LSST Precise Uniform Photometry with GAIA

F. Feinstein* and M. Bétoule**
*CPPM-Marseille
**LPNHE-Paris
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Gaia in a nutshell

Launch dec. 2013, L2, five-year ESA mission, survey of 1 billion stars

Astrometry : unprecedented, but not considered here

Photometric survey of all stars in G band [330-1050 nm] < 20.5

Performances estimated in July 2014, after launch

Precision (all spect. types) in G band, avg 70 (40 to 130) passes, 5 y)

G band mag.	15	18	19	20
Error (mmag)	1	2	4	6
Error (1 y)	2.5	5	9	13

Blue and Red Photometers (low resolution spectrometers)

$\Rightarrow$ Measurement of astrophysical parameters : M, T_{eff}, log g, [Fe/H]

$\Rightarrow$ determination of spectral type

Detection of variability : 10 to 20 mmag over 0.5 to 1 year

Meeting with Gaia

- Meeting in Paris, 9th October
- Attendants :
  - C. Babusiaux , C. Jordi (on-line), F. Mignard for Gaia
  - M. Betoule, J. Cohen-Tannugi, F. Feinstein, N. Regnault for LSST
- Their science field
  - Dark matter and dark energy, baryonic oscillation, cosmology
- Objective :
  - exchange of information on the structure of each project
  - presentation of Gaia
  - presentation of LSST
  - Gaia photometry

LSST

- Several programs require photometric measurements calibrated at at the 1% level **0.1% !**
  - the uniformity over the sky and time stability is crucial
- Gaia could provide photometric standards ($G > 16$)
  - large sample per square degree
  - Gaia potential: fix the photometric zero point over patches of 1 deg^2
- one could make trials from an existing survey
  - CFHT-LS, Pan-Starrs, DECALS, Low-z SN
- Synthetic photometry in the (u)griz band requested from Gaia data
  - need to know the performance ➔ work in progress (Jordi et al.)

Exercise with GAIA simul. data

BP & RP help to identify star types

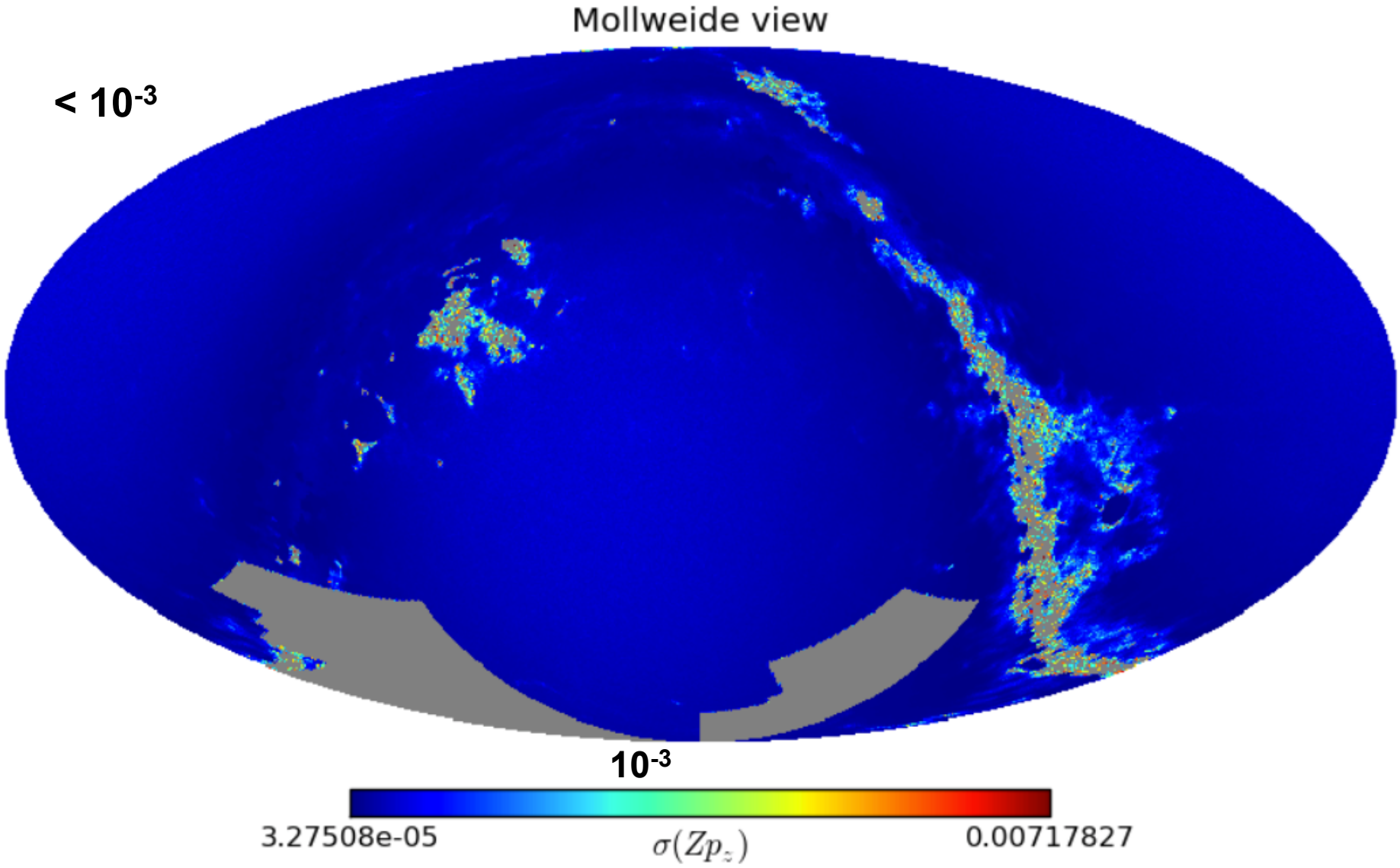
Take all stars in each 0.2 sq. deg. (~ 3 CCDs)

16 < *m* < 18 and 0 < BP – RP < 1

Uncertainty on each star photometry from GAIA table (simul.)

$BP-RP$	0.20	0.30	0.38	0.49	0.76	0.89
$\sigma(g^{BP})_{G=18}$	0.0045	0.0046	0.0048	0.0050	0.0058	0.0062
$\sigma(g^{BP})_{G=16}$	0.0016	0.0016	0.0017	0.0017	0.0019	0.0021
$\sigma(r^{BP})_{G=18}$	0.0054	0.0054	0.0054	0.0054	0.0054	0.0055
$\sigma(r^{BP})_{G=16}$	0.0020	0.0020	0.0020	0.0020	0.0020	0.0020
$\sigma(i^{RP})_{G=18}$	0.0053	0.0051	0.0050	0.0049	0.0045	0.0044
$\sigma(i^{RP})_{G=16}$	0.0018	0.0018	0.0017	0.0017	0.0016	0.0016
$\sigma(z^{RP})_{G=18}$	0.0073	0.0070	0.0067	0.0065	0.0058	0.0056
$\sigma(z^{RP})_{G=16}$	0.0025	0.0024	0.0023	0.0022	0.0020	0.0020

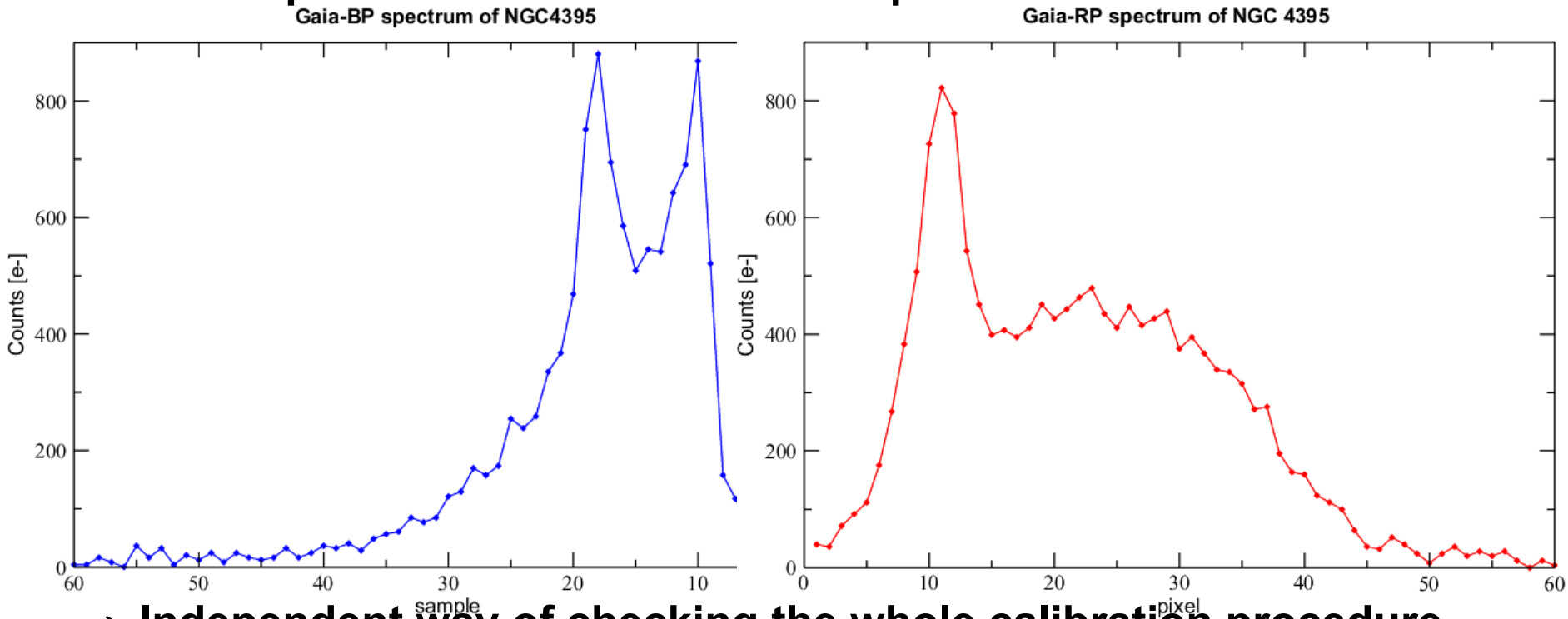
Z_p error estimate (PRELIM)



Future

A collaboration on the validation of the catalog(s): 2016, 2017, 2018

GAIA will provide millions of MS star spectra with BP & RP



⇒ **Independent way of checking the whole calibration procedure**

⇒ **Possibility to correct for small cloud extinction on 1 exposure**

⇒ **GAIA will give unprecedented precision on Galactic extinction**