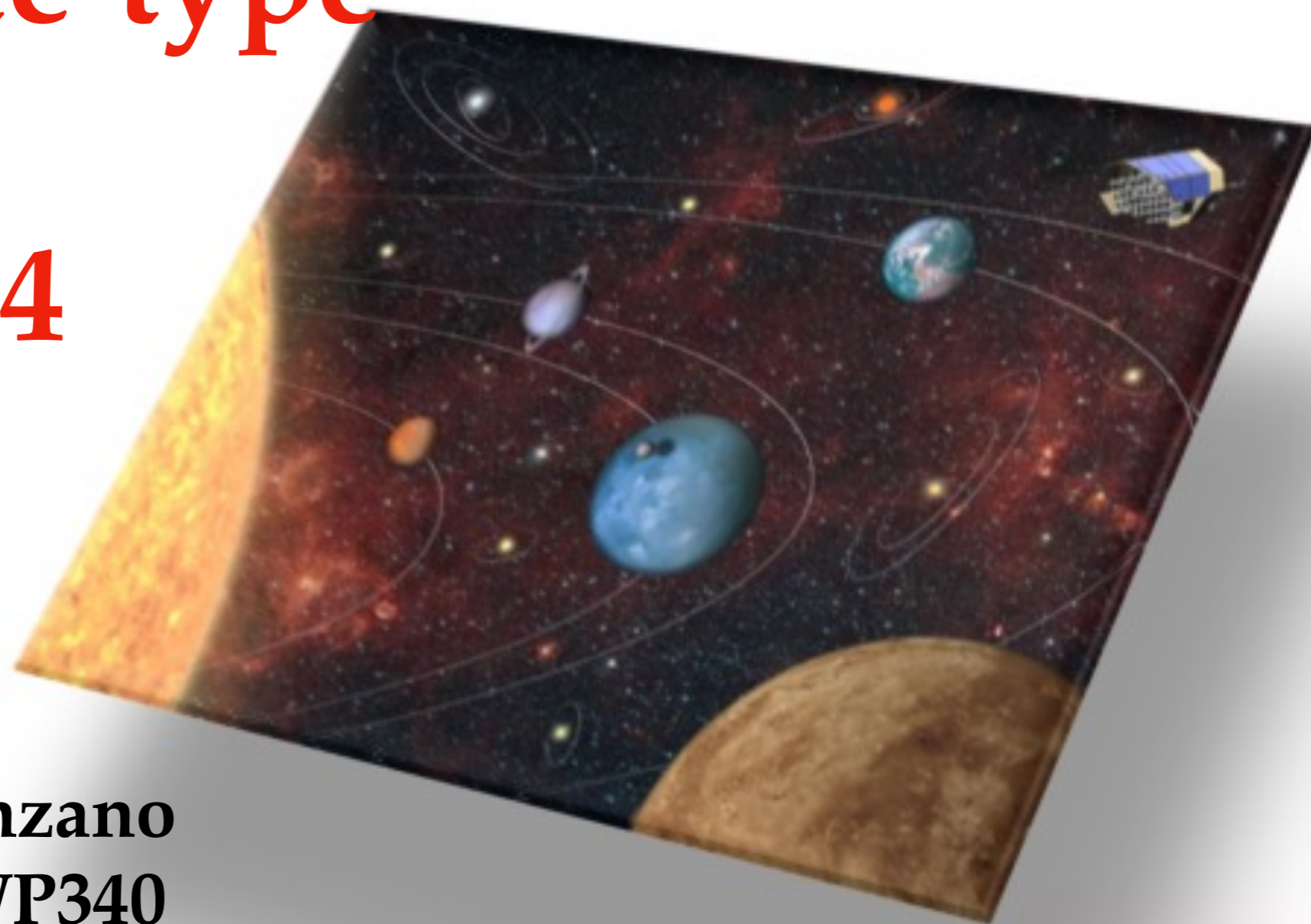




PLATO Input Catalog

Cool late-type dwarfs sample 4



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and WP 130 - WP340**



Agenzia Spaziale Italiana

PLATO Input Catalog (PIC) workshop Padova, 24-26 September 2019

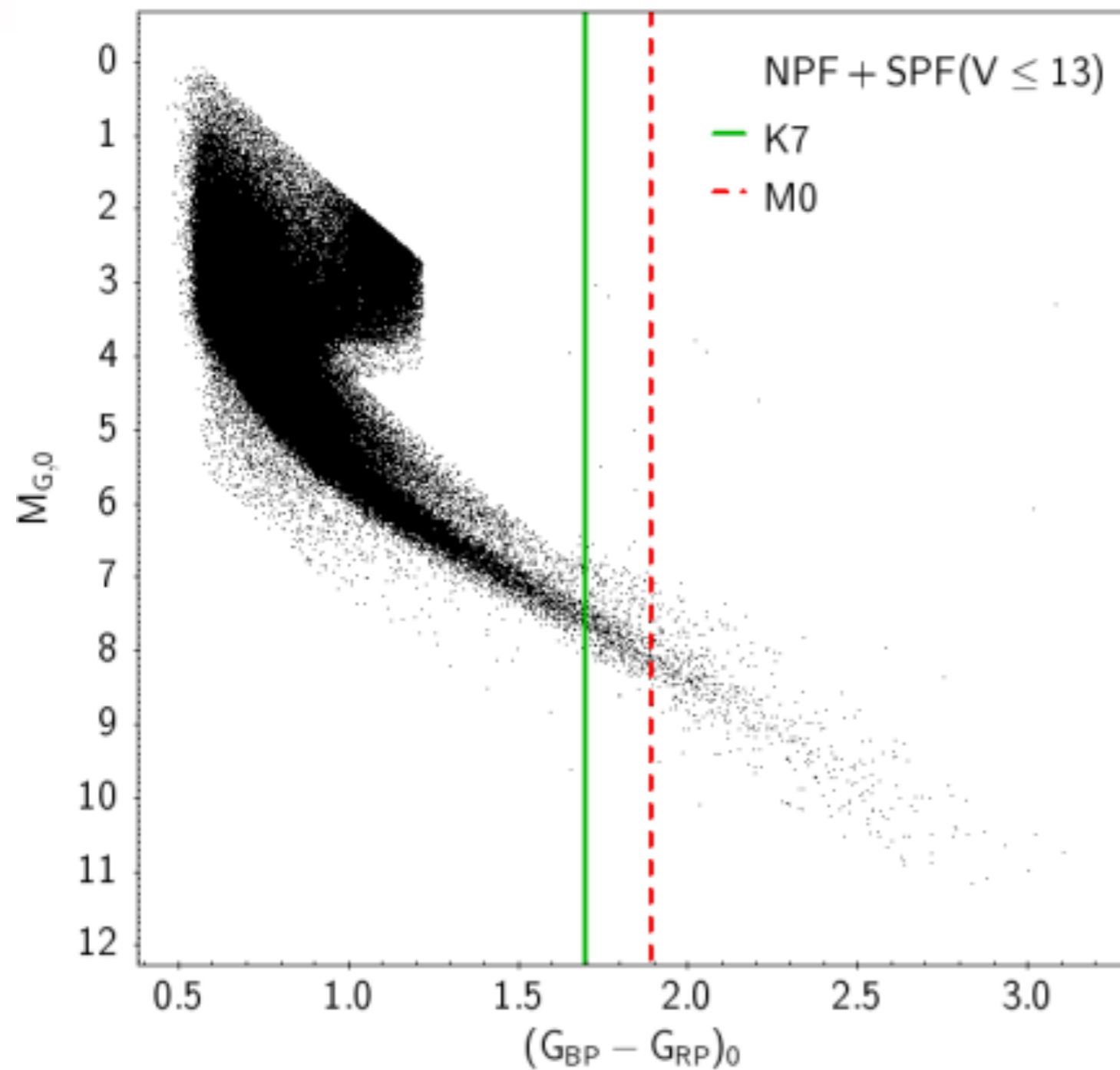
Science Requirements

Stellar sample 4 is specifically directed to a survey of cool late type dwarfs in the solar vicinity

- R-SCI-232** The total number of targets in stellar sample 4 (cumulative over all sky fields) shall be **at least 5,000** cool late-type dwarfs monitored during a Long-Duration Observation Phase.
*This requirement assumes the observation of at least two sky fields.
The decision whether to observe one or more sky fields during the nominal mission will be made about two years before launch.*
- R-SCI-234** The dynamic range of stellar sample 4 shall be **$m_V \leq 16$** .
- R-SCI-239** It shall be possible to obtain imagettes of 5,000 targets in stellar sample 4 with a sampling time equal to 25 seconds.

Reference: PTO-EST-SCI-RS-0150, ESA-PLATO-ESTEC-SCI-RS-001 Approved 15/07/2019

P4 & P5 sample connection



Sample 5:

$V < 13$

F5 to late-K stars

$G_{BP} - G_{RP} \leq 1.84$

Pecaut & Mamajek (2013)

Sample 4:

$V < 16$

from M0 onward

$(G_{BP} - G_{RP}) > 1.84$

**no gap between
samples 4 and 5**

DATA & TARGET SELECTION



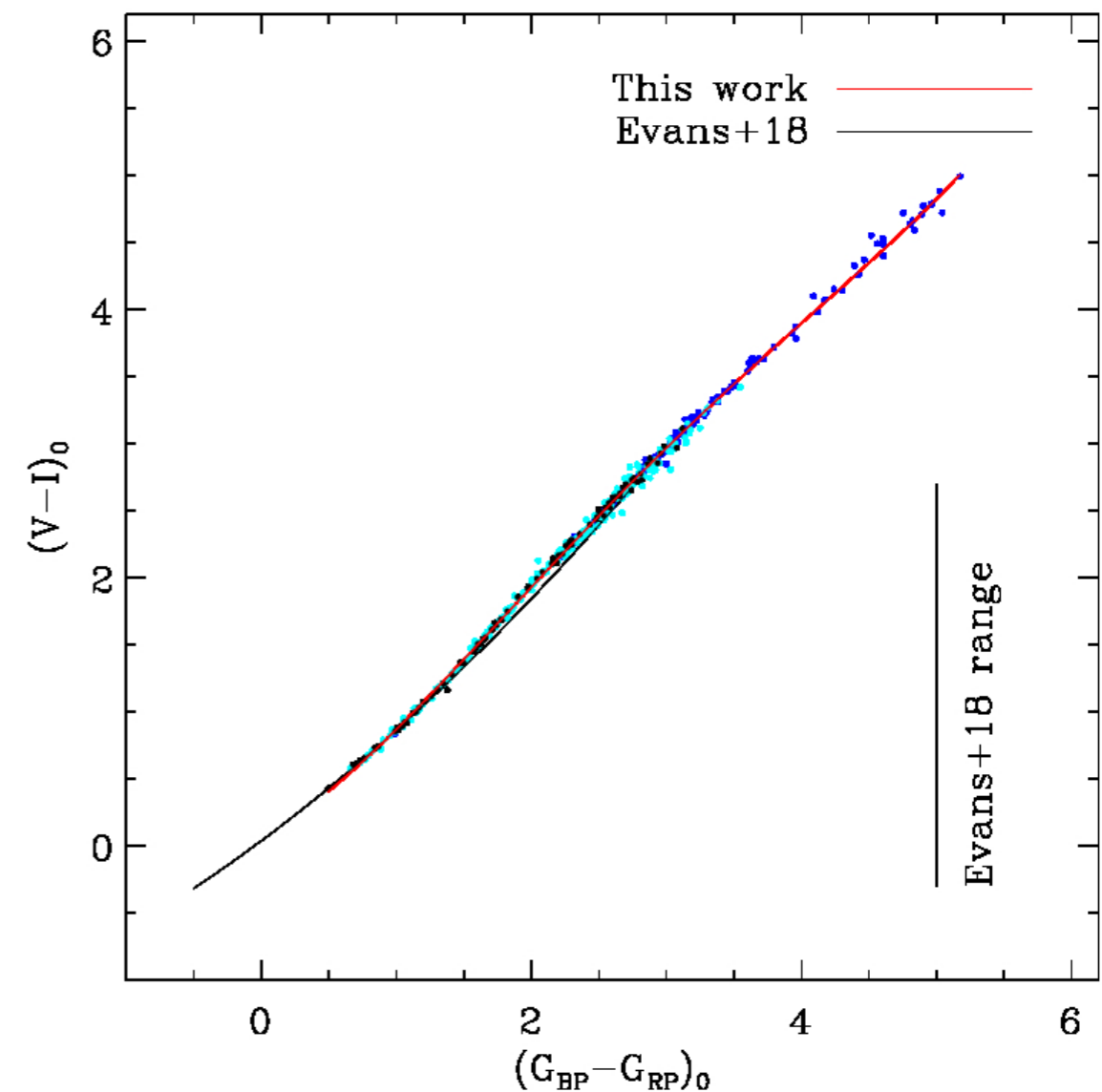
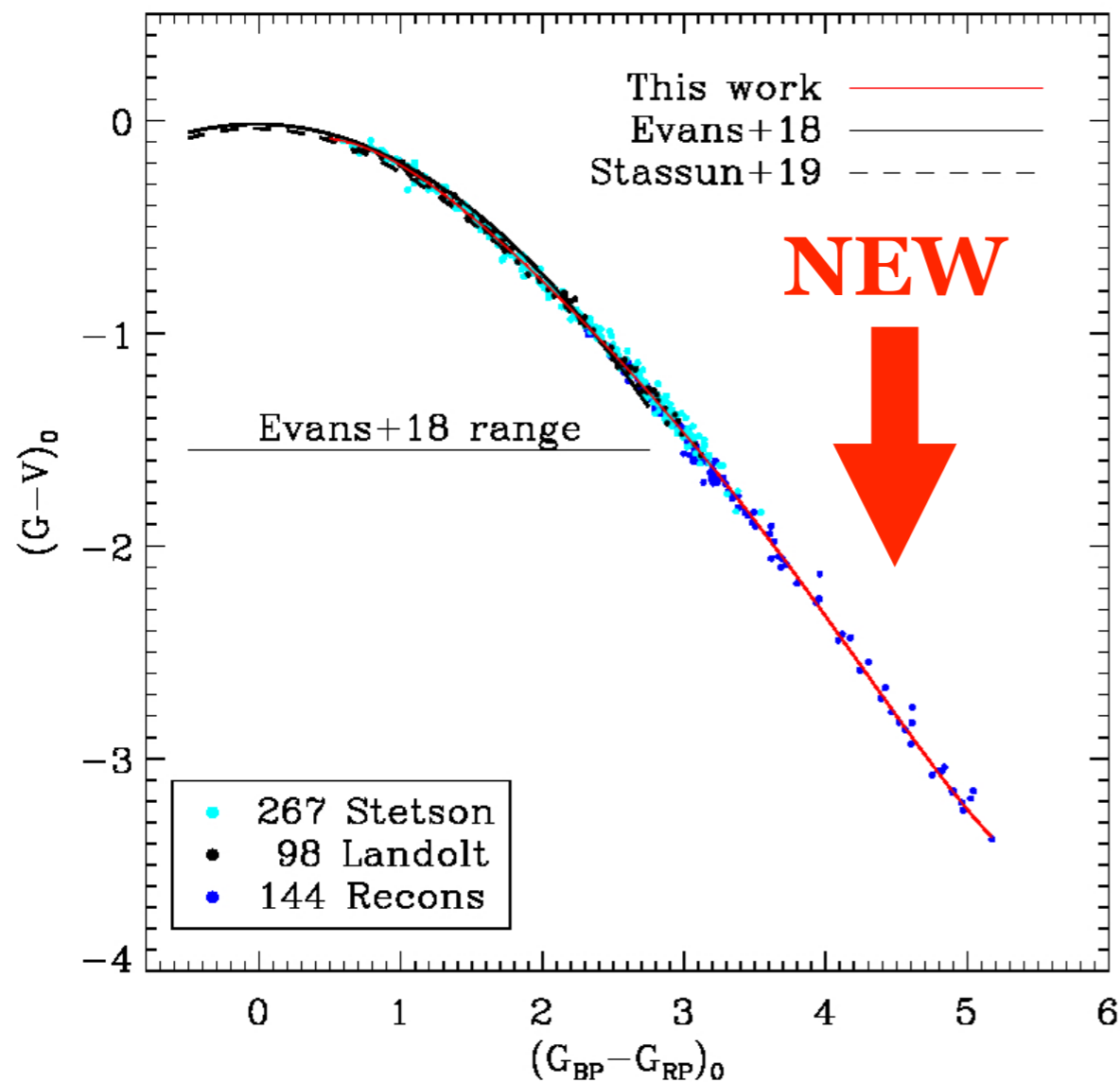
Data: Gaia DR2 catalog + Bailer-Jones+18 distances
(+ Pan-STARRS1 & 2MASS for tests)

First step - constraints:

1. $V < 16.0$ science requirement
2. $(G_{BP} - G_{RP})_0 > 1.84$ B-V=1.408 limit for M0 stars
Pecaut & Mamajek (2013)
3. $M_{G0} > 3$ to discard giants

316 171 objects (all sky)

Johnson-Cousins & Gaia DR2 relationship



- Evans+18 not defined for M-dwarfs later than M4V
- MS standards: $d < 200$ pc & $E(B-V) < 0.05$ & $\sigma(G_{BP}-G_{RP}) < 0.003$
- **New calibration extended down to M9V**

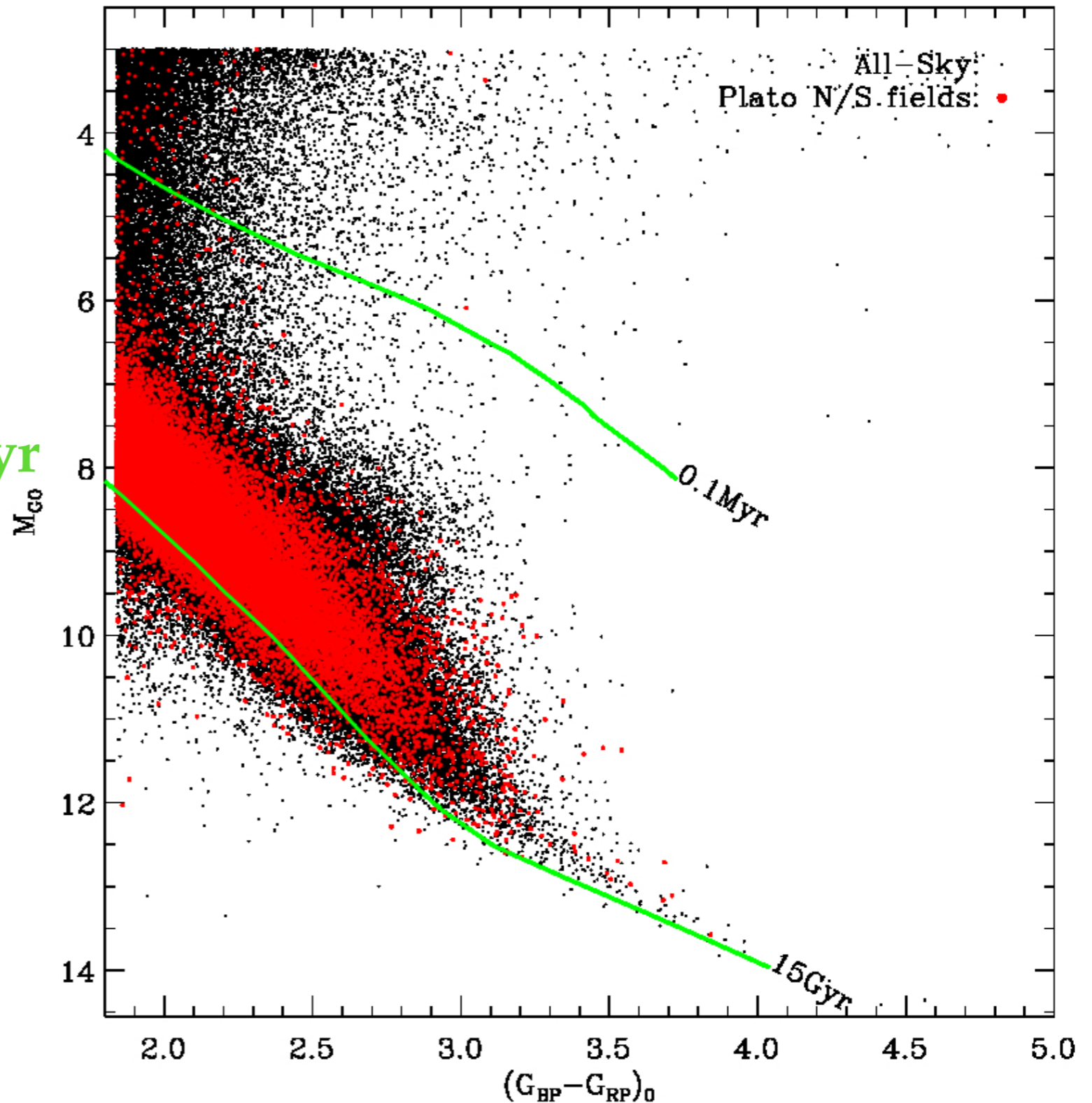
Unreddened color-abs. magnitude diagram



Reddening correction
(Montalto talk)

Sample 4 in NPF/SPF

dwarfs solar metallicity
isochrones: 0.1Myr-15Gyr
(Pisa group)

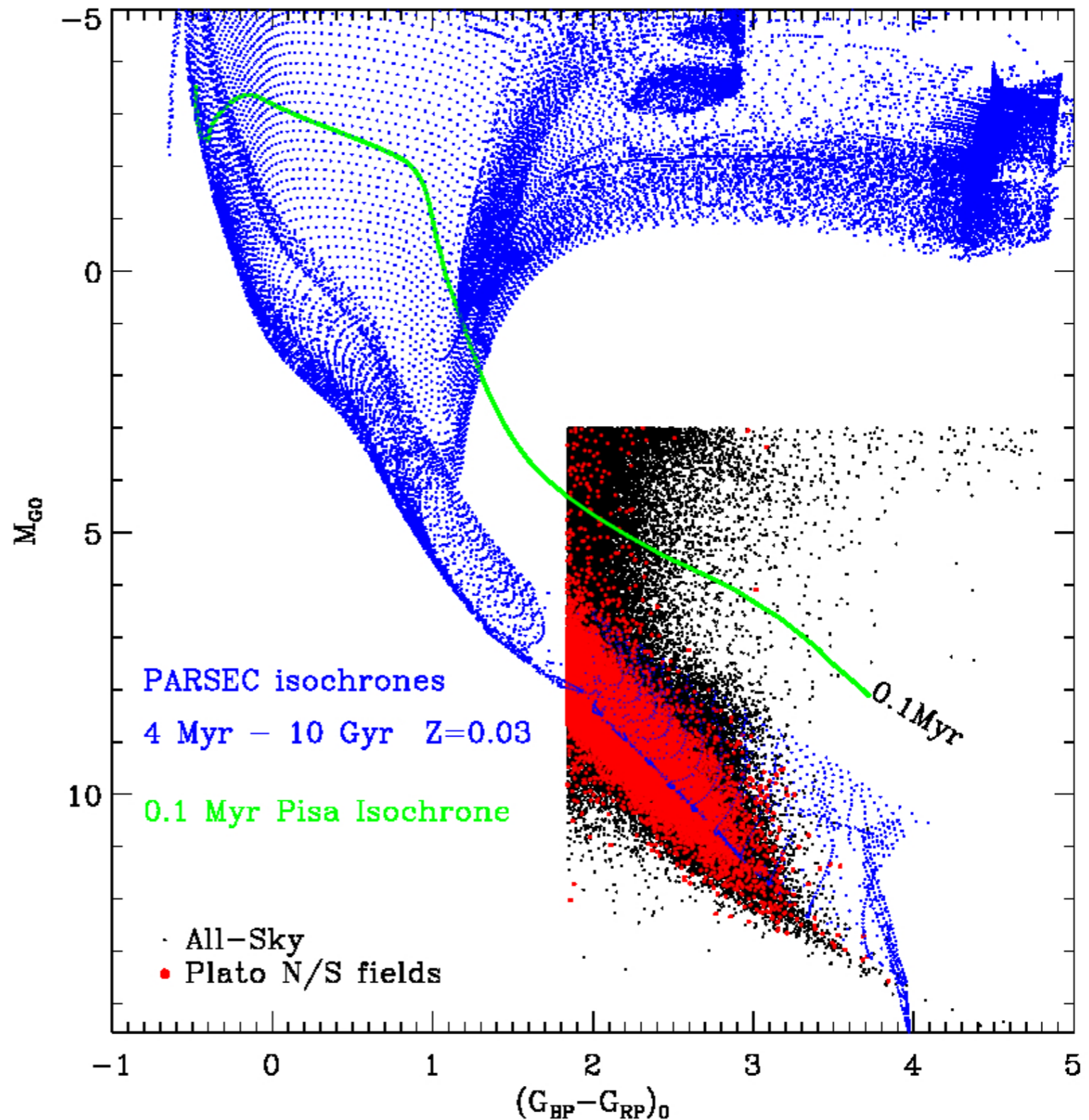


Giants vs. Dwarfs



Sample 4 in NPF/SPF

$M_{G0} > 3.0$ is a safe condition to discard giants and include all MS and PMS stars



2MASS TEST



- All data: 316 171 stars
- 2MASS counterparts: **305 466** stars
- 2MASS counterparts & err. J and H <0.1:
302 996 (96% of sample 4)

Intrinsic 2MASS (J-H)₀ vs. Gaia colors

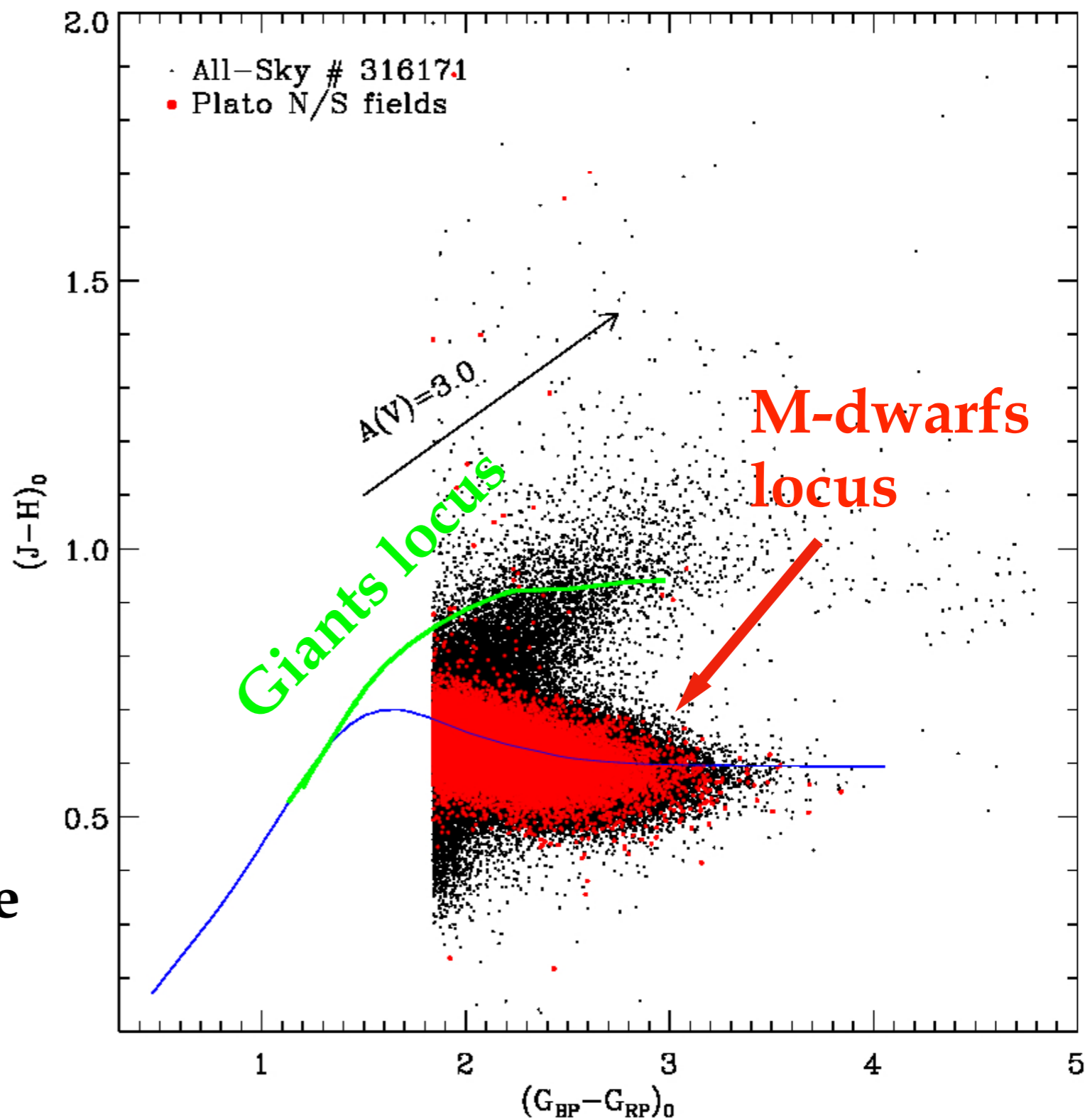


- 1 Gyr Pisa isochrone for dwarfs
- 10 Gyr Pisa Giant locus

BIFURCATION of dwarfs & giants

- Sample 4 in NPF/SPF most of the sample 4 candidates fall in the M-dwarf locus

only 47 candidates of sample 4 to be discarded





Pan-STARRS1 TEST



- All data: 316 171 stars
- PS1 counterparts: **187 475**
- PS1 counterparts with g and r errors <math><0.02</math>:

187 475 stars (59% of sample 4)

Intrinsic Pan-STARRS1 vs. Gaia colors

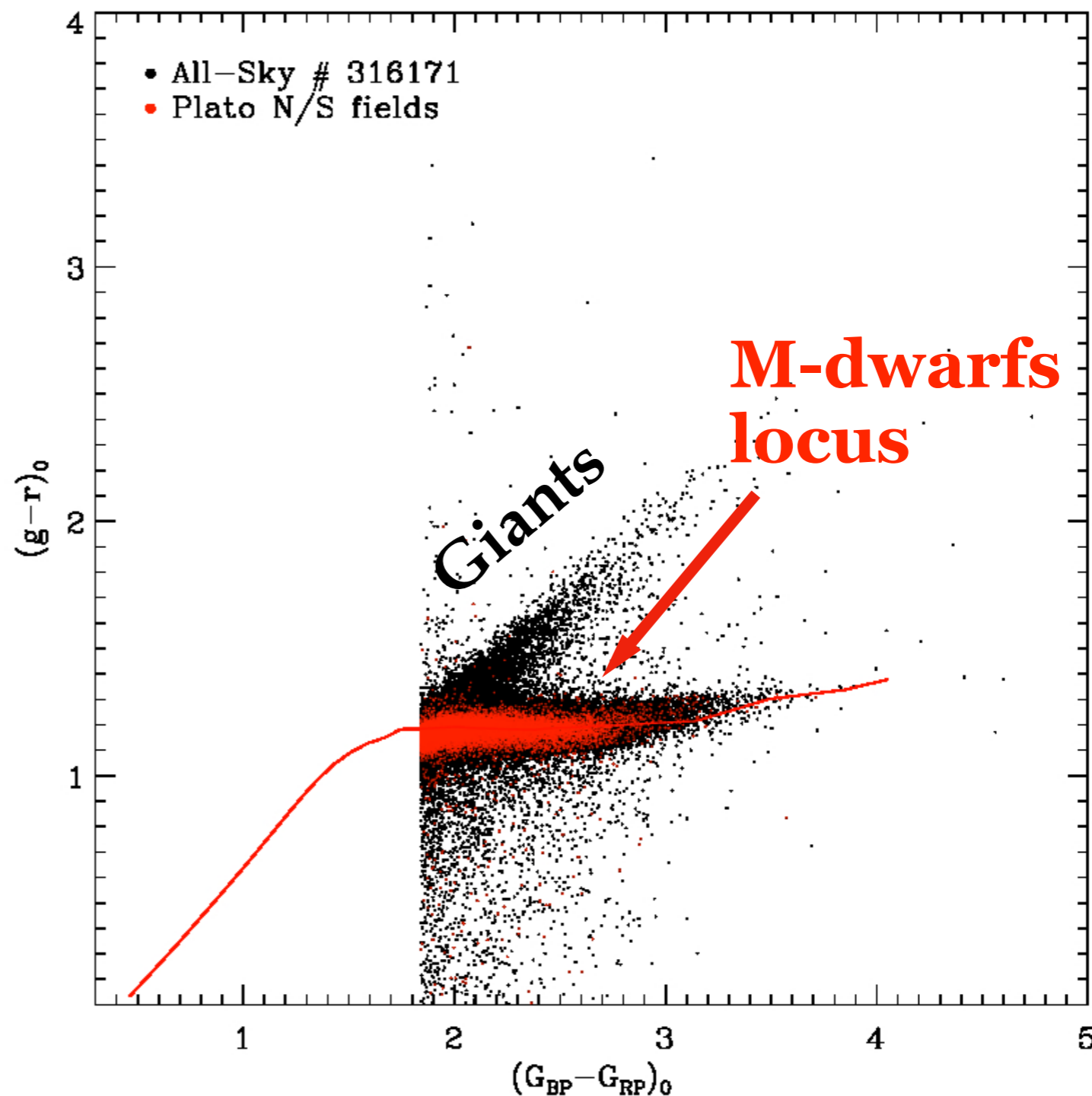


- **1 Gyr Pisa isochrone for dwarfs**
(Tognelli+18)
Bifurcation of dwarfs & giants

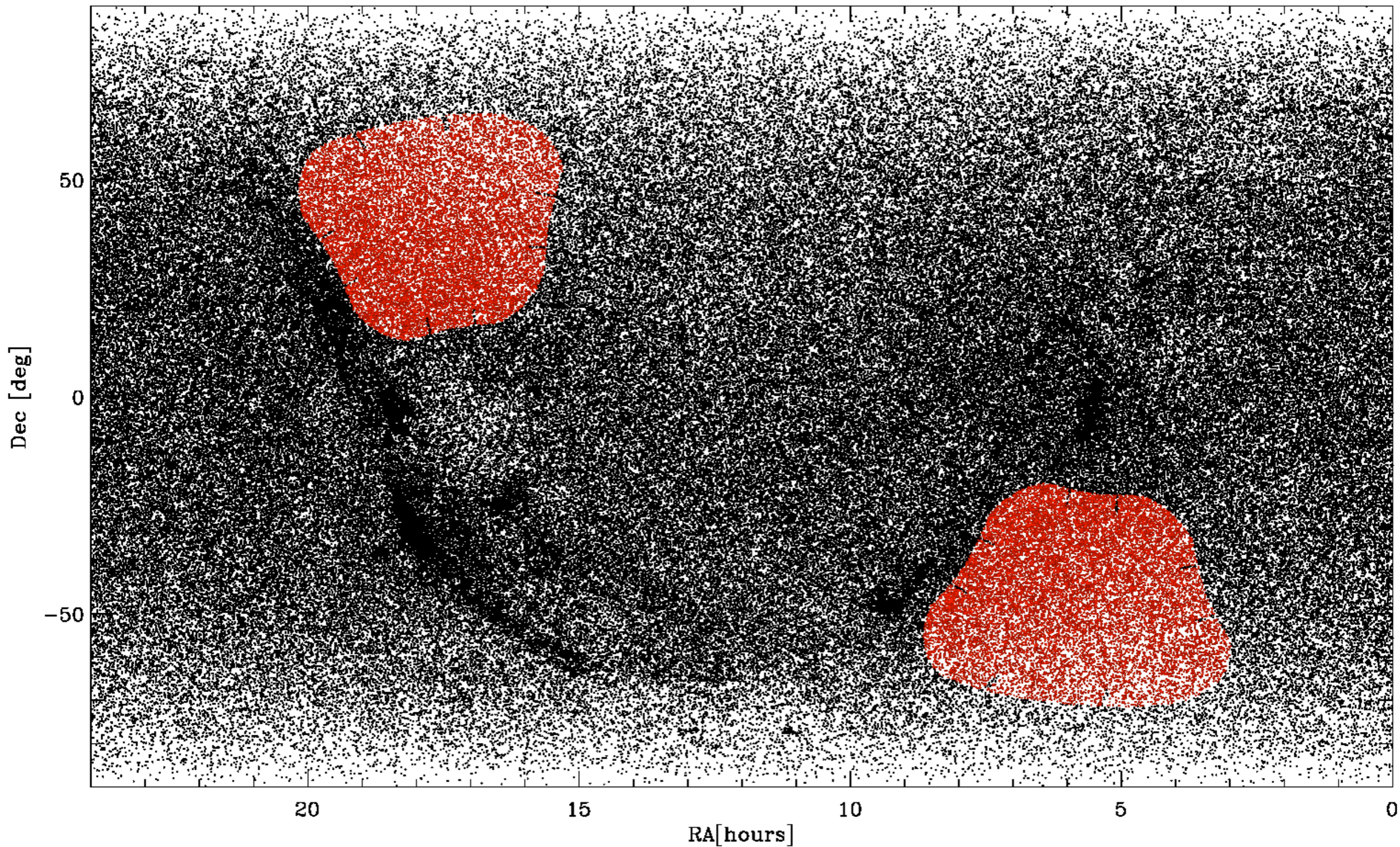
- **Sample 4 in NPF/SPF**

again

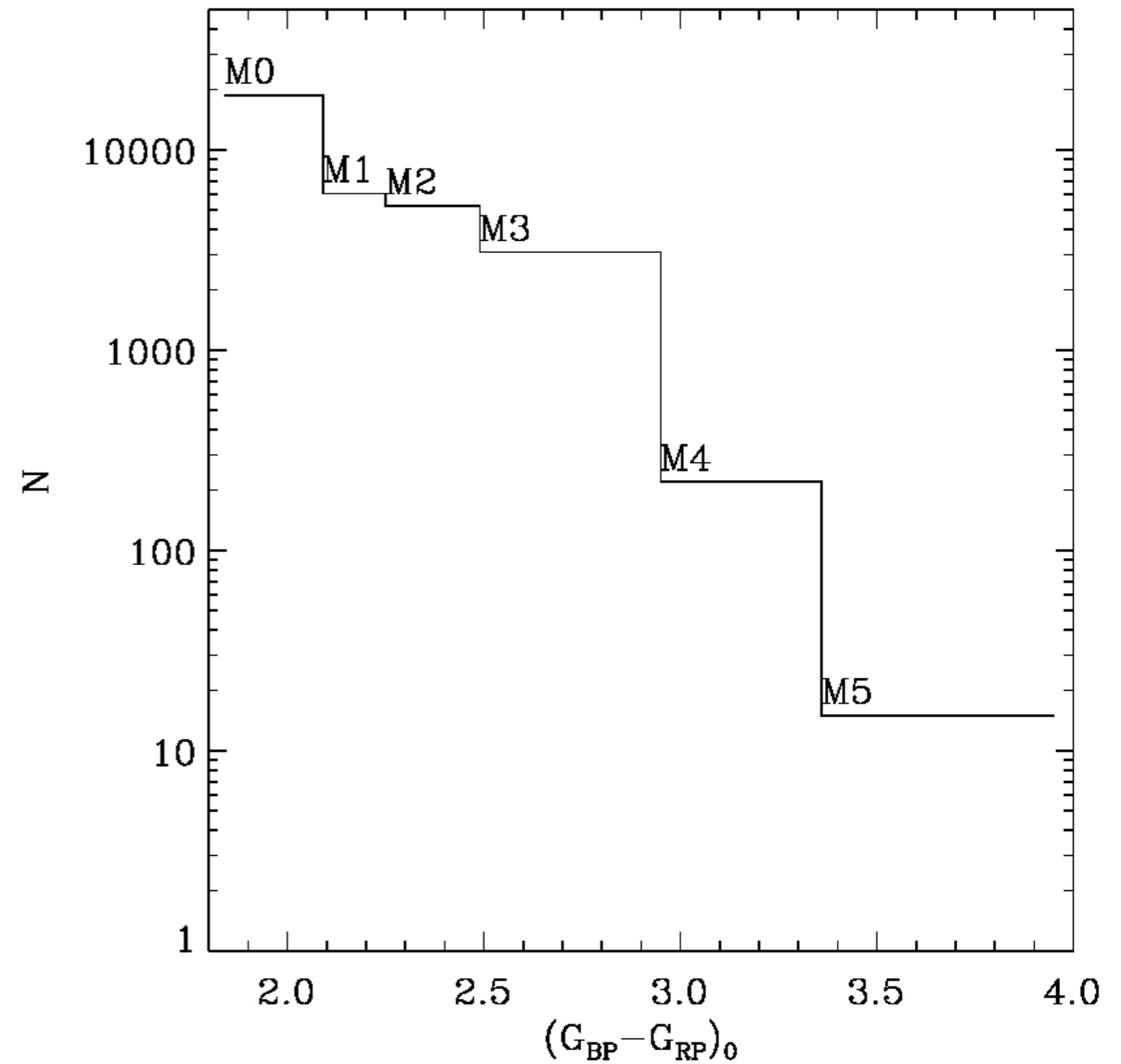
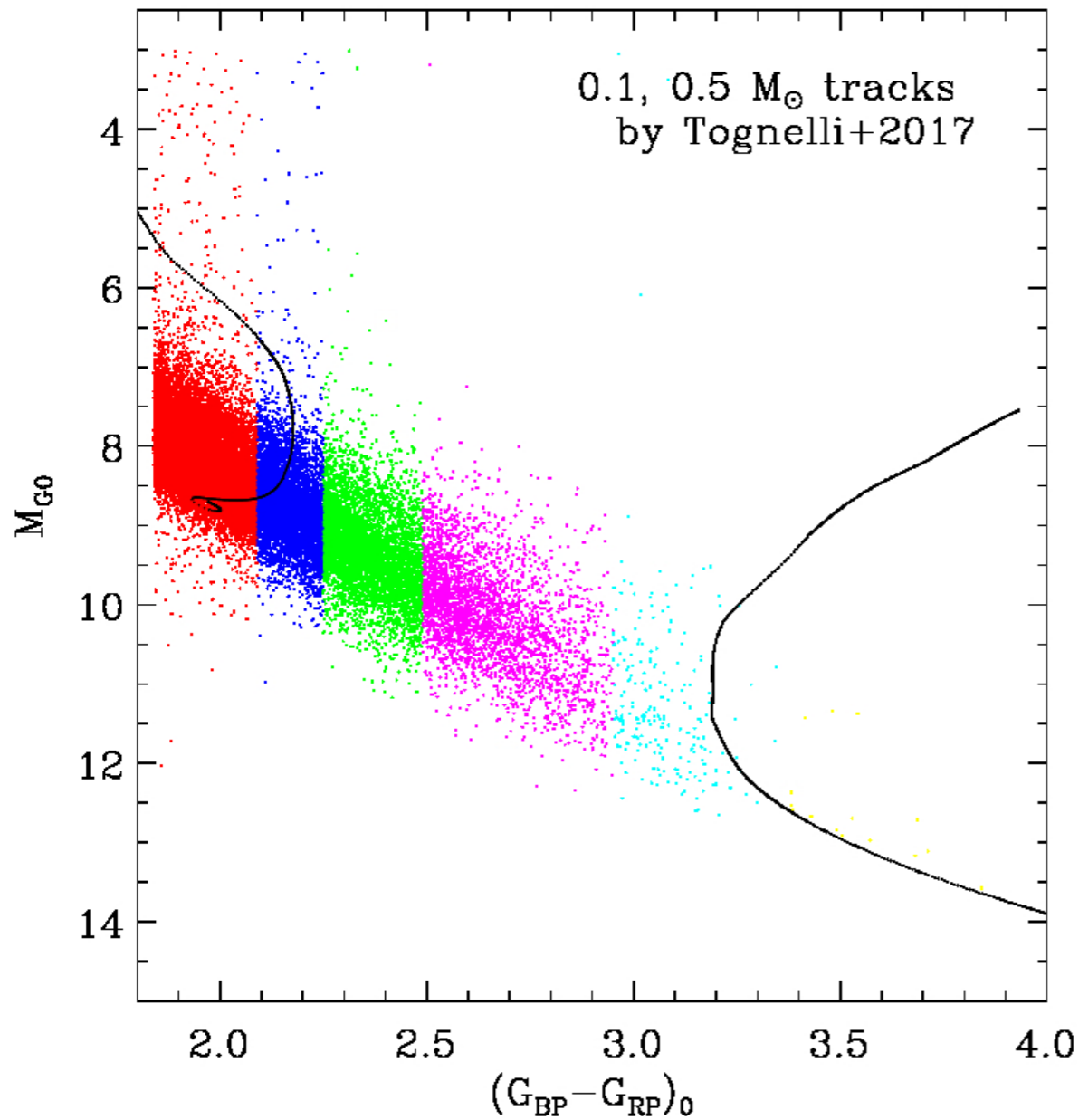
most of the sample 4 candidates fall in the M-dwarf locus



sample 4 candidate spatial distribution (NPF + SPF)



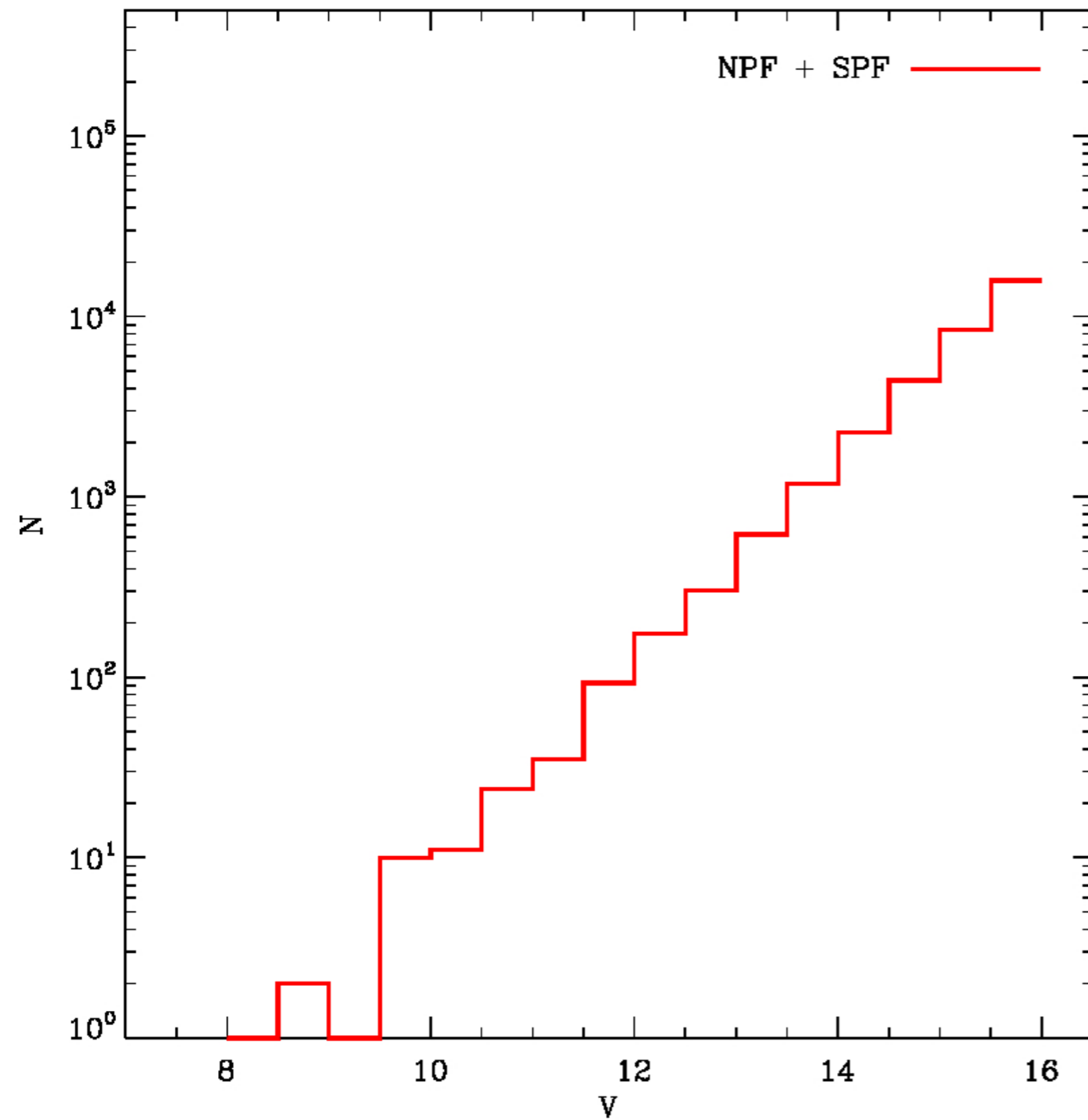
sample 4 candidate color & SpT distribution (NPF + SPF)



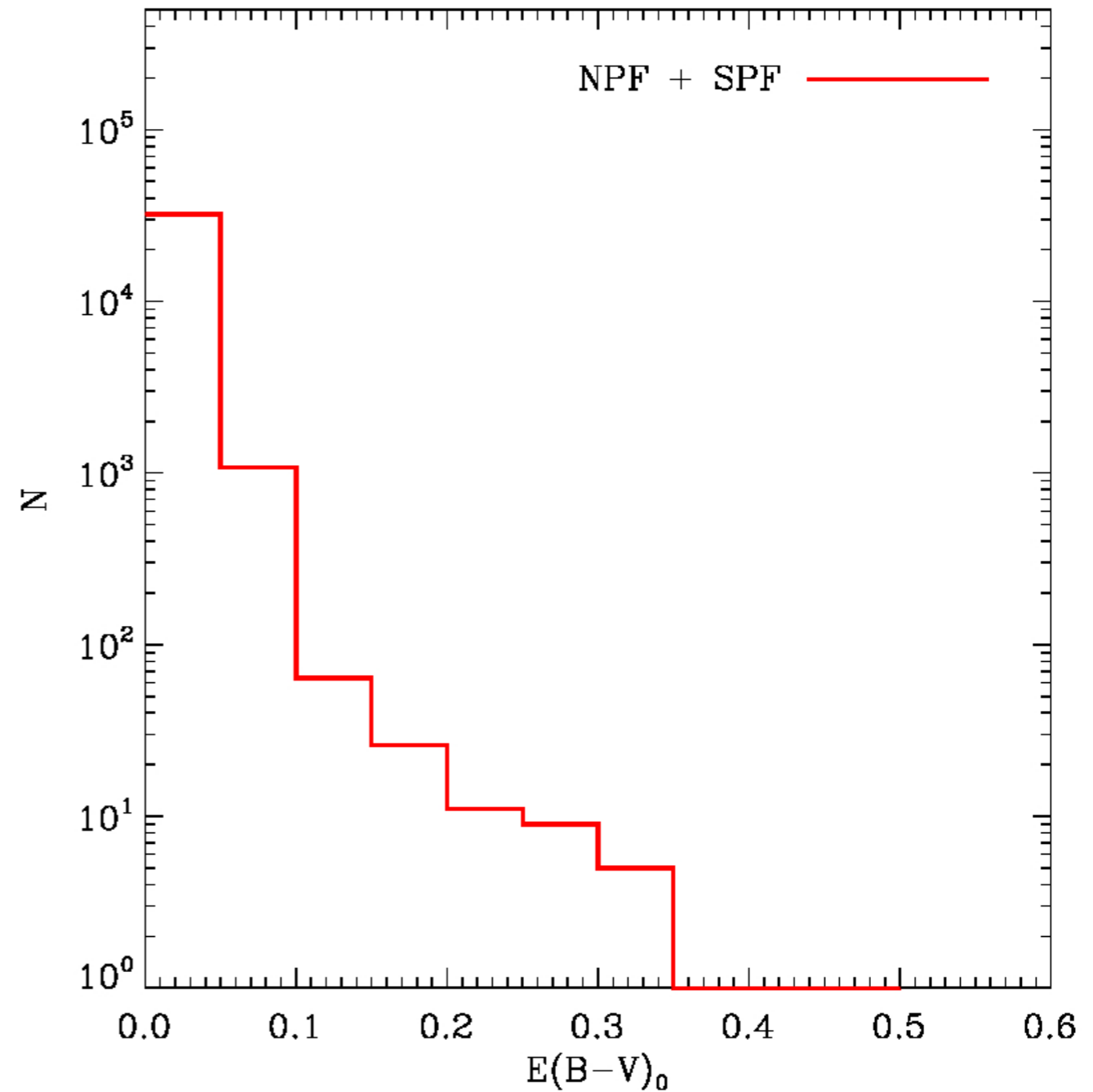
Spectral types and color conversions
from Pecaut & Mamajek (2013)

	Q1	Mean	Median	Q3
P4	1.93	2.12	2.05	2.26

Sample 4 candidate V mag & reddening distribution (NPF + SPF)



	Q1	Mean	Median	Q3
P4	14.93	15.23	15.46	15.77



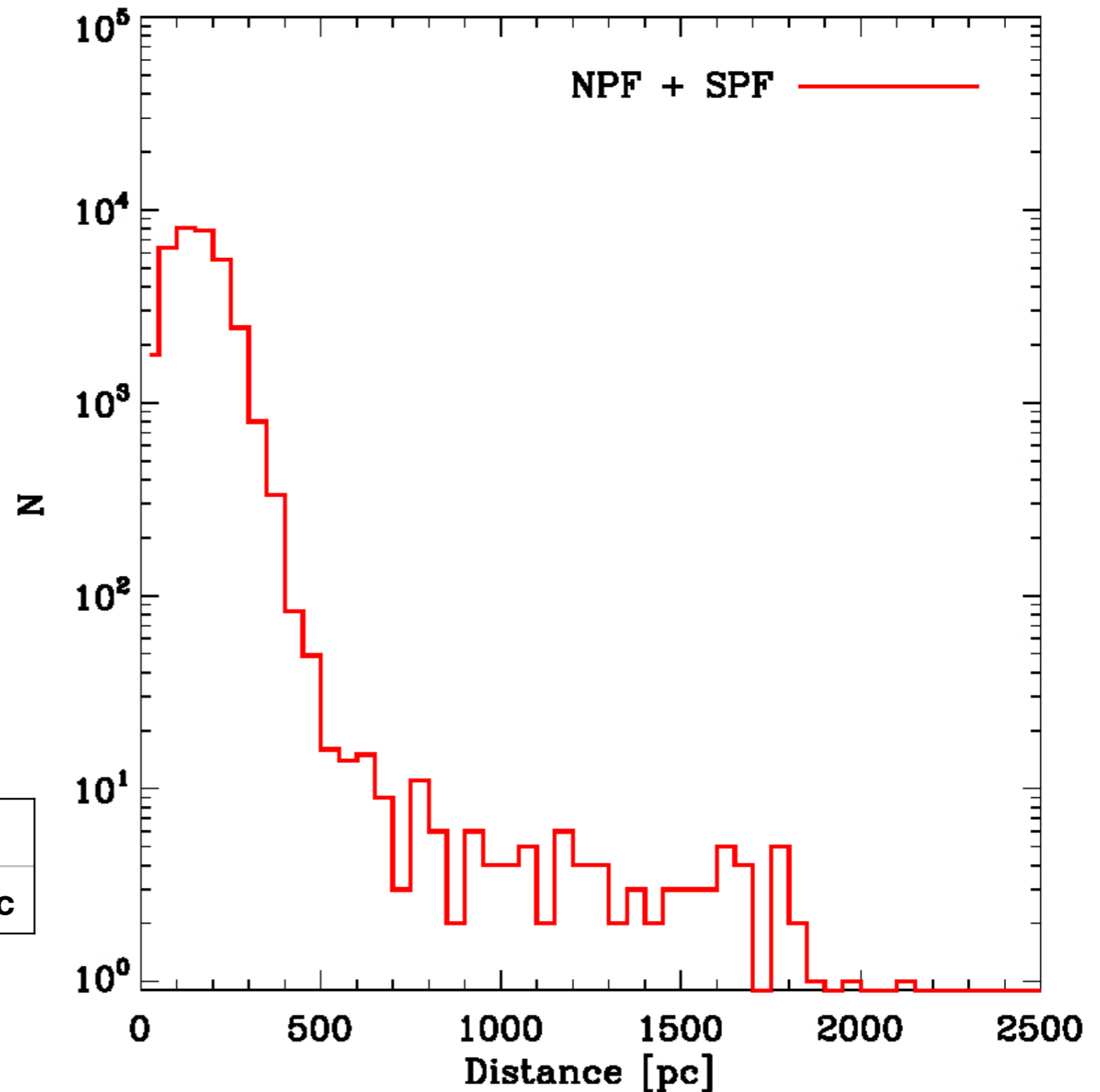
	Q1	Mean	Median	Q3
P4	0.002	0.013	0.009	0.019

sample 4 candidate distance distribution (NPF + SPF)



as expected
sample 4 candidates
in
NPF + SPF are
almost all
within 500 pc

	Q1	Mean	Median	Q3
P4	101 pc	161 pc	153 pc	207 pc



Summary



- Gaia DR2 data (+ 2MASS & PanSTARRS1 for tests)
- 3d map to derive individual $E(B-V)$ (see Montalto's talk)
- Johnson-Cousins vs. Gaia relationships derived using un-reddened standard stars down to spectral type M9V
- Selection criteria: $V < 16$ & $M_G > 3$ & $(G_{BP} - G_{RP})_0 > 1.84$
science requirement - dwarfs - SpT from M0 onward
- **sample 4 candidates in NPF + SPF compliant with science requirements**
- **Color-color diagrams with 2MASS and PanSTARRS1 confirm they fall in the M-dwarf locus**
- **Properties of sample 4 candidates are consistent with what expected for M-type stars in the solar vicinity**