



# The comparison between SDSS photometric data and two Milky Way models



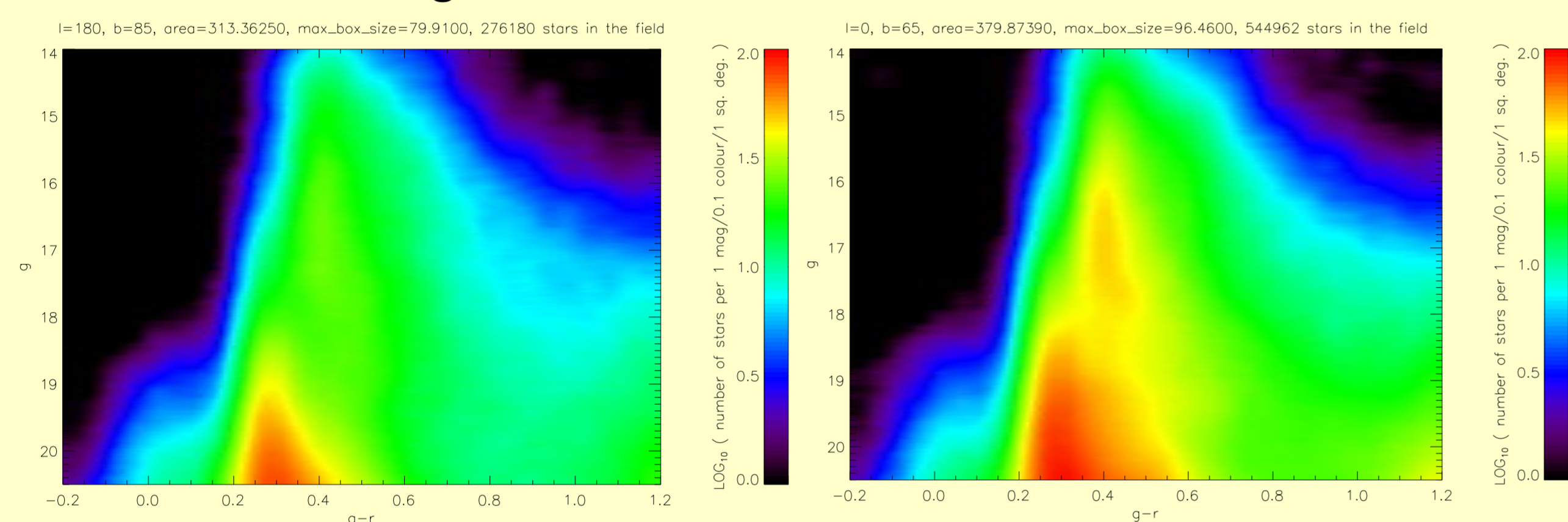
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## I. SDSS photometric data

As part of SDSS-II, the table *Star* which is adopted essentially contains the photometric parameters (no redshifts or spectroscopic parameters) for all primary point-like objects classified as stars from *PhotoPrimary*. These following parameters have been selected as our sample. At first, only NGP (the North Galactic Polar field, latitude  $b$  between 80 and 90 degrees) and a lower latitude field are considered (the other fields will be inferred in the future).

$l, b, ra, dec,$   
 $psfMag_u, psfMag_g, psfMag_r, psfMag_i, psfMag_z,$   
 $psfMagErr_u, psfMagErr_g, psfMagErr_r, psfMagErr_i,$   
 $psfMagErr_z,$   
 $extinction_u$

To begin with, we use SDSS PSF photometry of the North Galactic Pole (NGP), i.e., a region with a latitude  $b$  between 80 and 90 degrees. We selected our sample from SDSS DR7 including all stars within a color range of  $(g-r)_0 = [-0.2, 1.2]$  and magnitude limits of  $g = [14, 20.5]$  and magnitude errors under 0.2 mag.



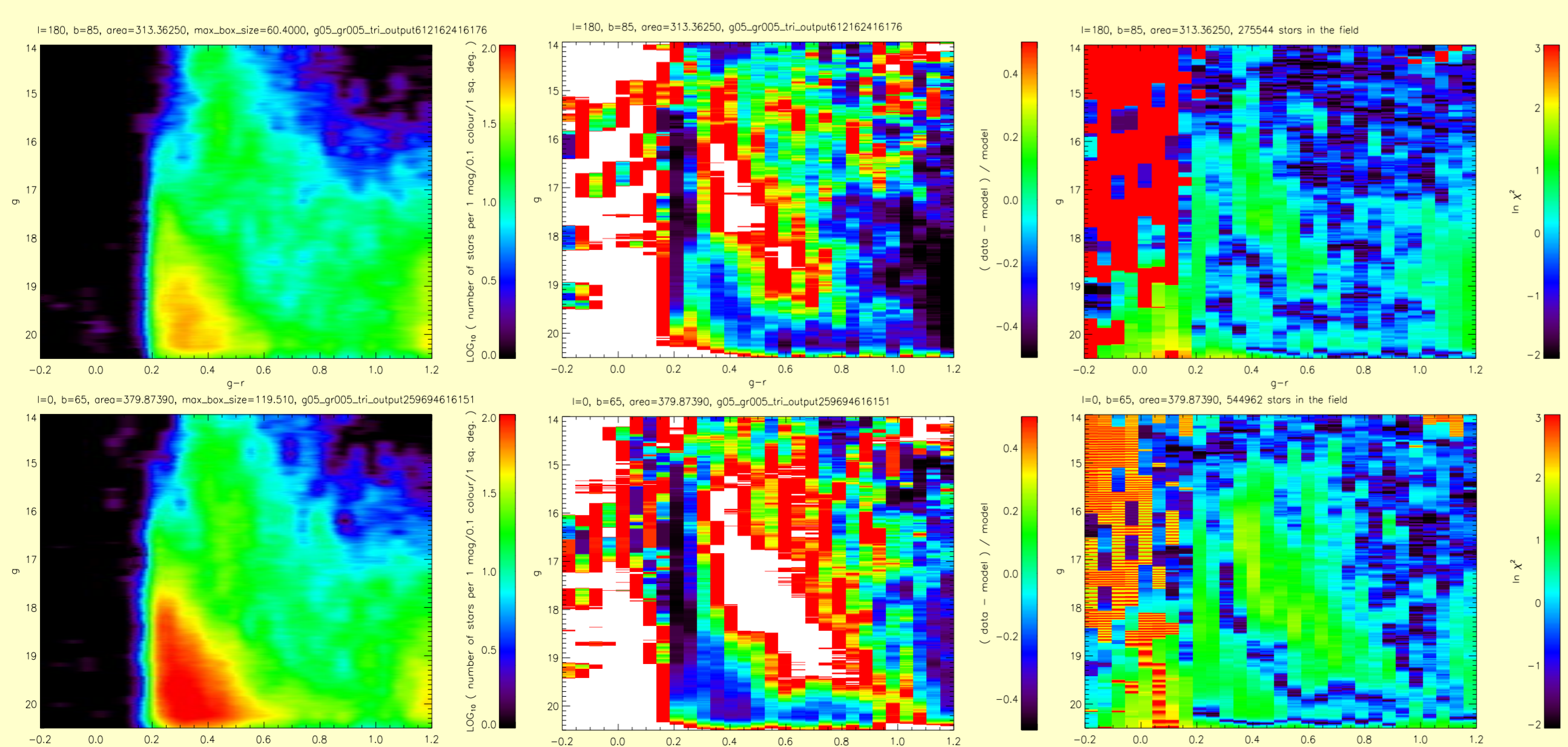
Left panel: There are 276,180 stars in the NGP sample which cover 313.36 sq. degs.. The stellar halo of the Milky Way stands out as a high-density area (reddish-yellowish). Right panel: A lower latitude field ( $b = [60^\circ, 70^\circ]$  and  $l = [-45^\circ, 45^\circ]$ ) covers 379.87 sq. degs. and contains 544,962 stars. At  $(g-r, g) = (0.4, 17)$  the thick disc turnoff is visible.

We count the stellar number densities of each box in  $(g-r, g)$  (a so called *Hess diagram*). The size of the box is  $0.05 \times 0.5$  mag. and it is smoothed in  $0.01 \times 0.01$  mag. bins.

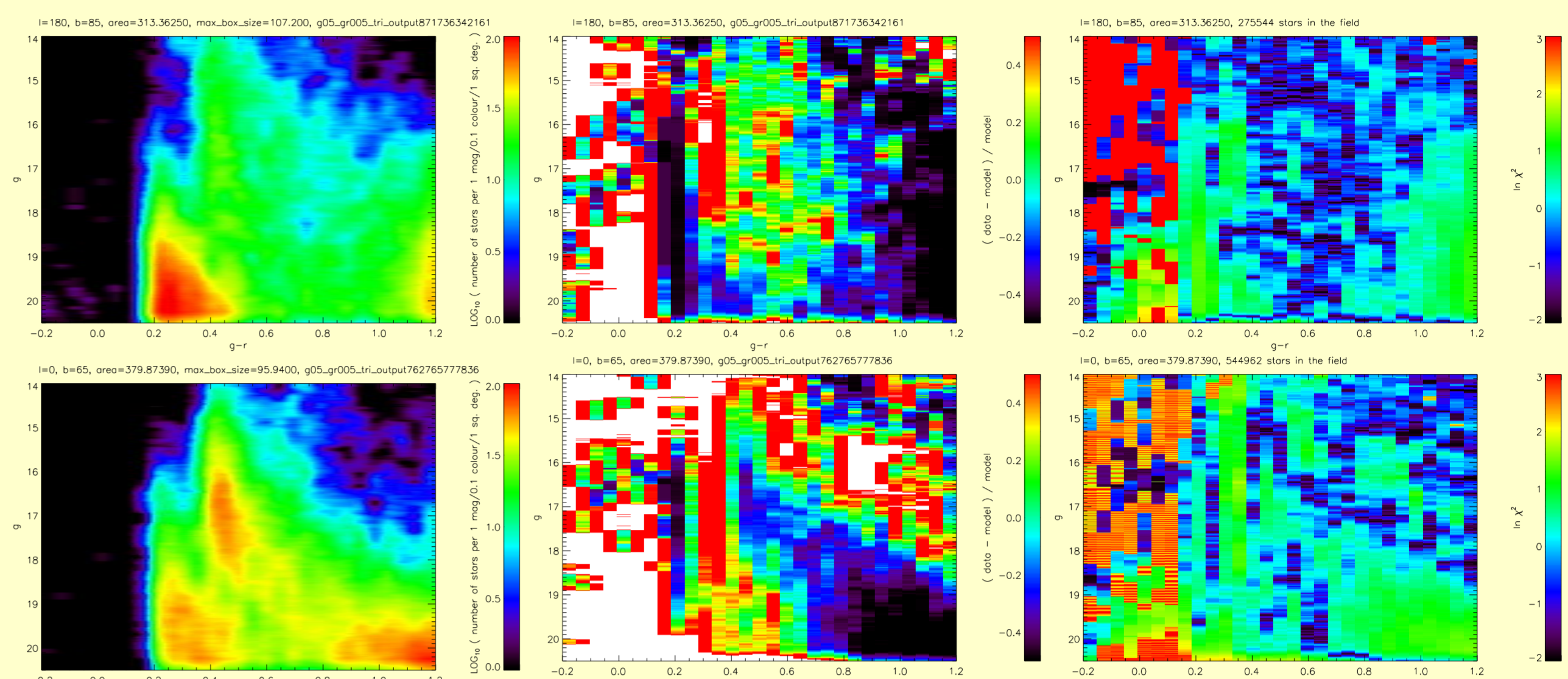
## II. TRILEGAL model

This code was named TRILEGAL for the task of modeling Galaxy population synthesis star counts. It allows users to create a pseudo stellar catalogue including positions, multi-color photometry and the other physical parameters according to user-defined structural parameters.

We tested them by the following distinct input. Expected NGP star counts as provided by TRILEGAL's default. And the second is a best fit in our testing with best fit disc parameters.



Upper panels: NGP of the default input parameters (model, difference to the empirical SDSS data, and  $\chi^2$ ). Lower panels: lower field. Parameters: const. SFR, Chabrier's lognormal IMF, larger solar position, squared hyperbolic secant thin disc and no thick disc, oblate  $r^{1/4}$  spheroid. Quality of the fit:  $\sim 50\%$

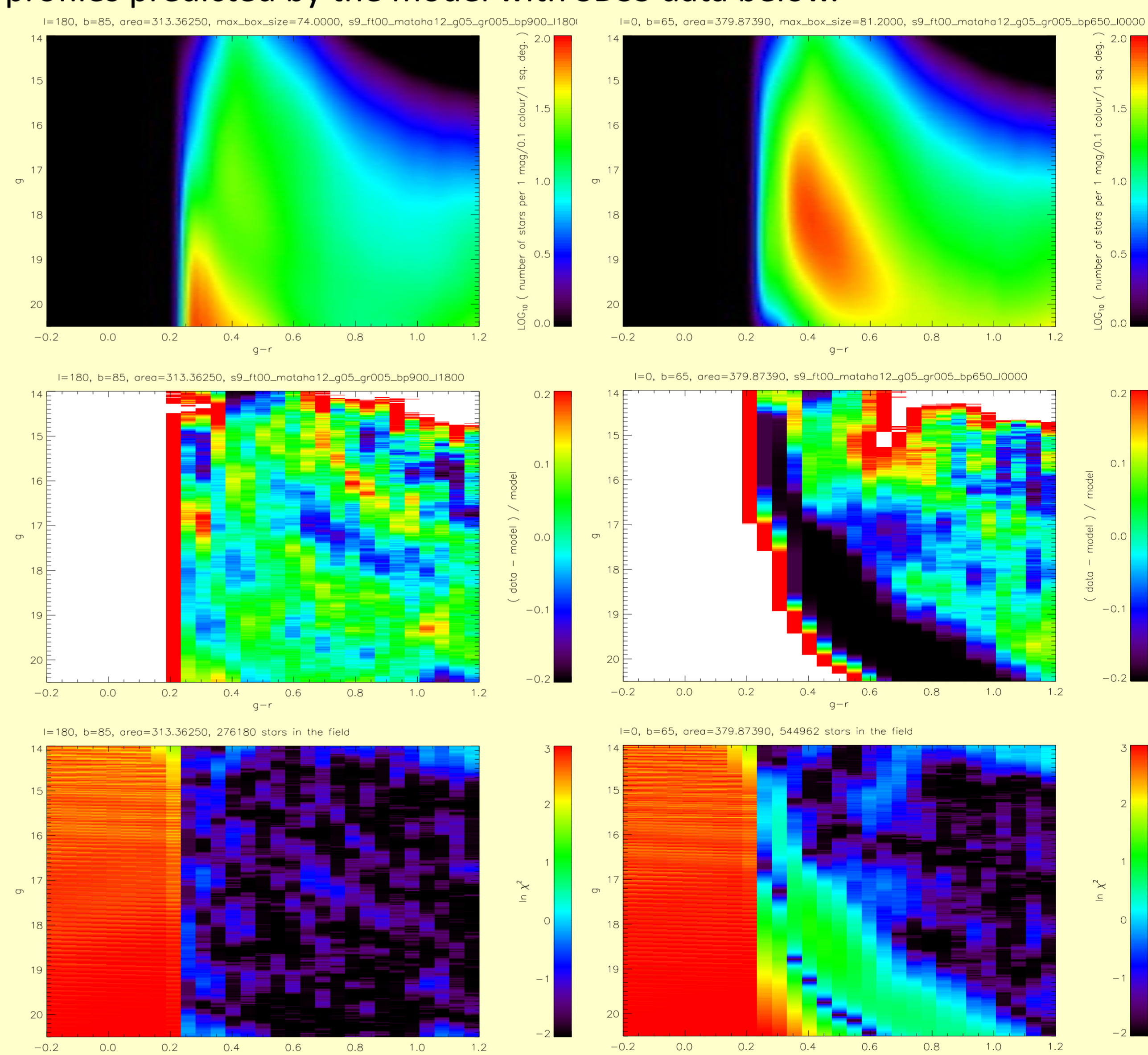


Upper panels: NGP of the default input parameters (model, difference, and  $\chi^2$ ). Lower panels: lower field. Parameters: const. SFR, Chabrier's lognormal IMF, normal solar position, squared hyperbolic secant thin and thick disc, oblate  $r^{1/4}$  spheroid.

## III. J-J model

(More details to have a talk by A. Just, on Thursday, (Session XXVII))

A. Just & H. Jahreiß present a consistent disc model of the Milky Way. The local disc model predicts detailed profiles of stellar number density in each sky field and each color-magnitude bin. We compare the density profiles predicted by the model with SDSS data below.

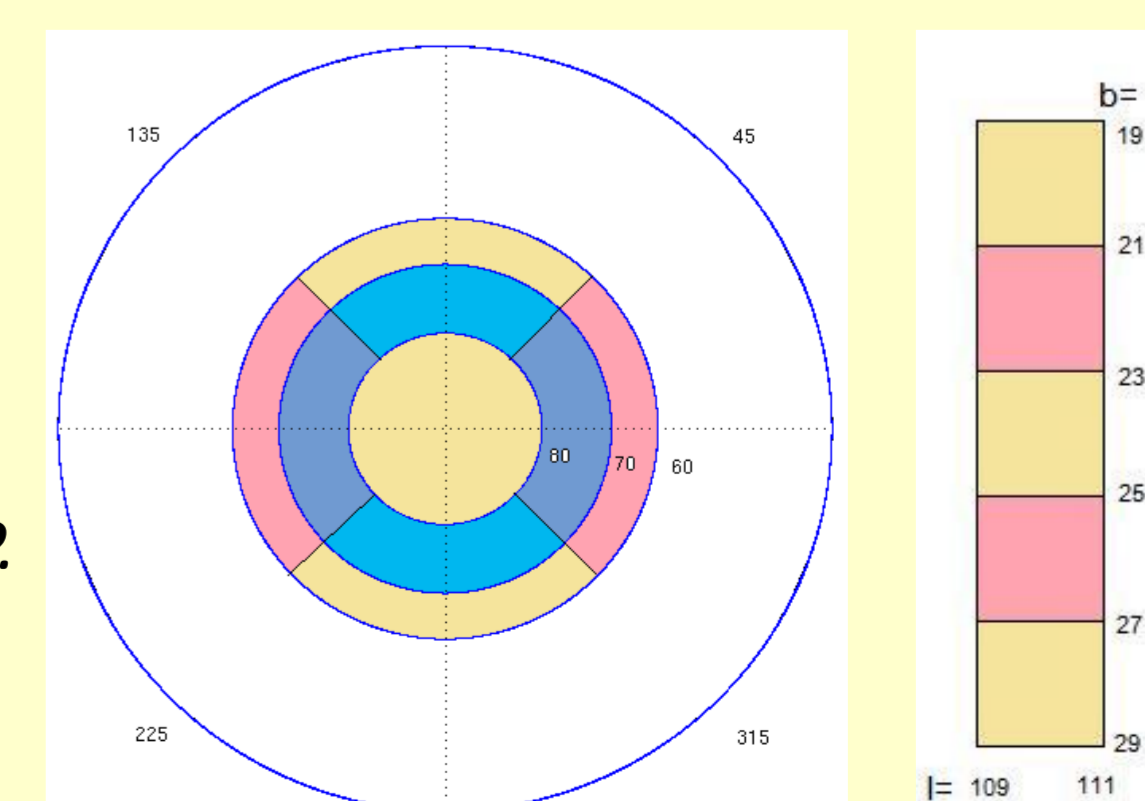


Left panels: Model, difference and  $\chi^2$  between model and real data of NGP field. No star bluer 0.2 in  $(g-r)$  are modeled and some problem about red giants of the thick disc. Right panels: those of a lower latitude field that has more problems so far but still better than TRILEGAL.

## IV. More fields

We are working on more sky fields with lower latitude. The planned sky fields are following. More comparison will be done in order to obtain the difference in the detailed profiles densities. The location of the planned fields is indicated in the figure below.

Apart NGP, 8 lower cap fields and 5 strips have been planned. Left: equal-area projection centered on the NGP. Right: a schema of the 5 fields in the  $l = 110^\circ$  strips.



## References

- Girardi, L., Groenewegen, M. A. T., Hatziminaoglou, E., & da Costa, L. 2005, A&A 436, 895G
- Just, A. & H. Jahreiß 2009, subm. to MNRAS (old version at astro-ph/0706.3850)