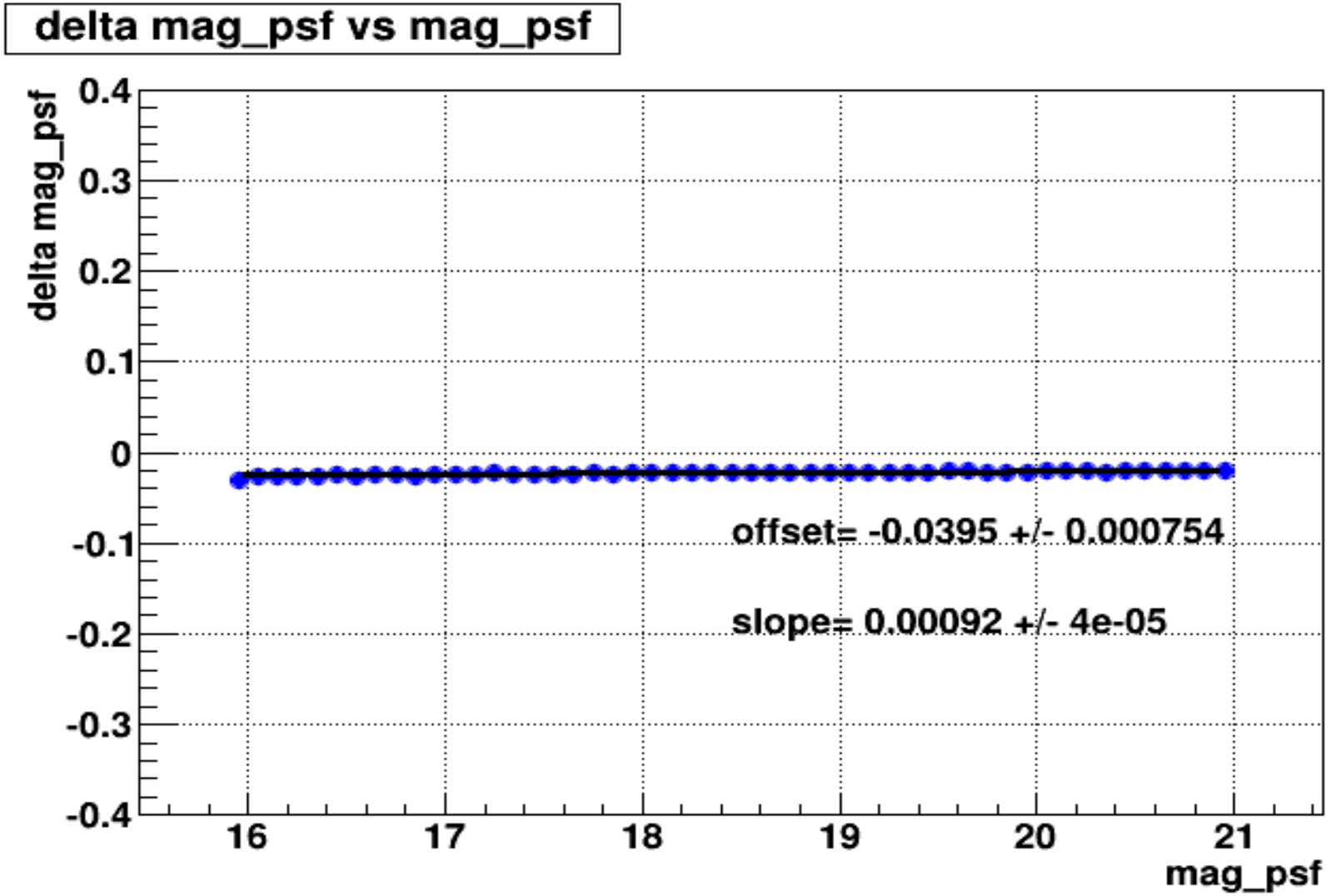

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Galaxies detection.

- To select galaxies I was using spread_model > 0.002 cut, and class_ext = 1
- Comparison was done using mag_sinc for LSST and mag_aper for DES.
- To make the comparison possible I have changed the

['flux.sinc'].radius2=5.55 (2.92 arcsec diameter) to be the same as in selected DES mag_aper.

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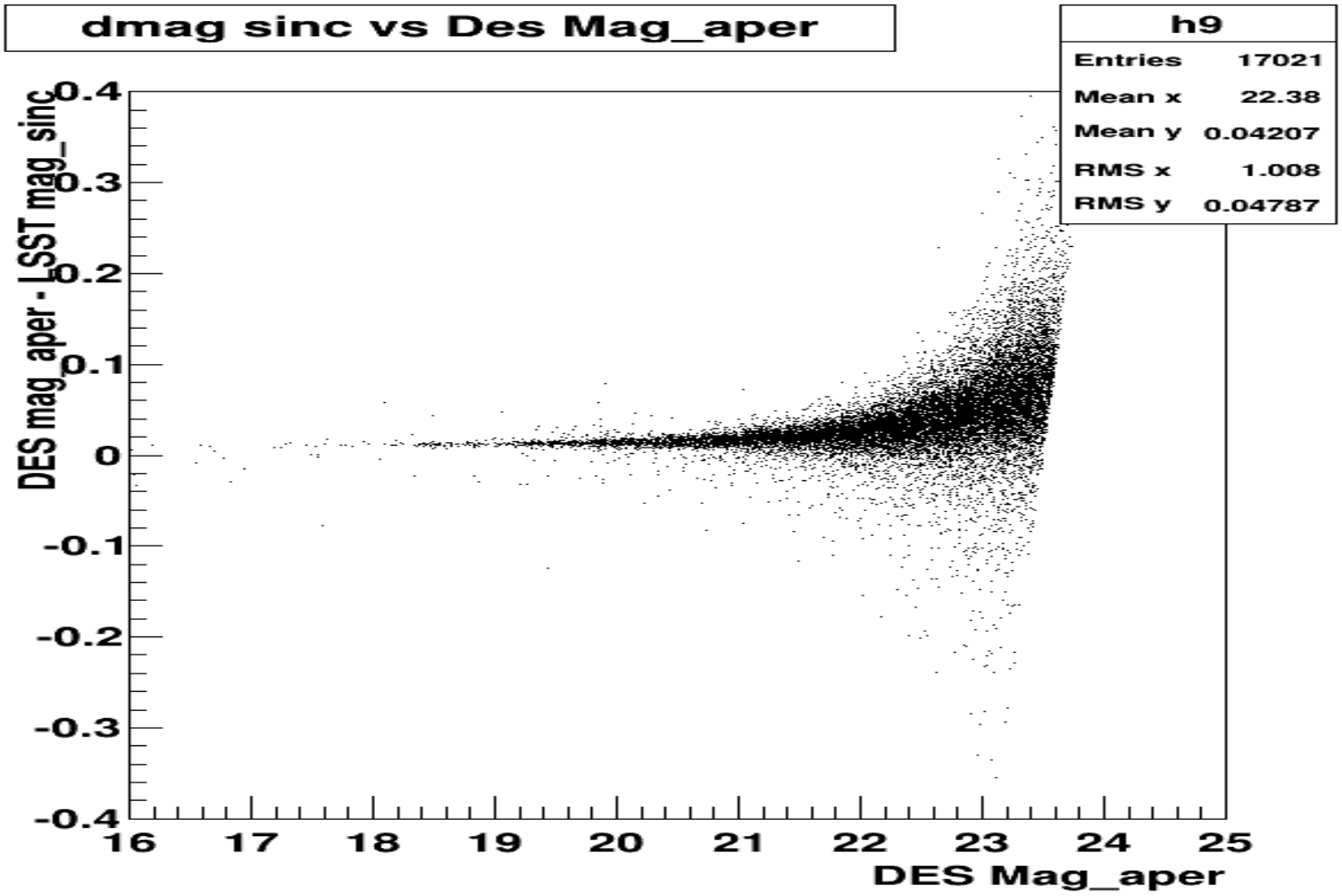

To estimate dmag error we can cut out faint tail

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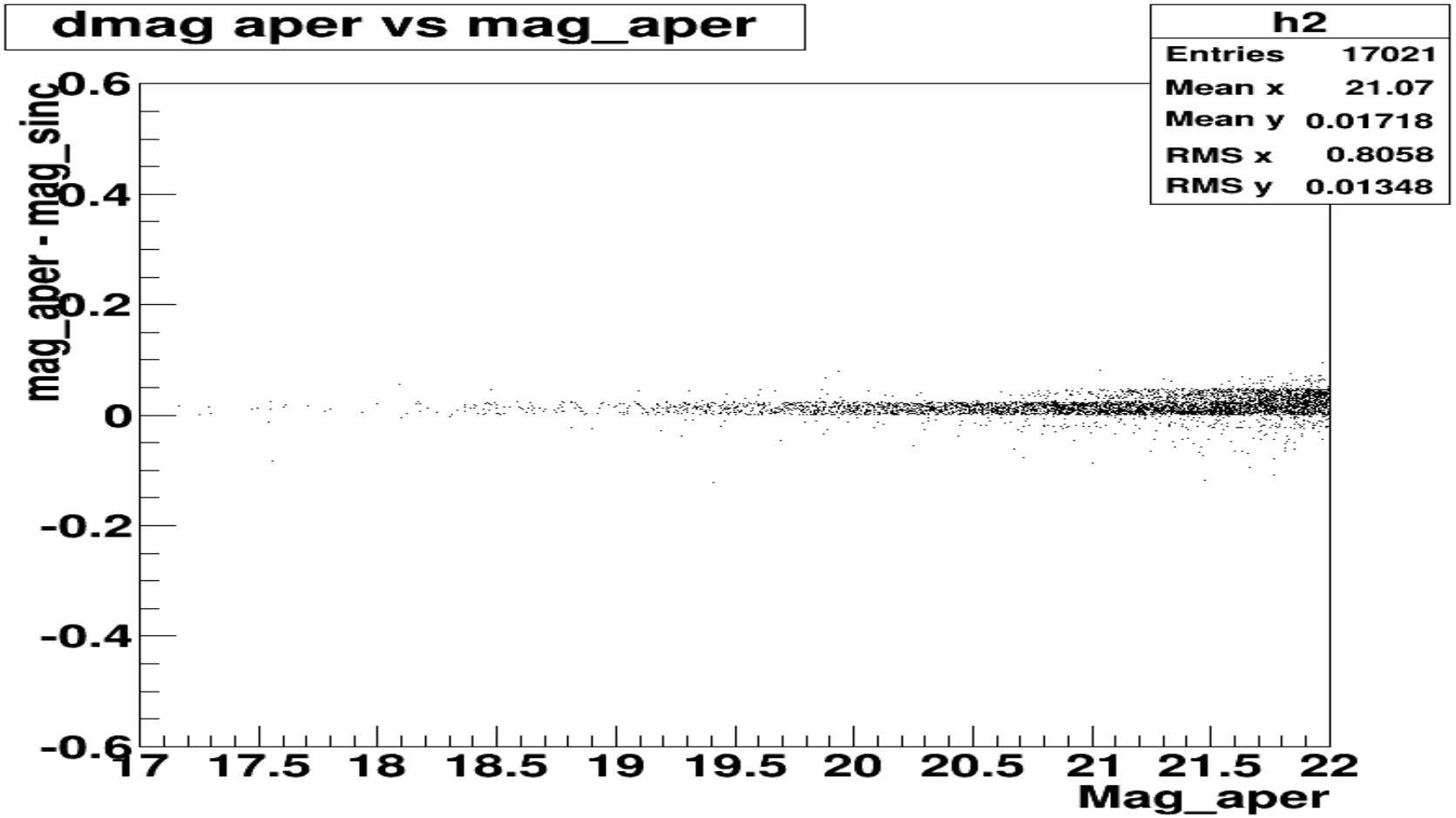

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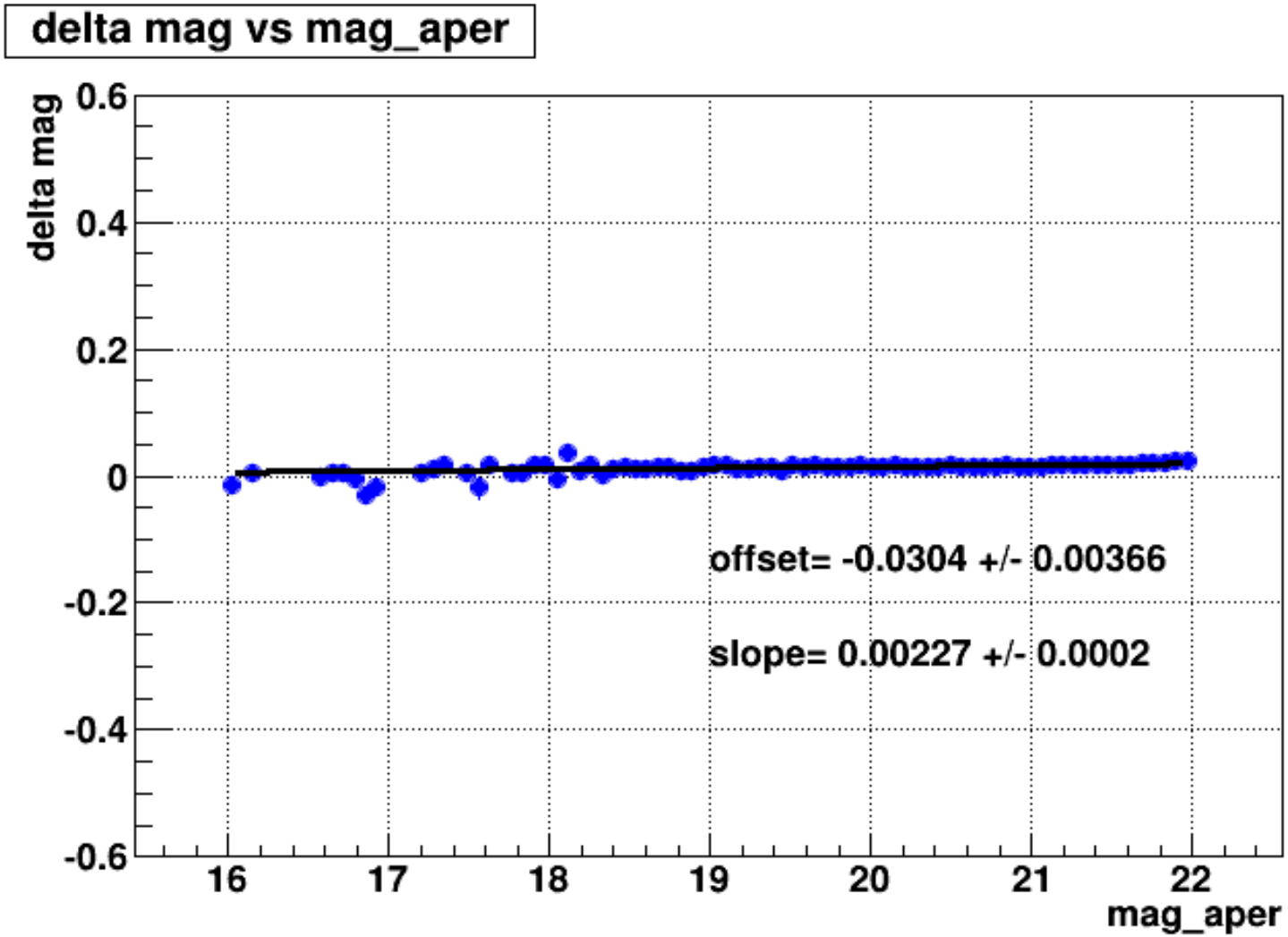

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Conclusion

- LSST shows similar performance in comparison with DESDM. Small problems are most probably subject of fine tuning.

- This result is achieved with coadded image where majority of artifacts are removed.

Raw data will be more difficult to process.