NCCS-WYIN catalog analysis

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Preliminary

Thanks to J. Marriner, A. Stebbins, P. Timbie, G. Tucker, L. Robinthal and for observations and data reduction

1. The NCCS-WIYN catalog

2. Extinction effect

3. Understanding catalog magnitude and redshift distribution

4. Correlation function

5. Comparison with SDSS

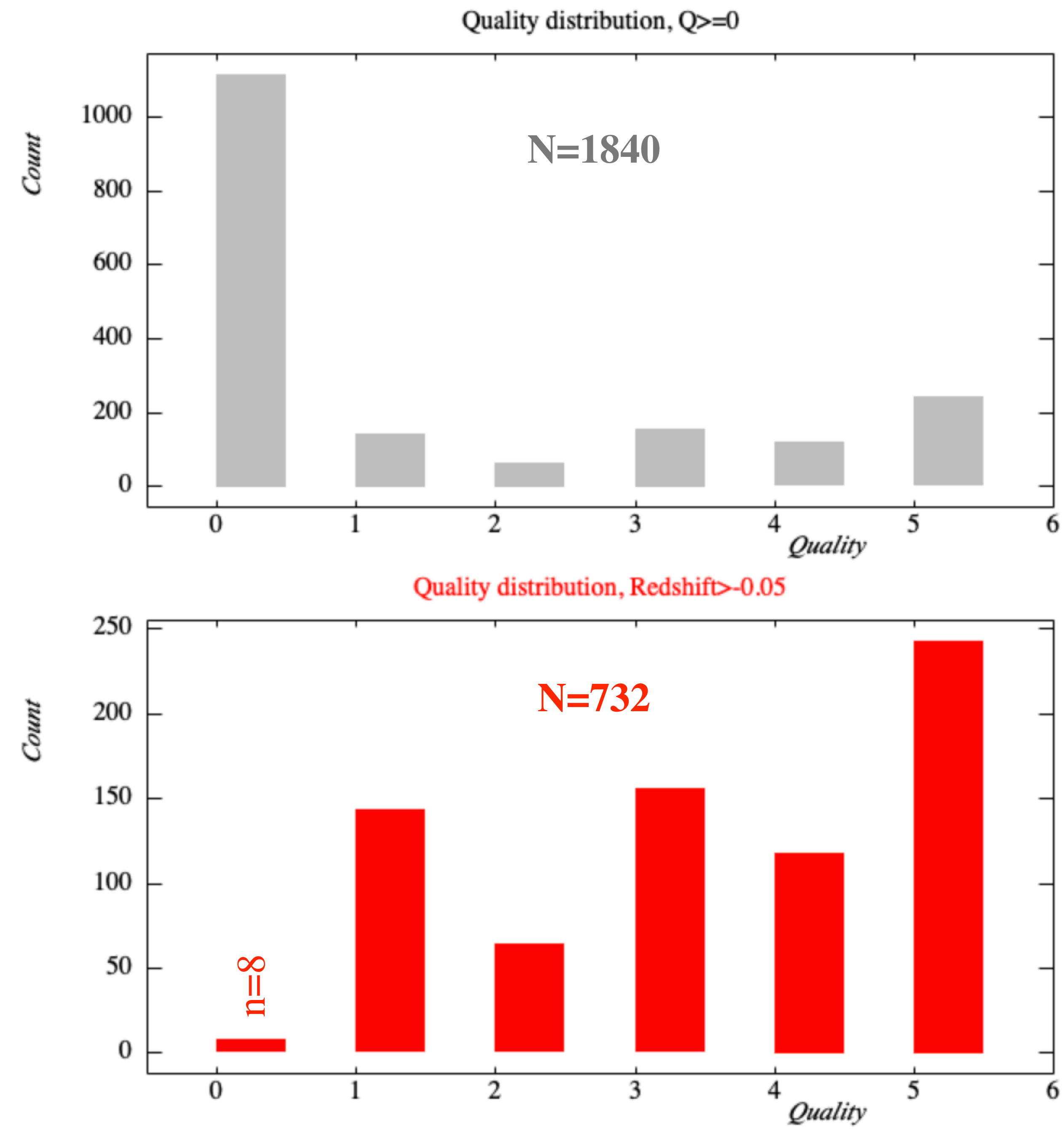
1. NCCS-WIYN spectroscopic catalog (I)

WIYN_summary_v4.txt

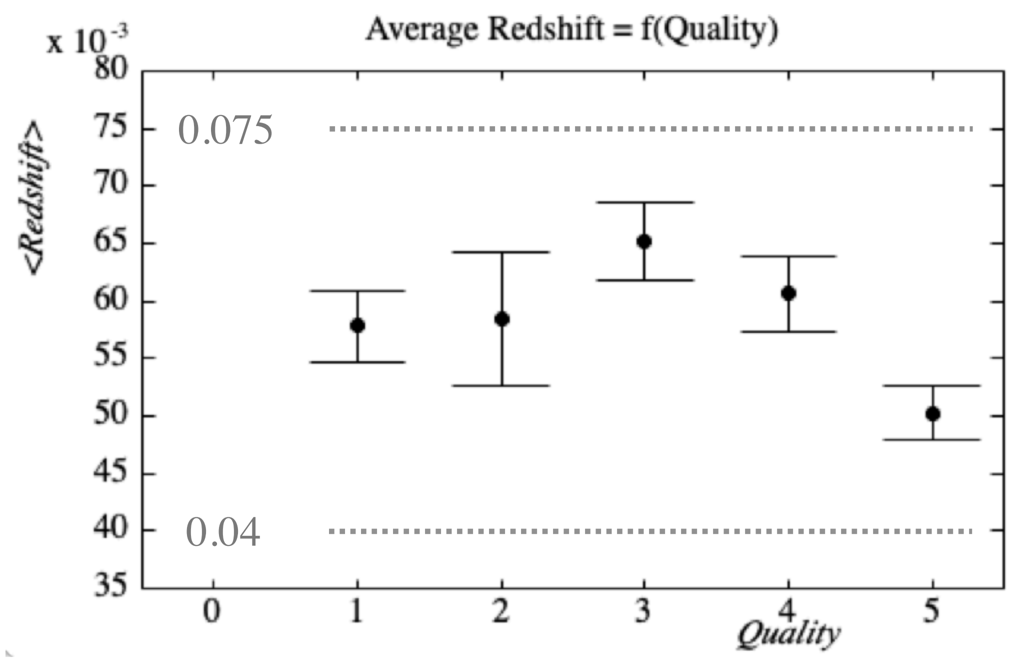
```
BaseDataTable: NVar= 18 NEnt= 2801 ( SegSize= 512  NbSegments= 6 )
-------------------------------------------------------------------------------
  i:           Name [Sz] (Typ) |        Min   |       Max   |          Units
-------------------------------------------------------------------------------
  0:          Tile      (  S) |          -  |          -  |
  1:       NCCS_ID      (  I) |         19  |    3751410  |
  2:        status      (  I) |          3  |          3  |
  3:            RA      (  D) |    0.23438  |    359.977  |
  4:           Dec      (  D) |    86.6001  |    89.8049  |
  5:          Vmag      (  D) |      9.147  |         19  |
  6:      err_Vmag      (  D) |      0.001  |      0.294  |
  7:          Rmag      (  D) |      7.496  |     21.309  |
  8:          Imag      (  D) |      6.442  |     19.781  |
  9:         VFWHM      (  D) |      0.811  |     22.352  |
 10:         RFWHM      (  D) |      1.137  |     33.467  |
 11:         IFWHM      (  D) |      0.904  |     52.286  |
 12:            fV      (  I) |          0  |          7  |
 13:            fR      (  I) |          0  |          7  |
 14:            fI      (  I) |          0  |          7  |
 15:          PESS      (  I) |          2  |          3  |
 16:       Quality      (  I) |        -99  |          5  |
 17:      Redshift      (  D) |         -1  |          1  |
-------------------------------------------------------------------------------
```

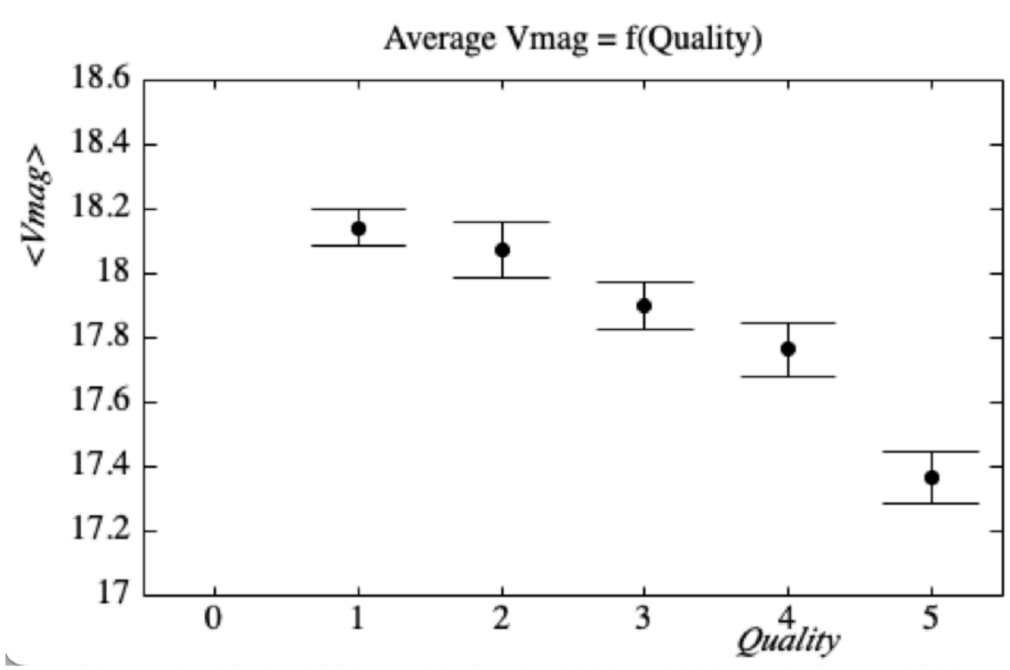
	Nb objects
All	2801
Q>=0	1840
Q>=1	724
Q>=2	581
Q>=5	243
Q>=0&&Redshift>-0.05	732
Q>0&&Redshift>0.005	623

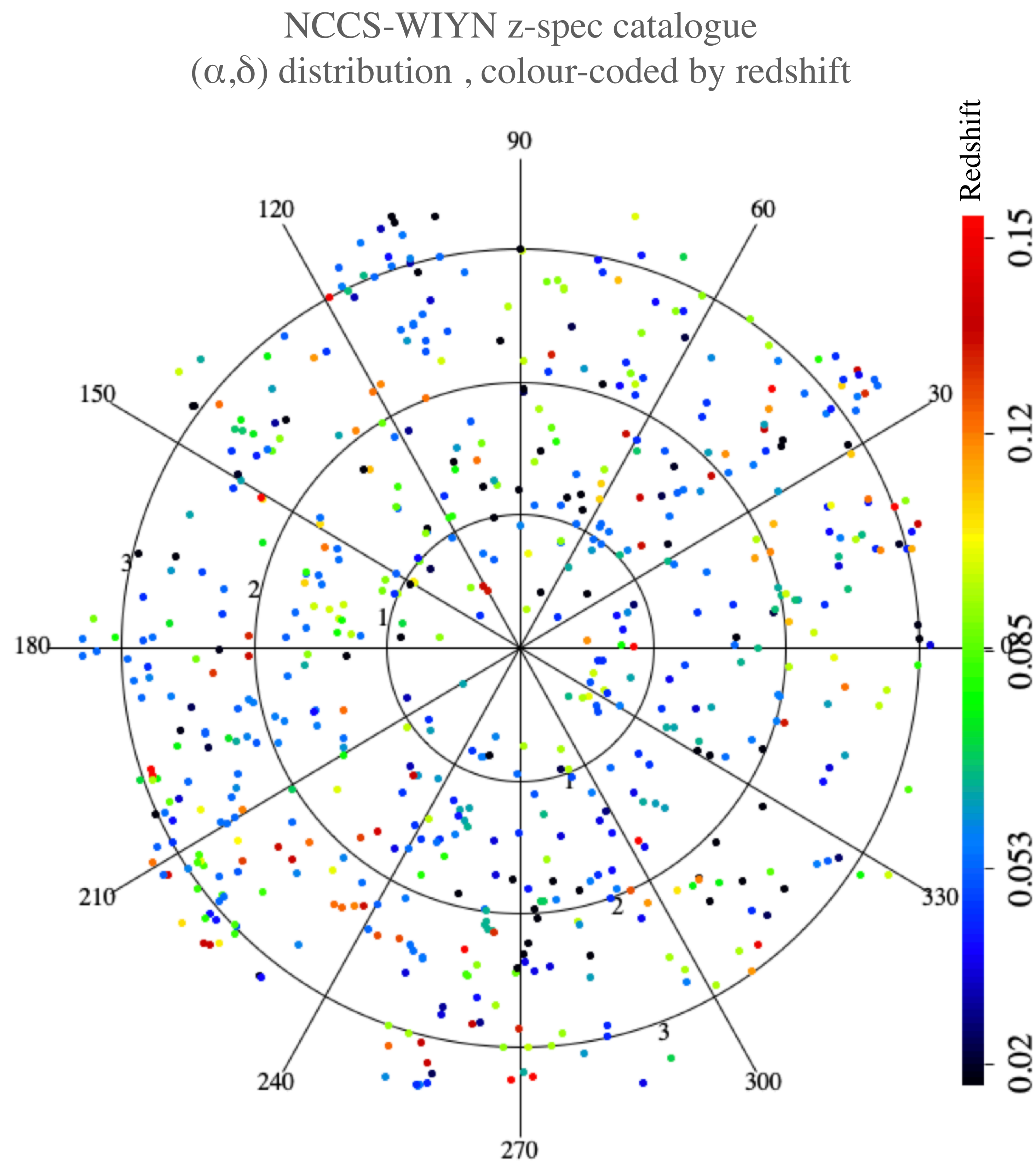
Quality distribution



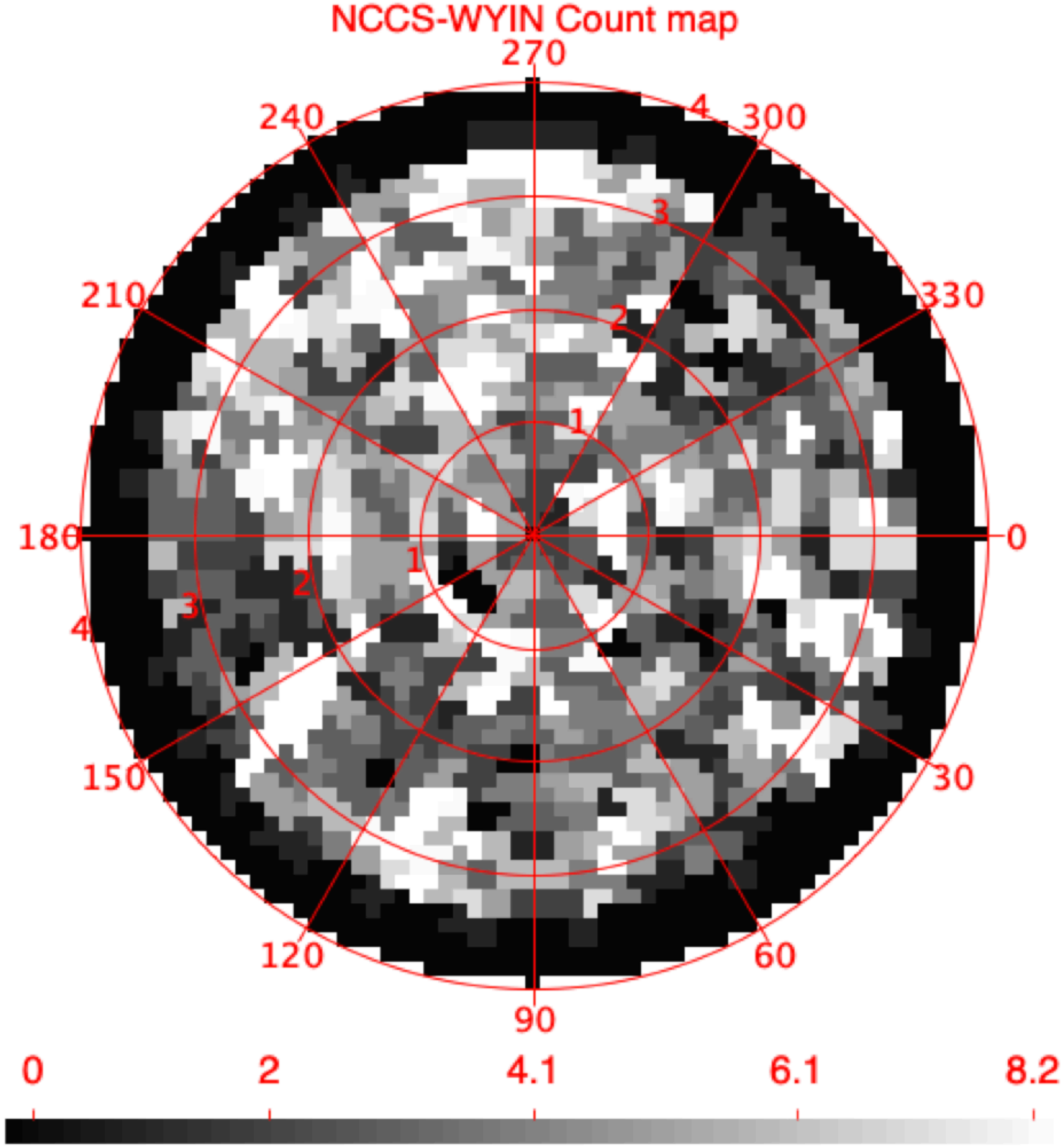
1. NCCS-WIYN spectroscopic catalog (II)

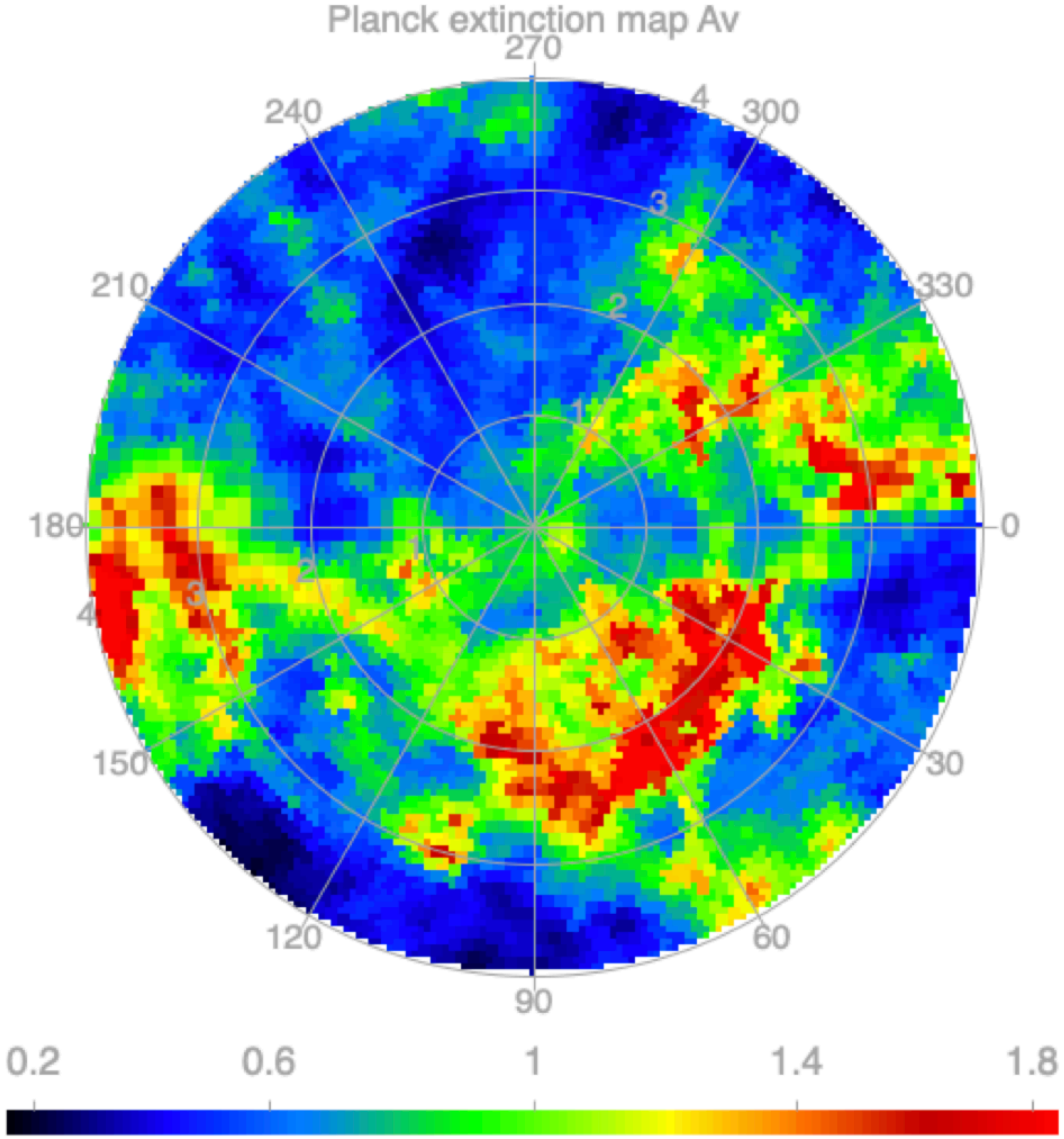






2. Impact of extinction (I)

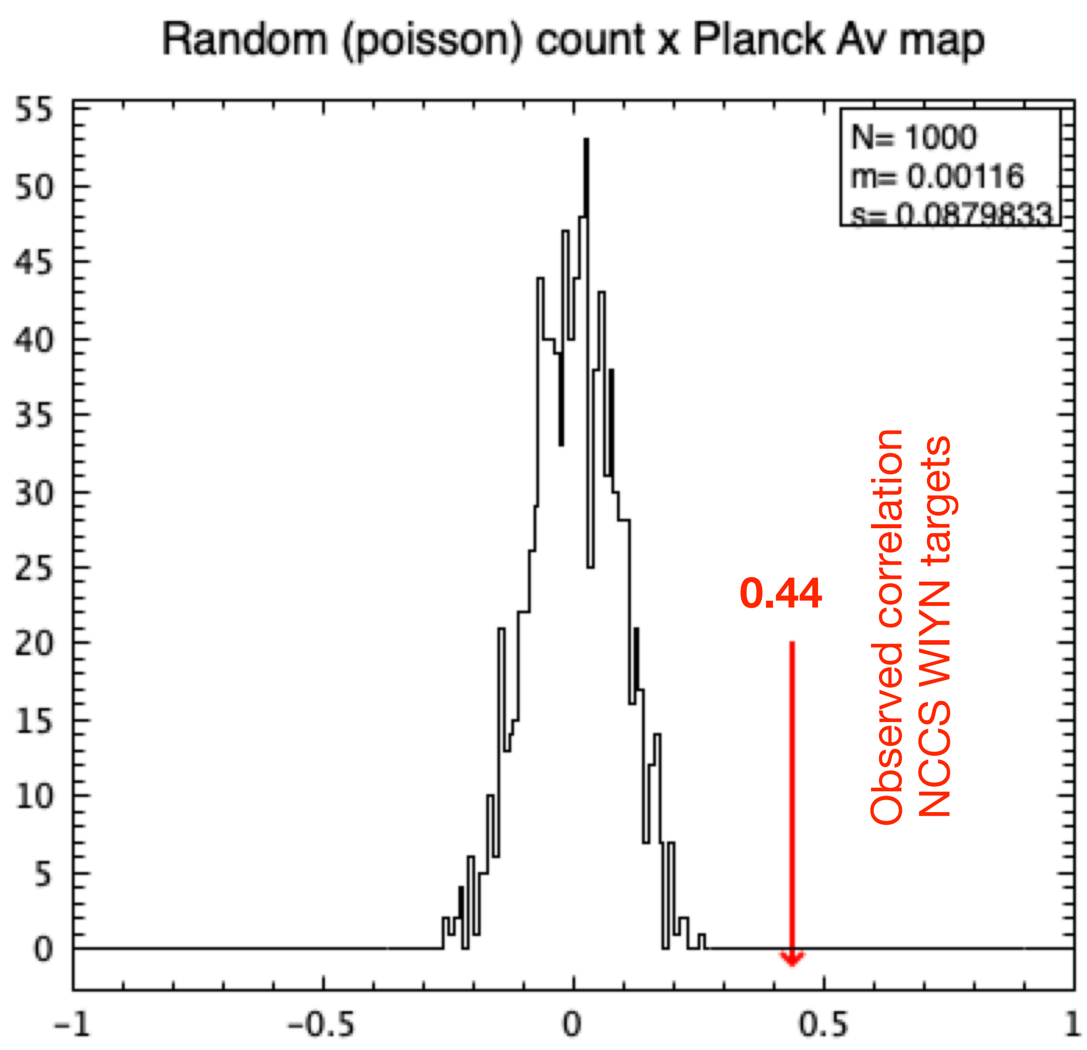


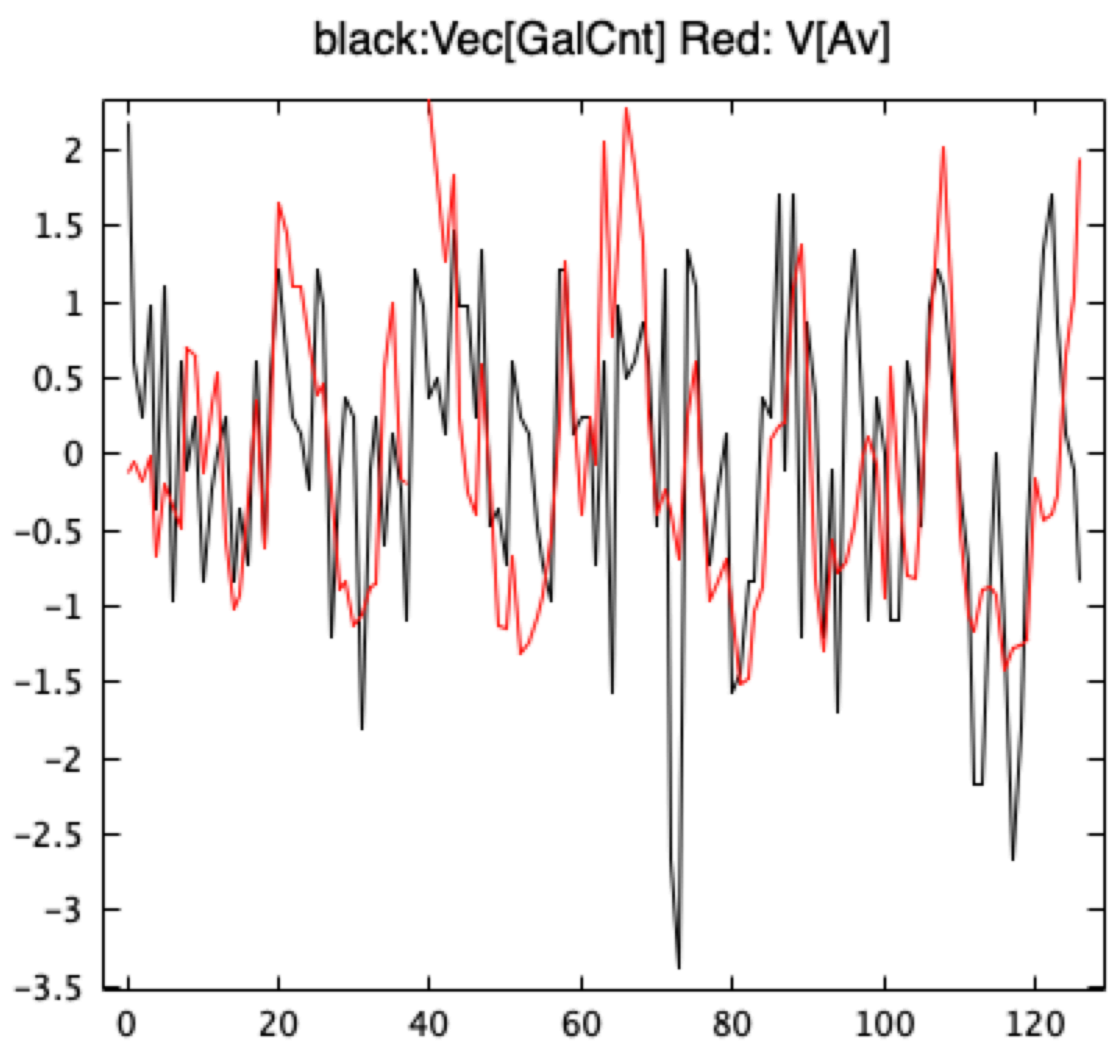


Some possible correlation visible

2. Impact of extinction (II)

NCCS WIYN tagets (ra,dec) distribution X Planck extinction Av map

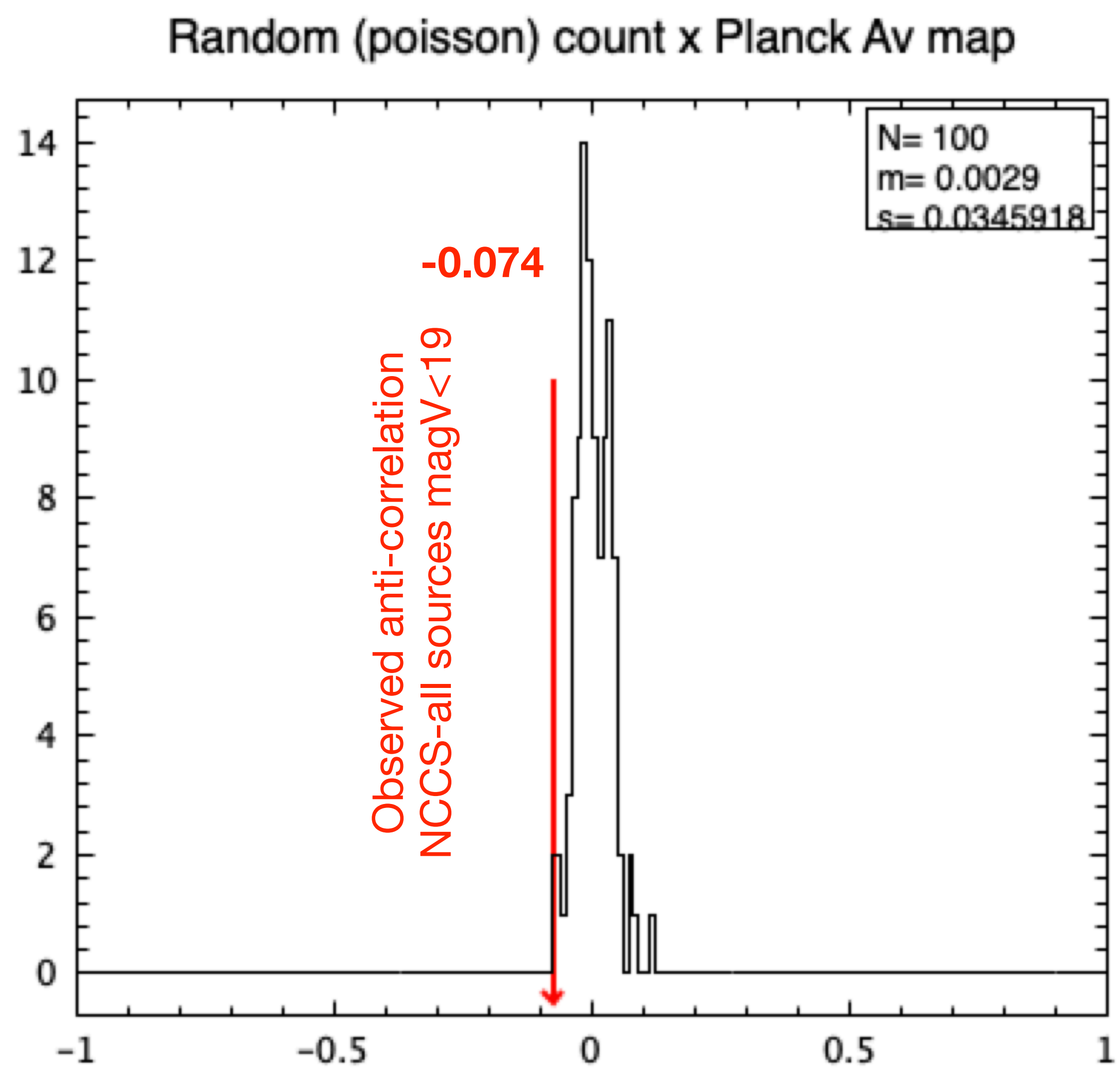


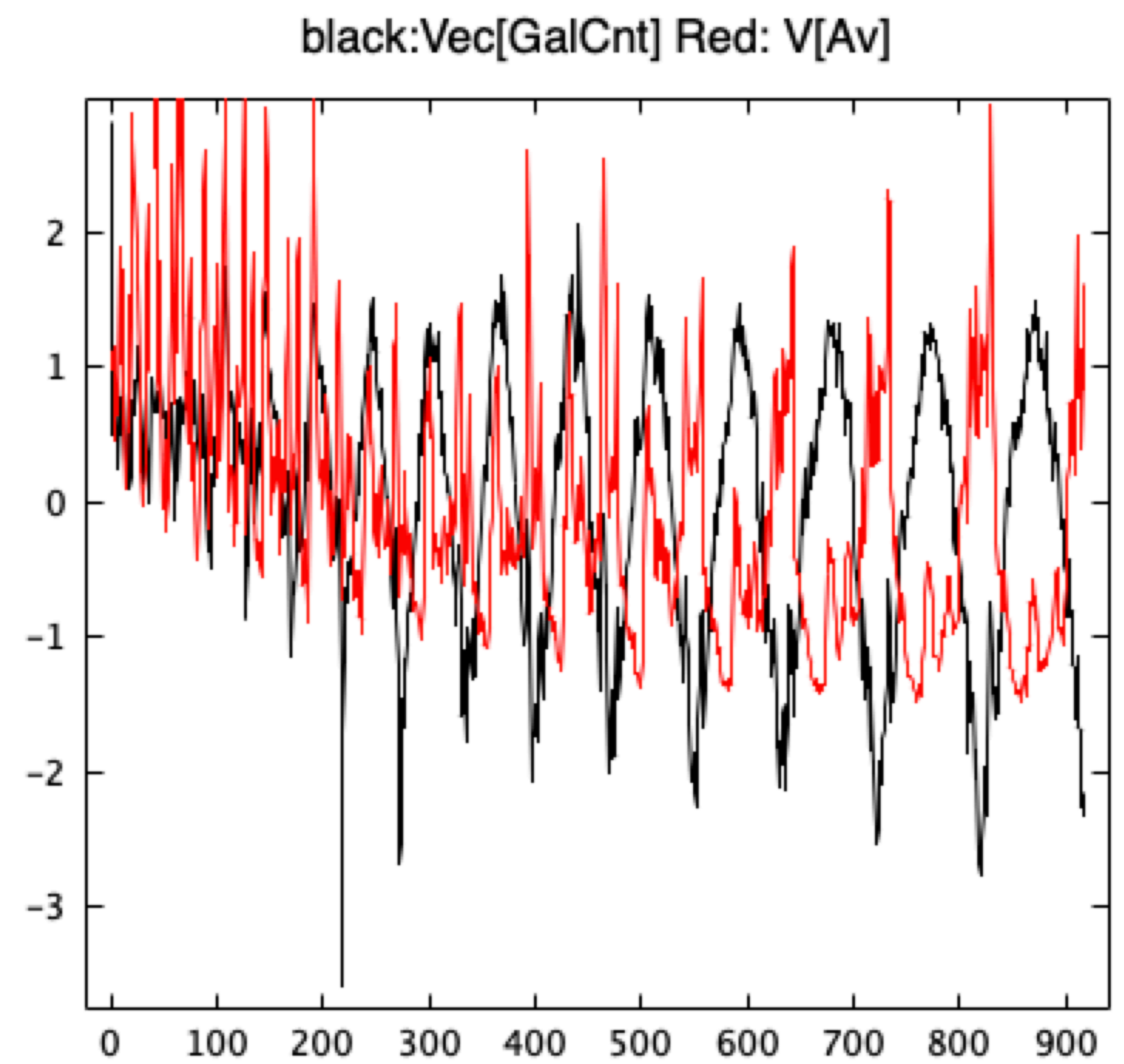


Significant value of the correlation is observed
(Note -GalCnt x Av to get positive correlation)

2. Impact of extinction (III)

NCCS ALL sources, magV<19 (ra,dec) distribution X Planck extinction Av map

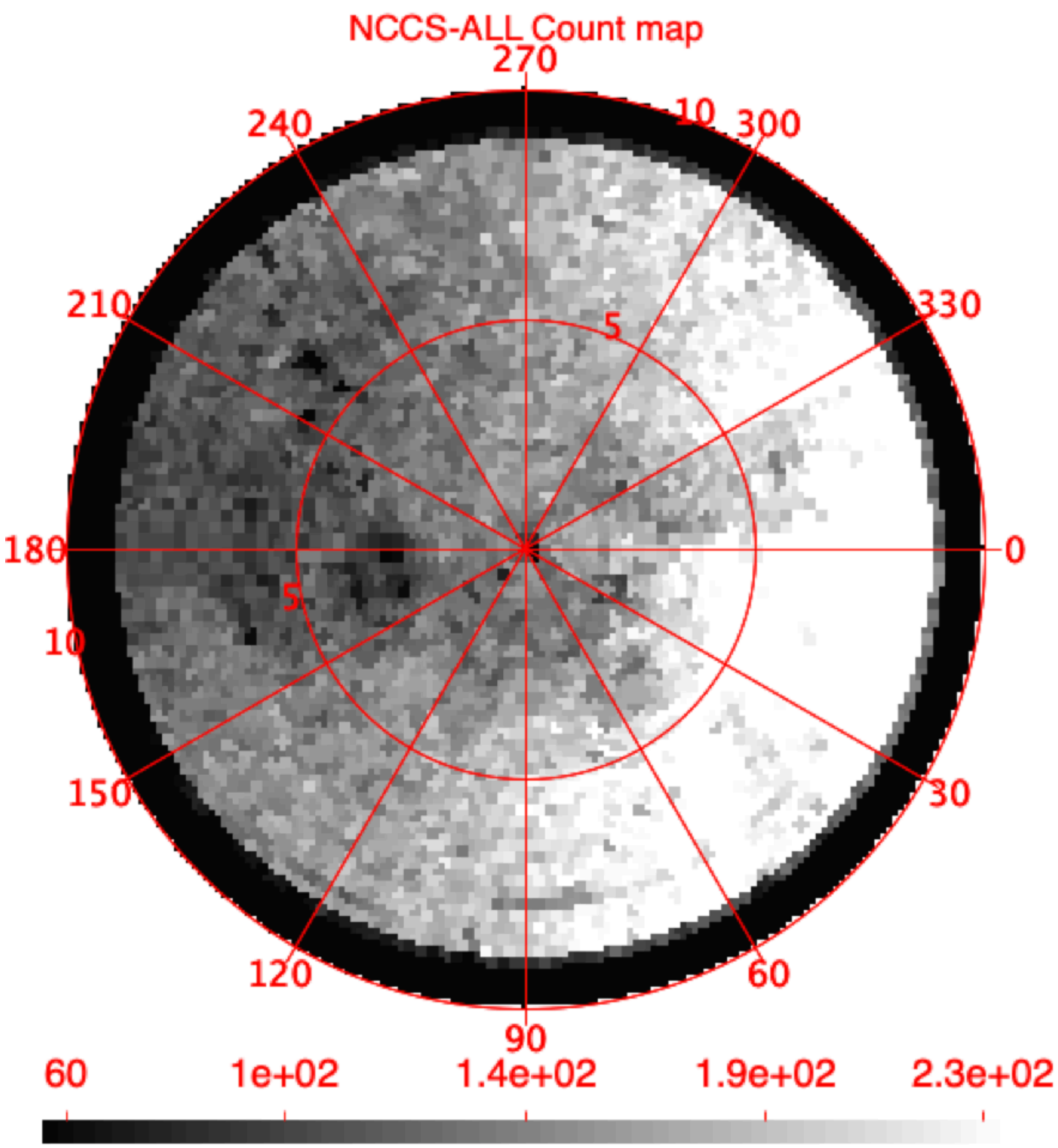


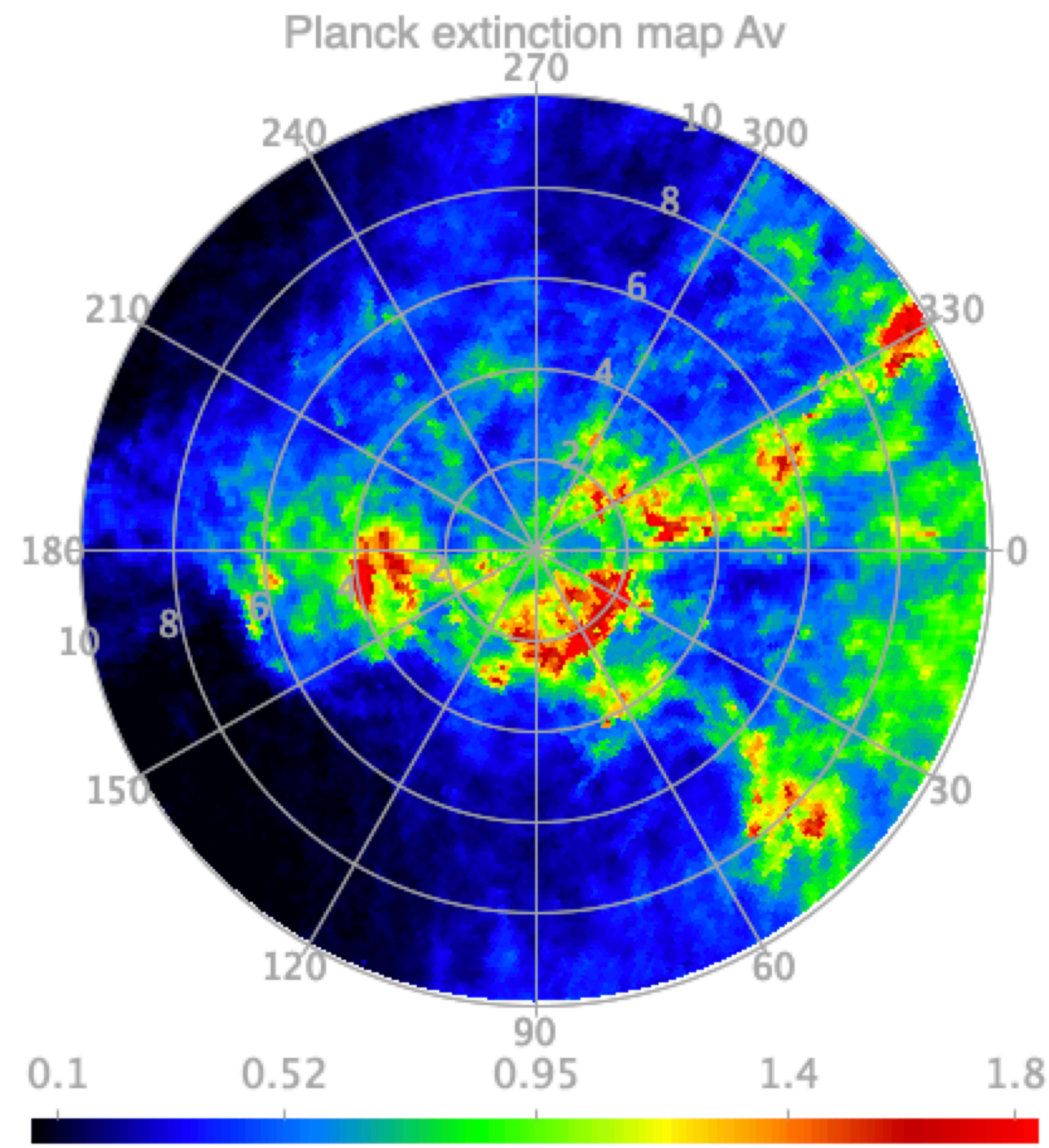


But a slight anti correlation is observed
for all NCCS sources (dec>81 deg, magV<19) !

2. Impact of extinction (IV)

NCCS ALL sources, magV<19 (ra,dec) distribution , Planck extinction Av map

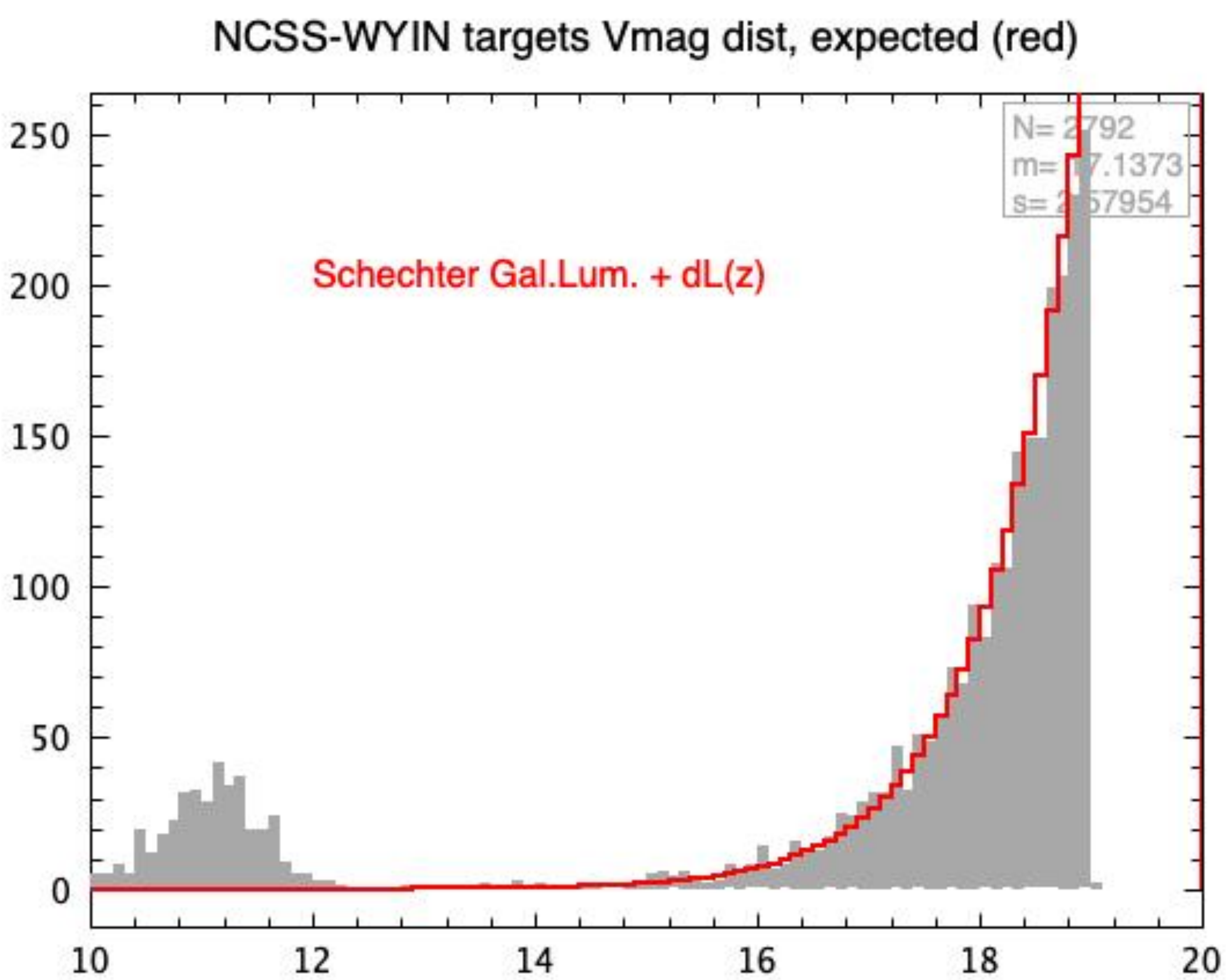




Anti correlation also visible ‘by eye’ !

3. Catalog magnitude distribution

Absolute number of galaxies over 27 sq.deg



Vmag distribution well reproduced by a Schechter Gal. Lum. Function with M*=-20.3, slope=-1.3 + cosmology (luminosity distance + volume element = f(redshift)
Schechter distribution renormalised

- Galaxy absolution magnitude distribution represented by a Schechter function
- Apparent magnitude distribution for each redshift obtained by applying distance module
- Cumulative apparent magnitude obtained by integrating volume weighting app-mag distribution up to redshift z=0.5
- NGal obtained by integrating app-mag up to m=18, 18.5 and 19
- NGalxEff is the galaxy count weighted by the redshift efficiency function

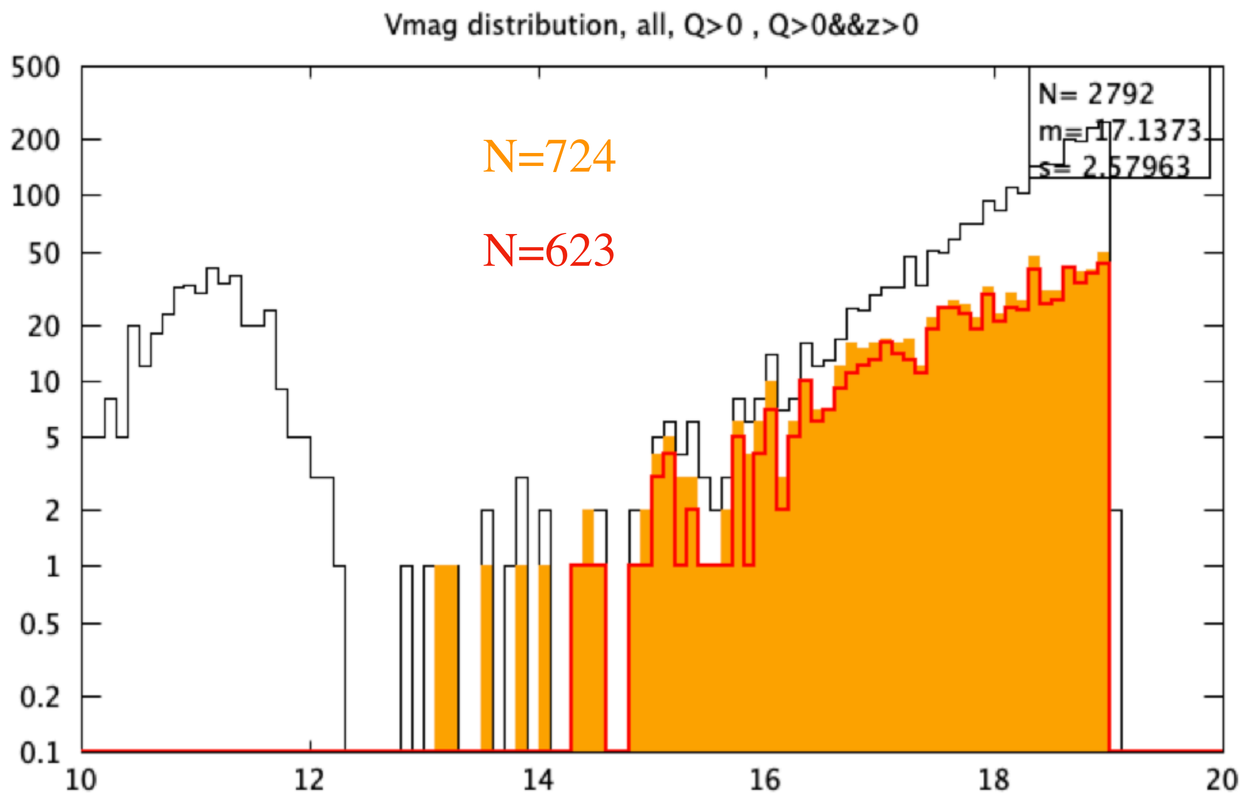
	NGal	NGalxEff
Vmag<18	1930	850
Vmag<18.5	3600	1220
Vmag<19	7500	1710
	# targets	# spec-z

Redshift finding efficiency function $\eta(m_V)$:

$$\eta(m_V) = \frac{1}{1+\exp(a(m_V - m^*))}$$

With : $m^* = 17$, $a = 1$

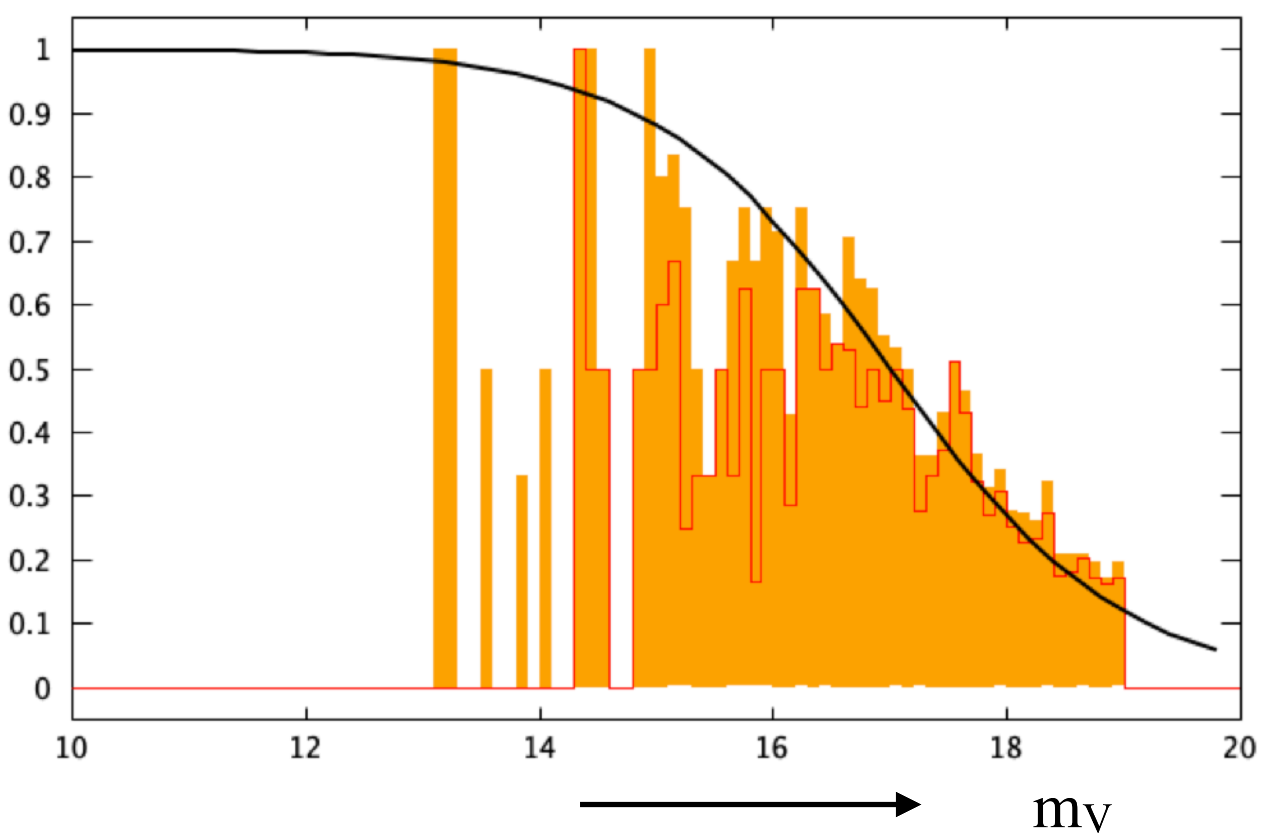
3. Magnitude distribution, redshift finding efficiency



NCCS target m_V distribution

m_V for Q>=1

m_V for Q>=1 && z>0



Ratio Q>=1 / all = f(m_V)

Ratio Q>=1&&z>0 / all = f(m_V)

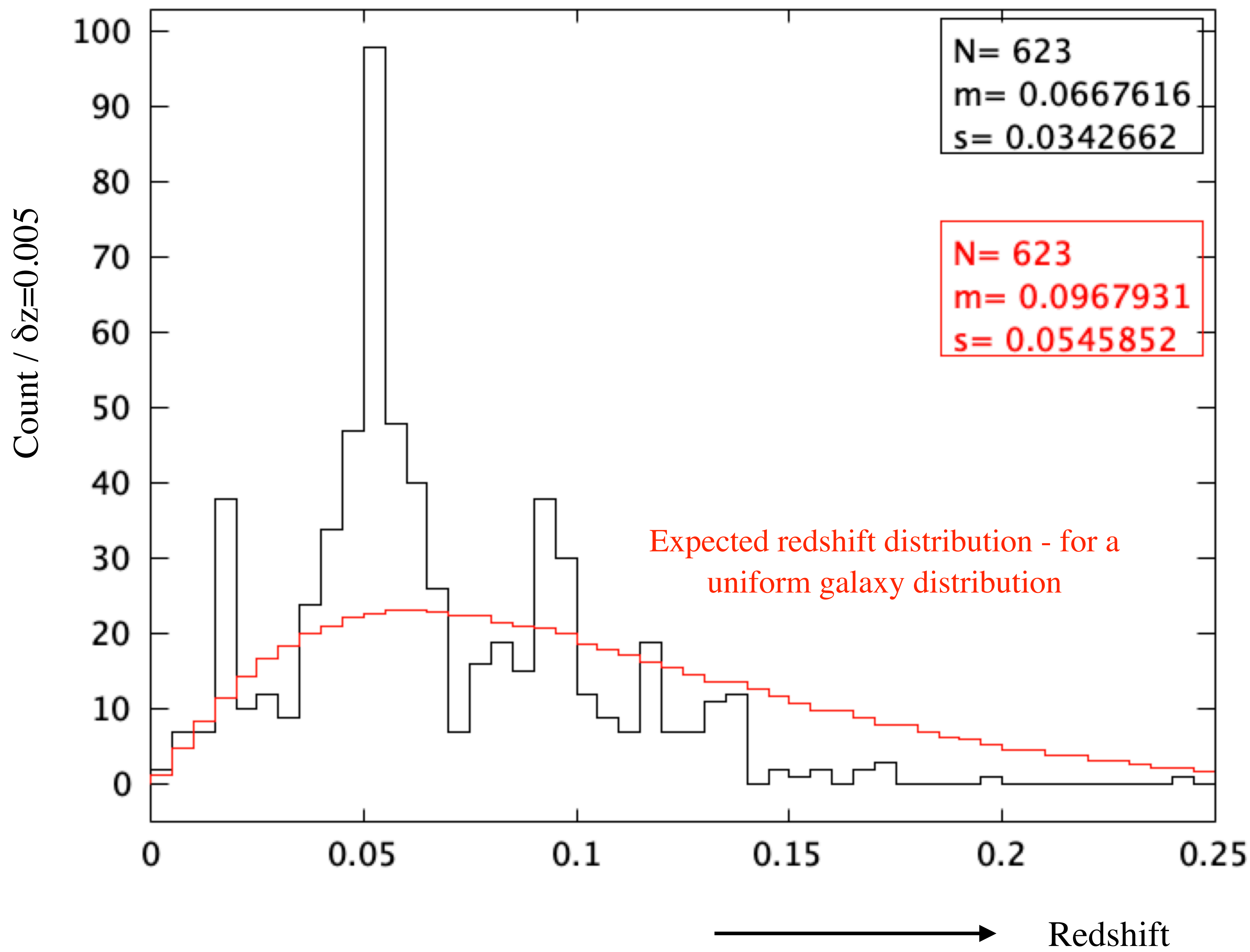
Redshift finding efficiency

$$\eta(m_V) = \frac{1}{1+\exp\left(a(m_V - m^*)\right)}$$

$$m^* = 17; a = 1$$

$$\eta(m_V) = \frac{1}{1+\exp\left(m_V - 17\right)}$$

2. Redshift distribution



4. Correlation function

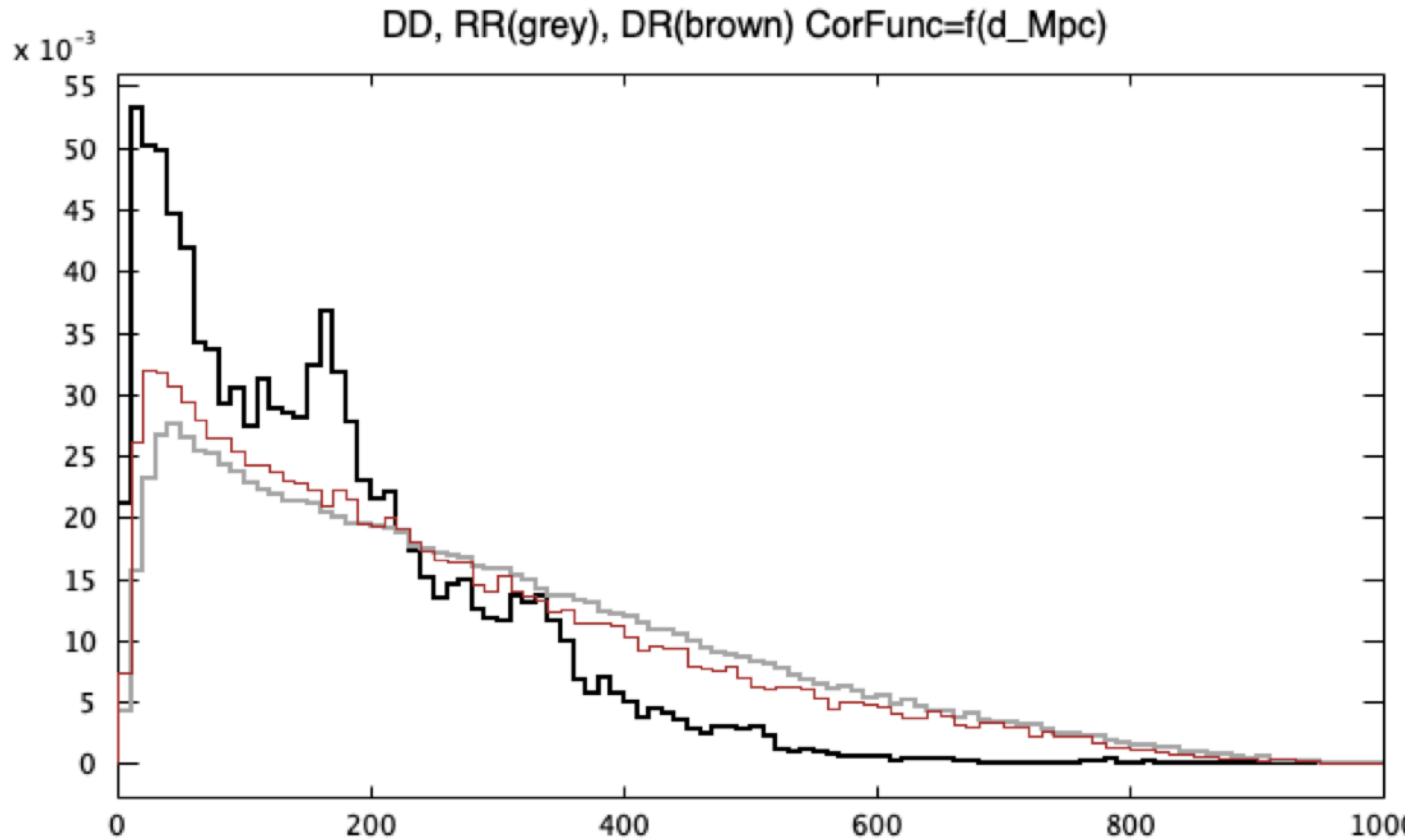
Data auto-correlation function DD

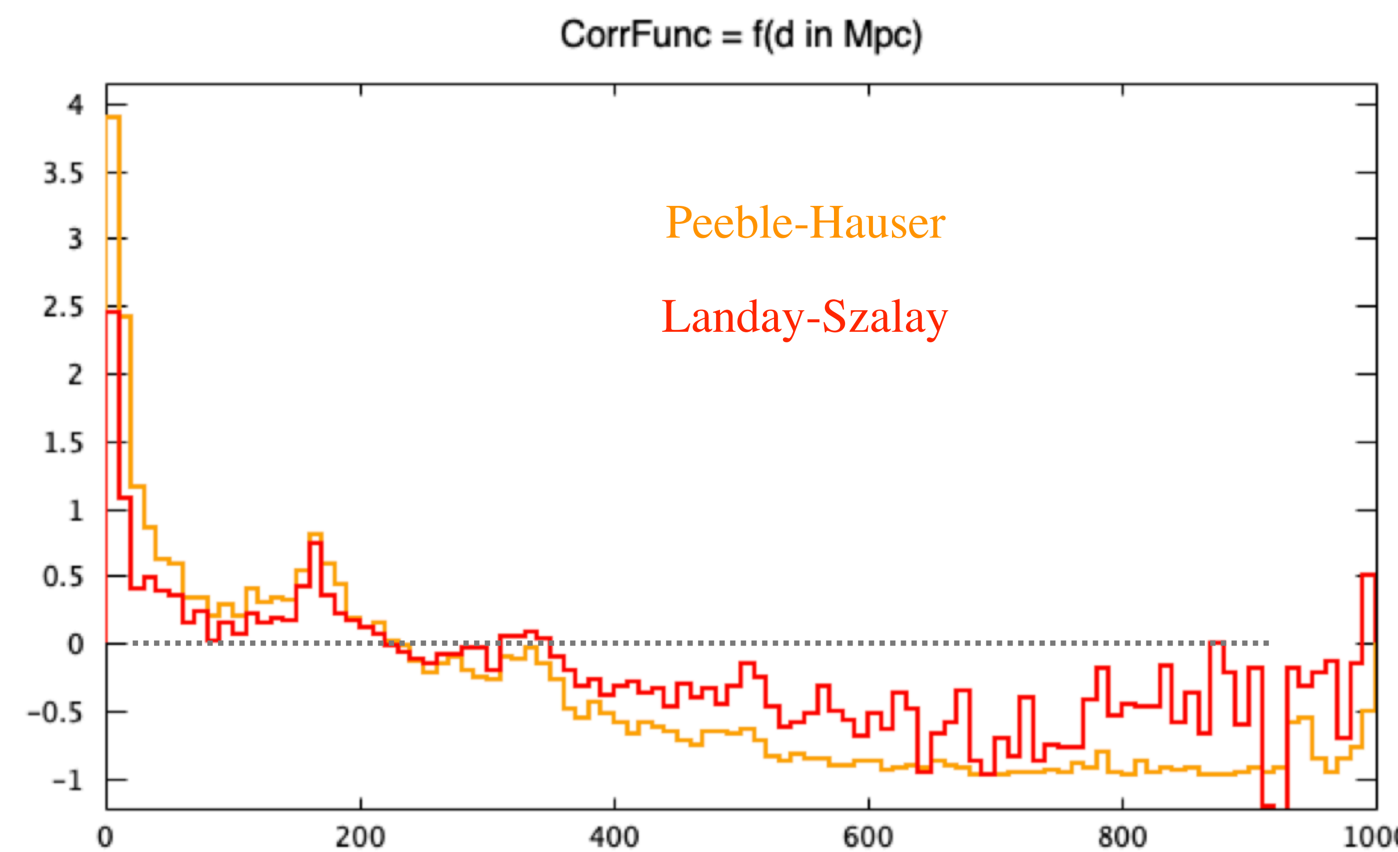
Random catalog auto-correlation RR

Data x random cross-correlation DR

$$f_{PB}(d) = \frac{DD}{RR} - 1$$

$$f_{LSz}(d) = \frac{DD - 2DR + RR}{RR}$$





d_{sep} (Mpc)

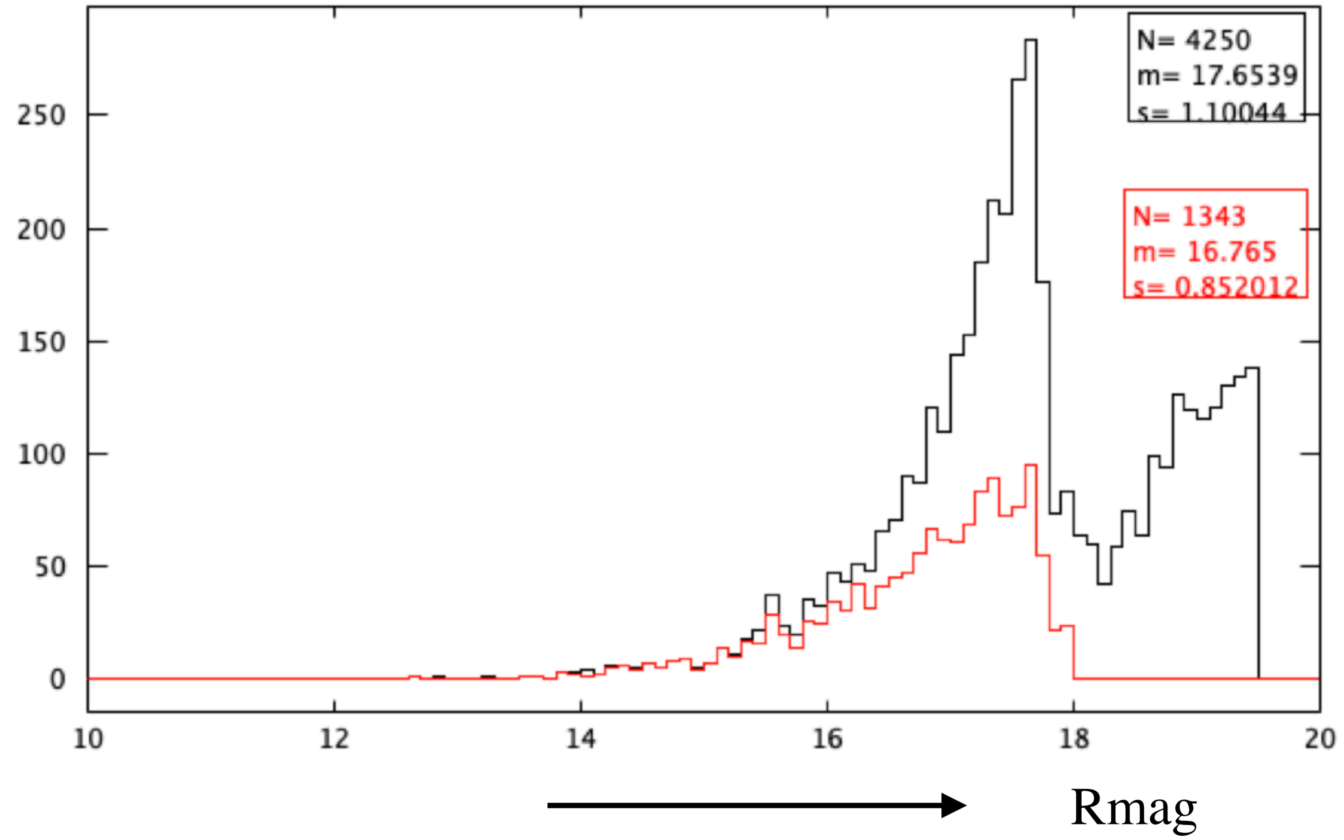
Check with SDSS

Extract galaxies from SDSS , in a 3.5 deg. radius around a reference point , Rmag<18

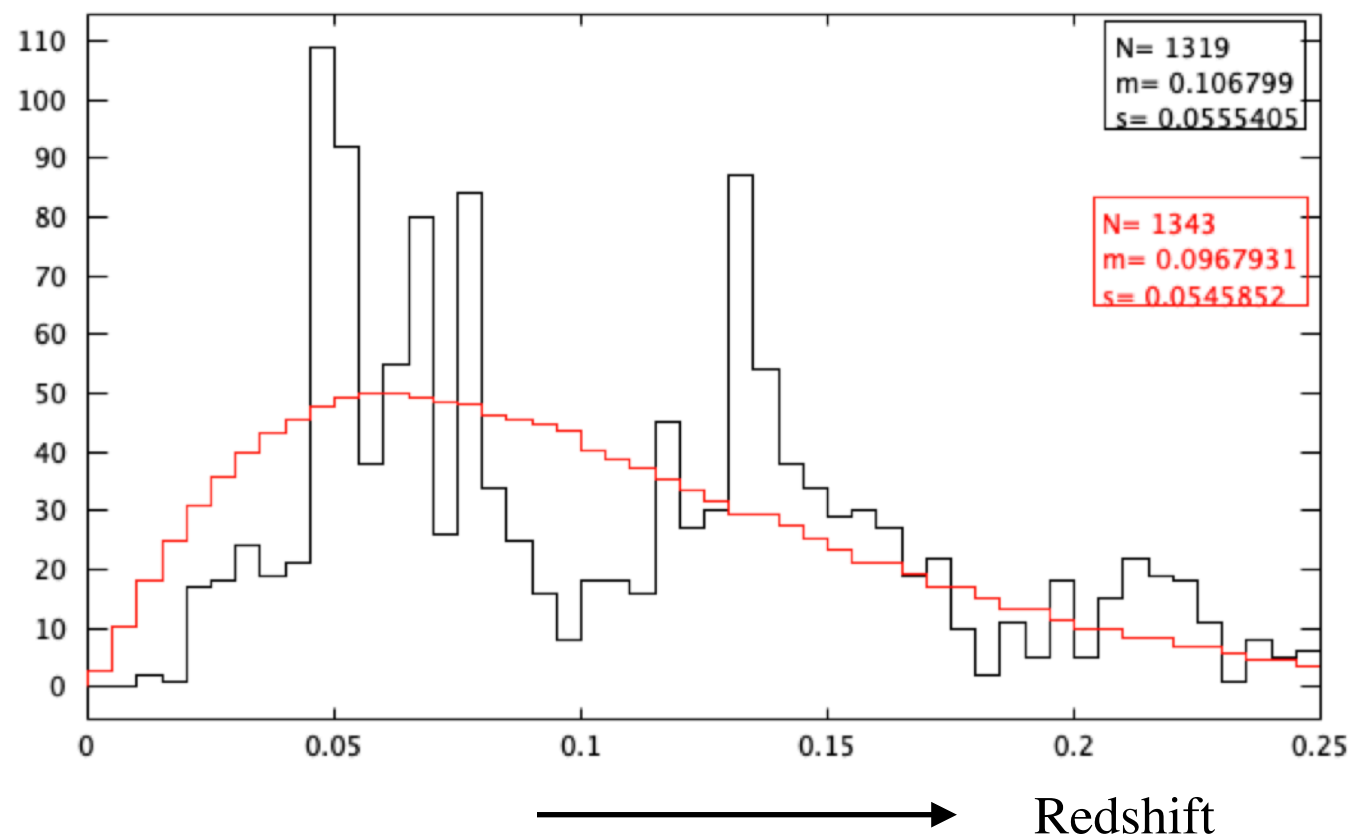
5.1 SDSS - Magnitude and redshift distribution

All within 3.5 degree of (ra,dec)=(150,50)
4250 galaxies (SDSS) to be compared to 2800 NCCS target galaxies

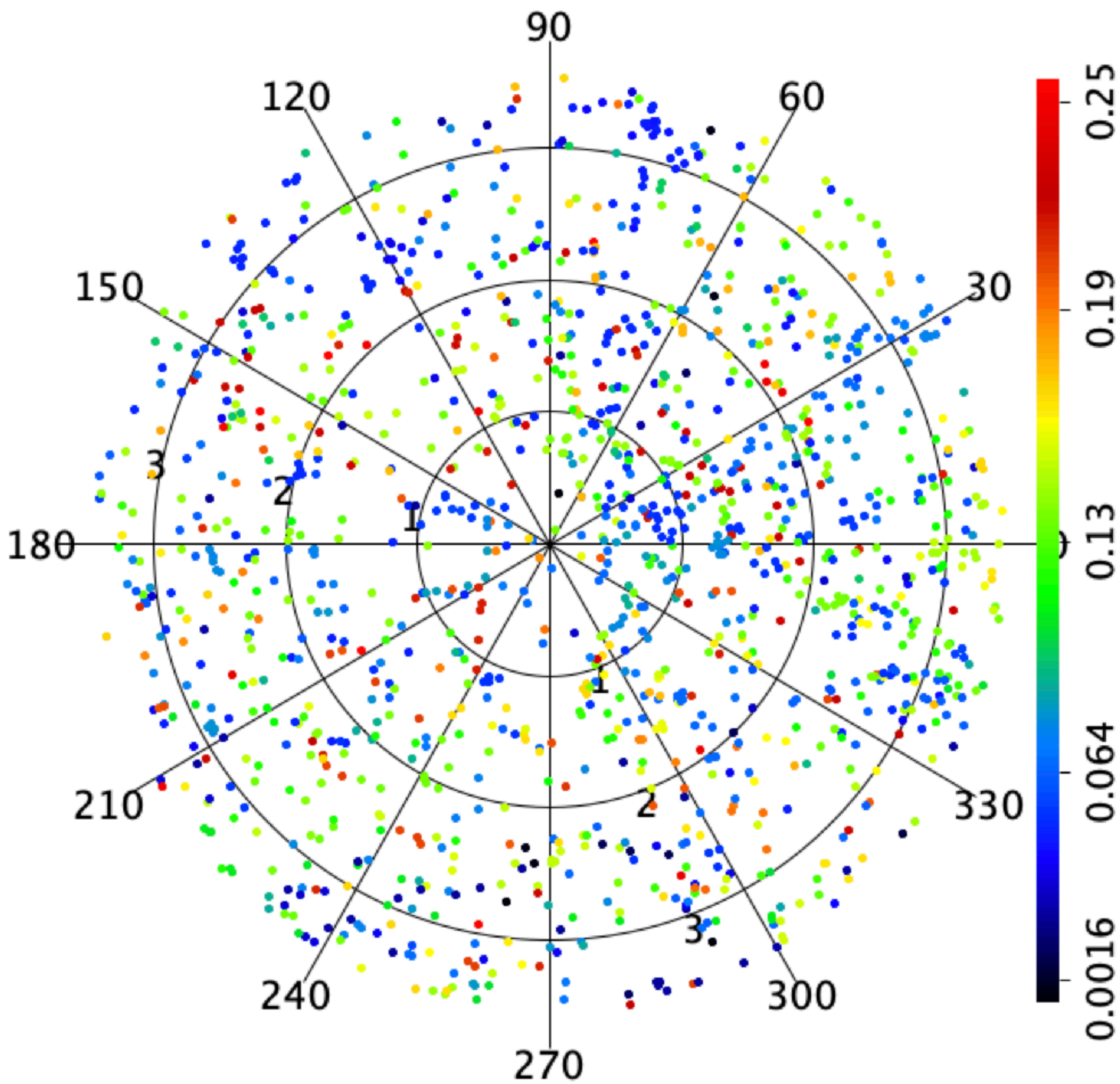
After efficiency application and magnitude <18 cut
1343 galaxies (SDSS) to be compared with 630 NCCS-WIYN with z-spec



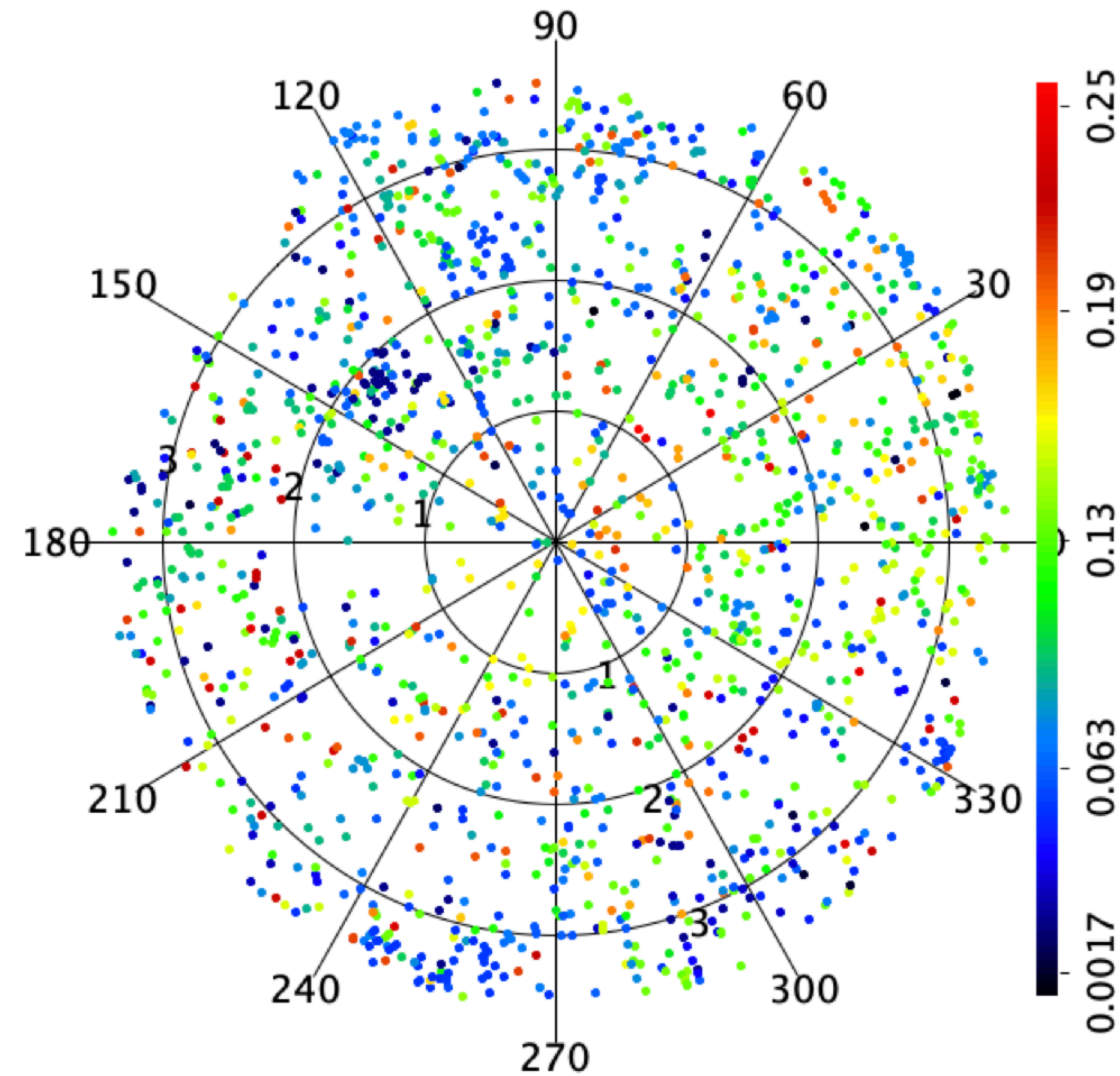
Expected redshift distribution for a uniform galaxy catalogue



5.2 SDSS selected galaxies (ra,dec) distribution, rotated toward north pole

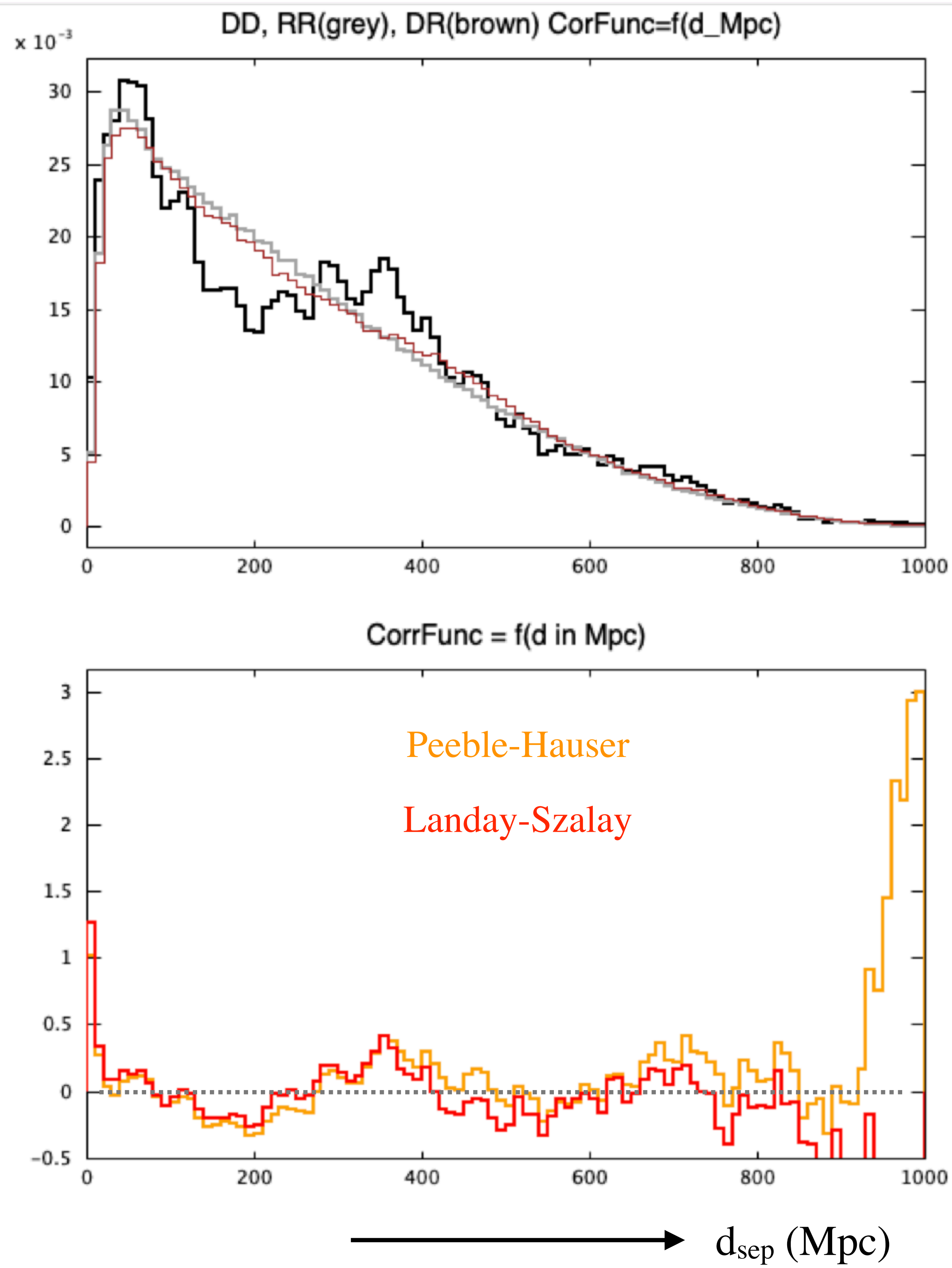


Centered on (ra,dec)=(150,50)

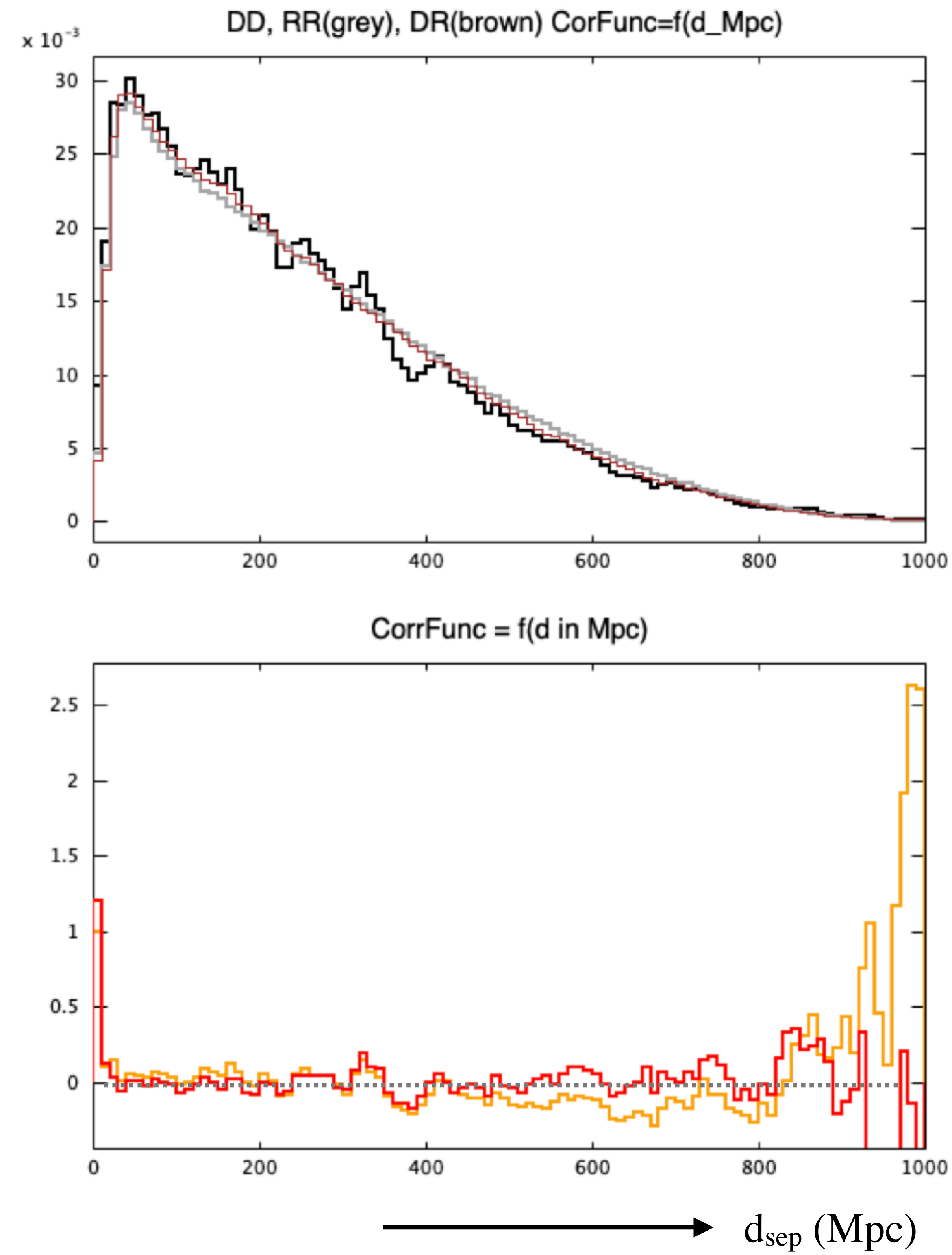


Centered on (ra,dec)=(120,49)

5.2 SDSS selected galaxies correlation function

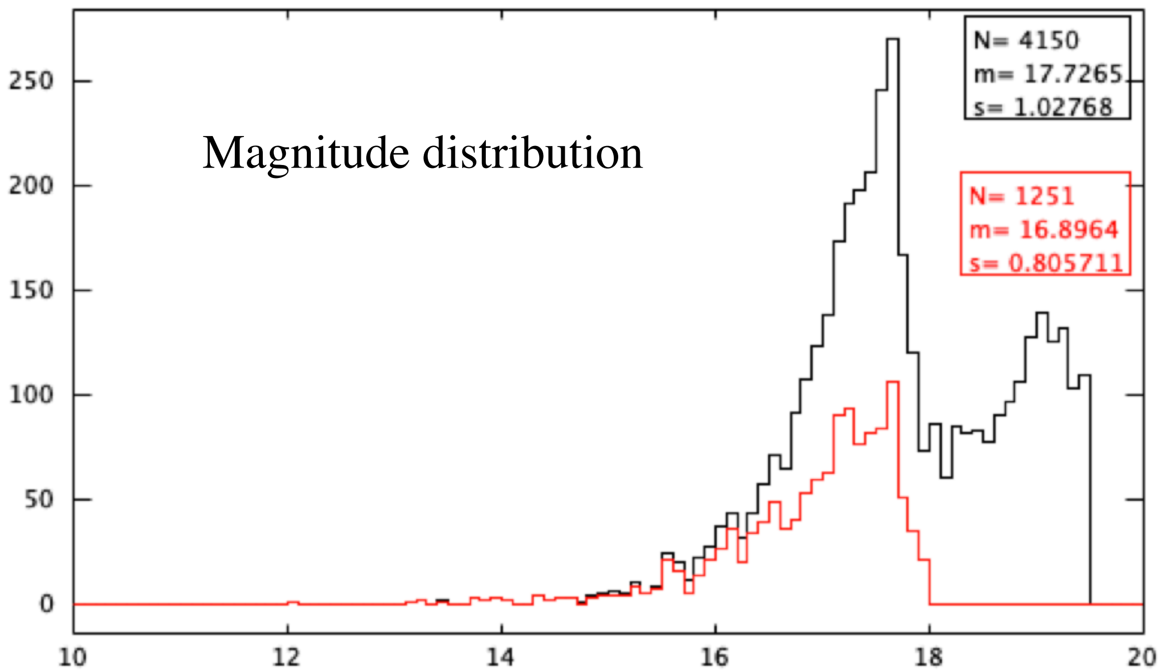


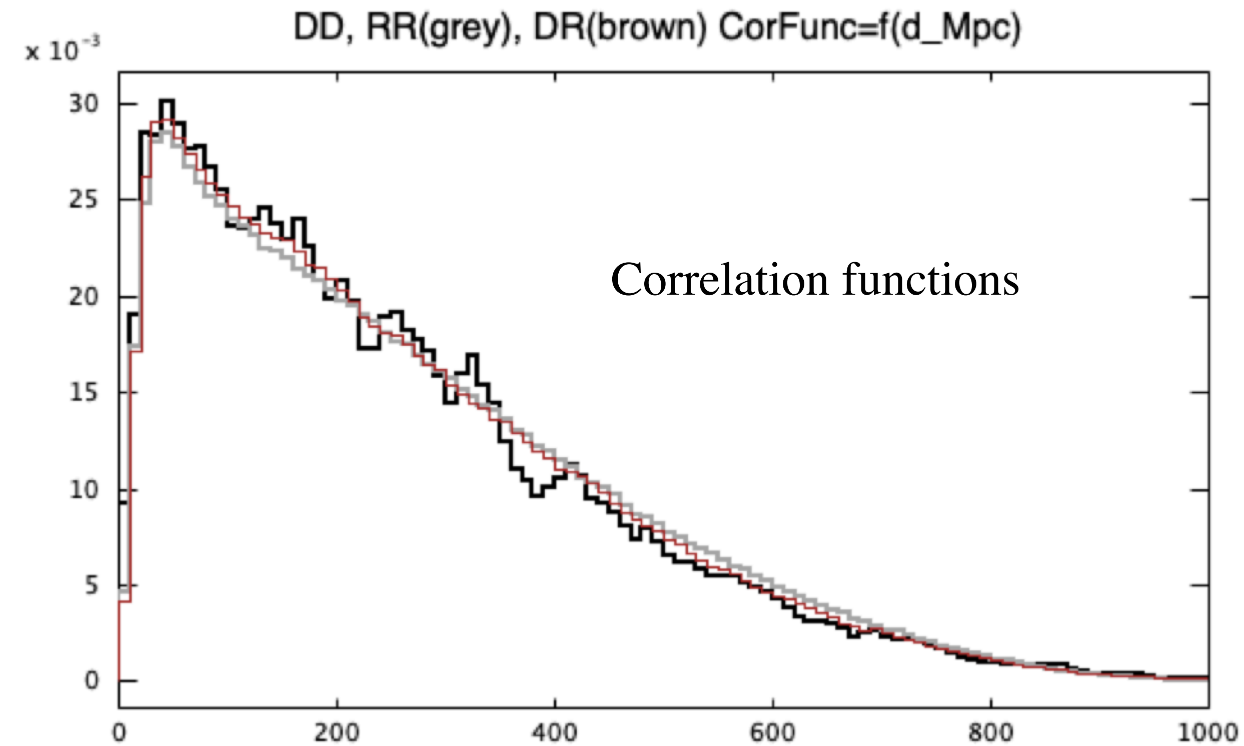
Centered on (ra,dec)=(150,50)

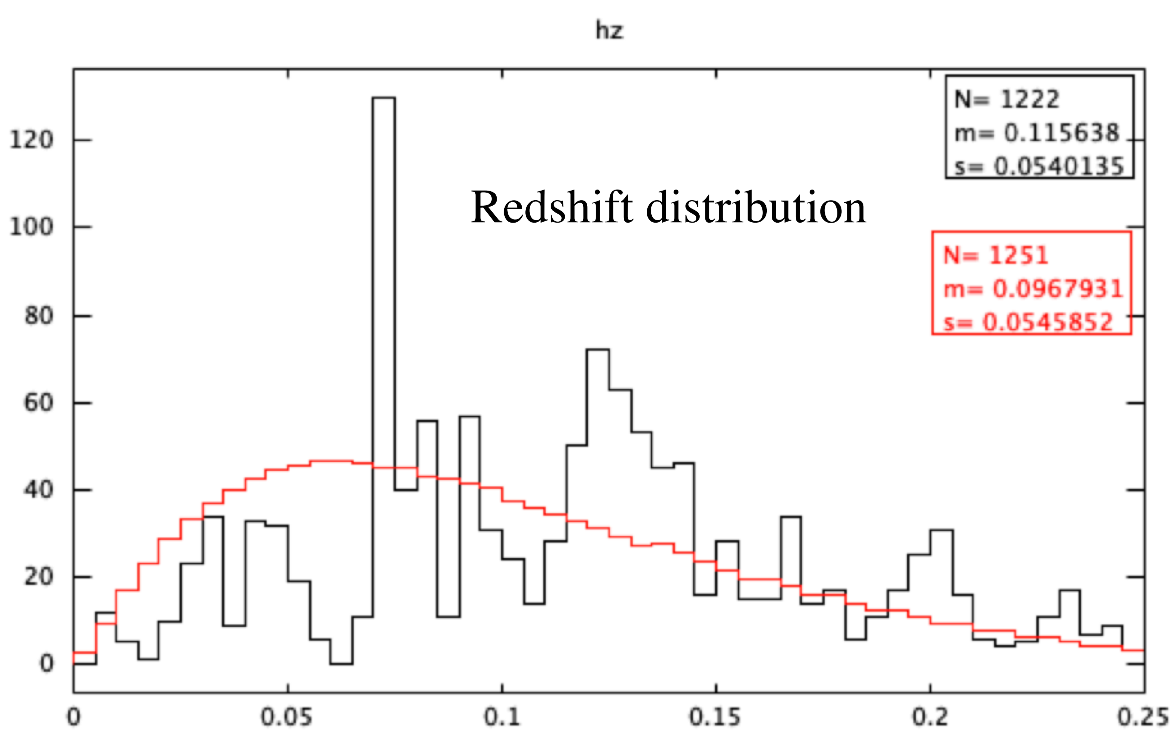


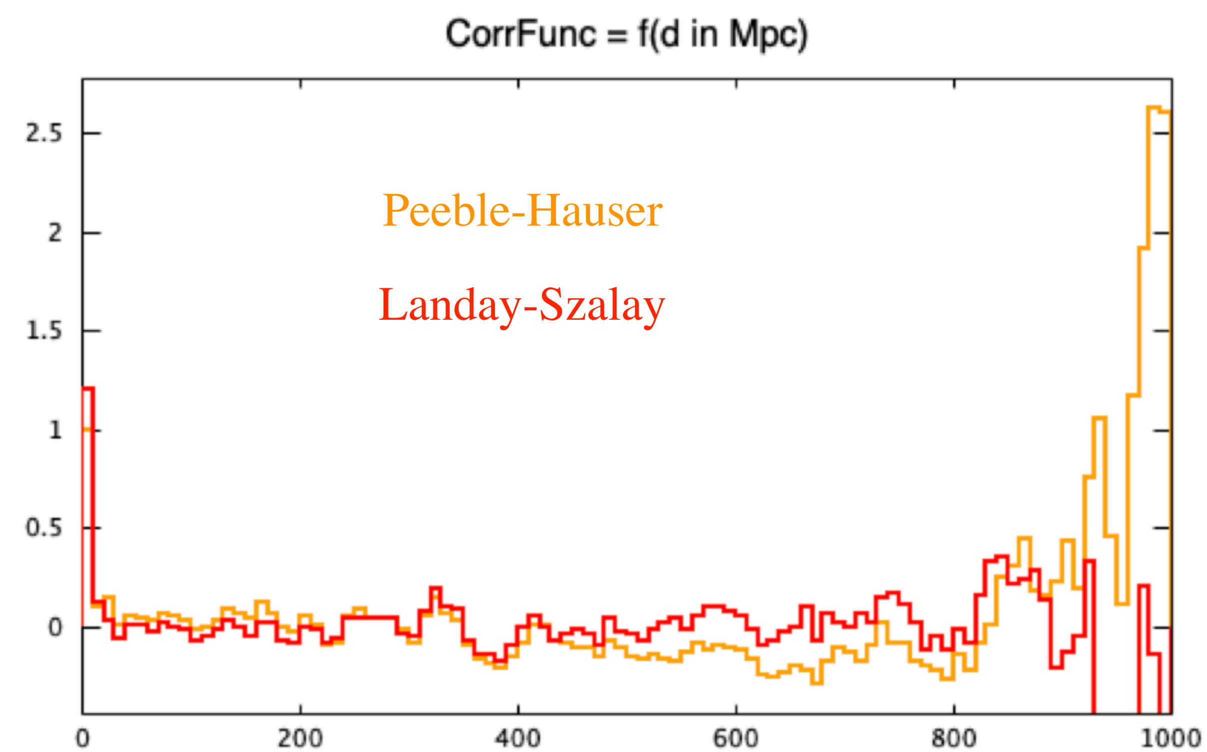
Centered on (ra,dec)=(120,49)

5.2 SDSS selected galaxies









Centered on (ra,dec)=(150,60)

Preliminary conclusions

- NCCS galaxy number density has a significant correlation with extinction map near the NCP, within 3.5 deg, but this is not seen when extending the region to full NCCS , ~ 9 deg.
- Magnitude distribution reasonably well understood
- Correlation function shows too much structuring, compared to SDSS
- One possible reason is that redshift determination efficiency drops too sharply (effect not captured enough by the efficiency function)
- Maybe, this is partly genuine structuring in the sky ?