

MORPHOLOGICAL ANALYSIS OF SDSS DISC GALAXIES

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– Sloan Digital Sky Survey (SDSS)

- wide-field optical photographic survey of $\sim 10^8$ sources
 - stars, galaxies, quasars
- determining the redshift of ~ 1.5 million galaxy
 - spectroscopic analysis
- mapping the LSS in the largest volume so far
 - covering one-third of the sky
 - discernible structure up to $z \approx 0,2$
- image processing pipeline \rightarrow database
 - photometry
 - morphology
 - spectroscopy

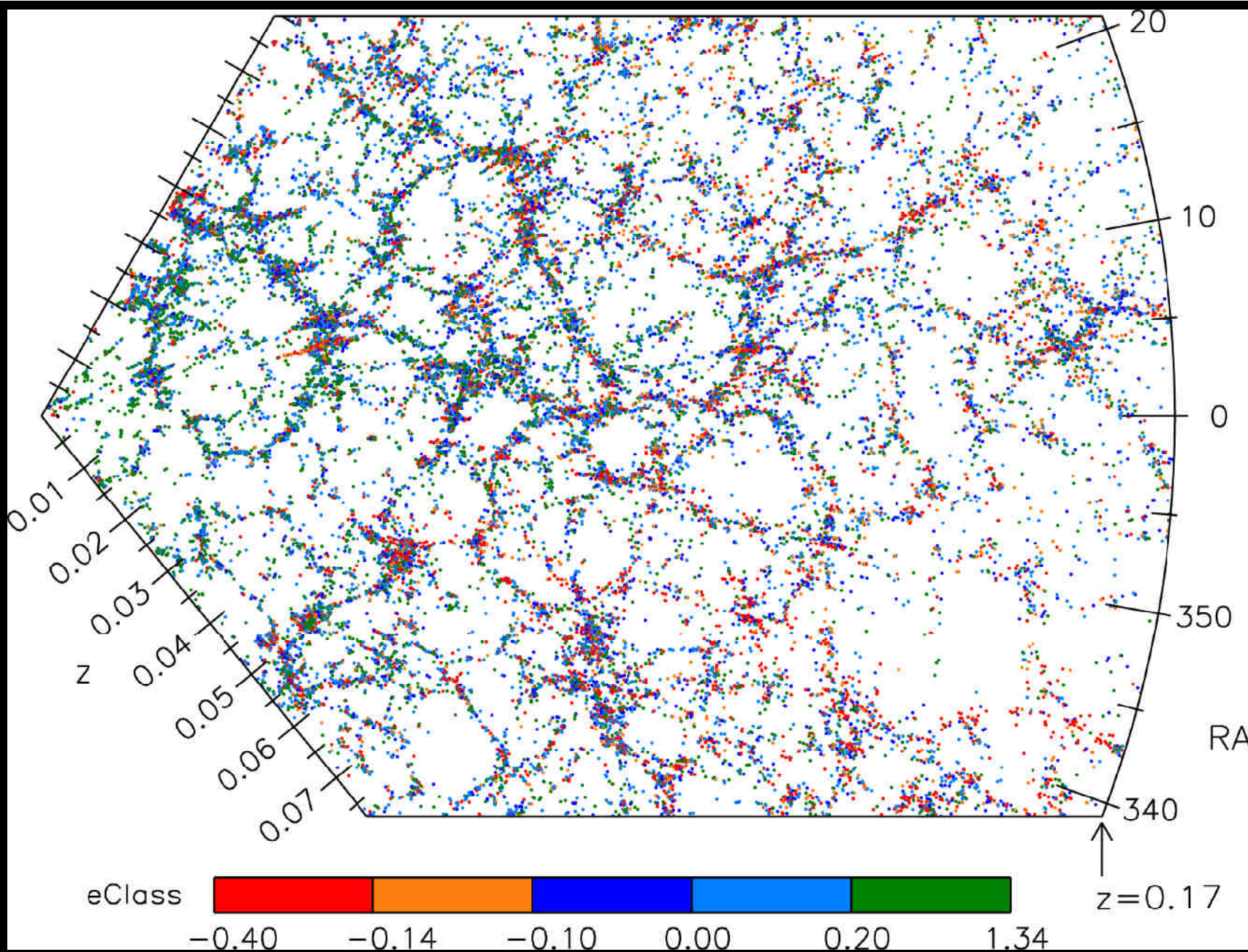


Figure 1: Map of ~40000 galaxies from the SDSS southern co-added survey

SDSS-III Data Release 9

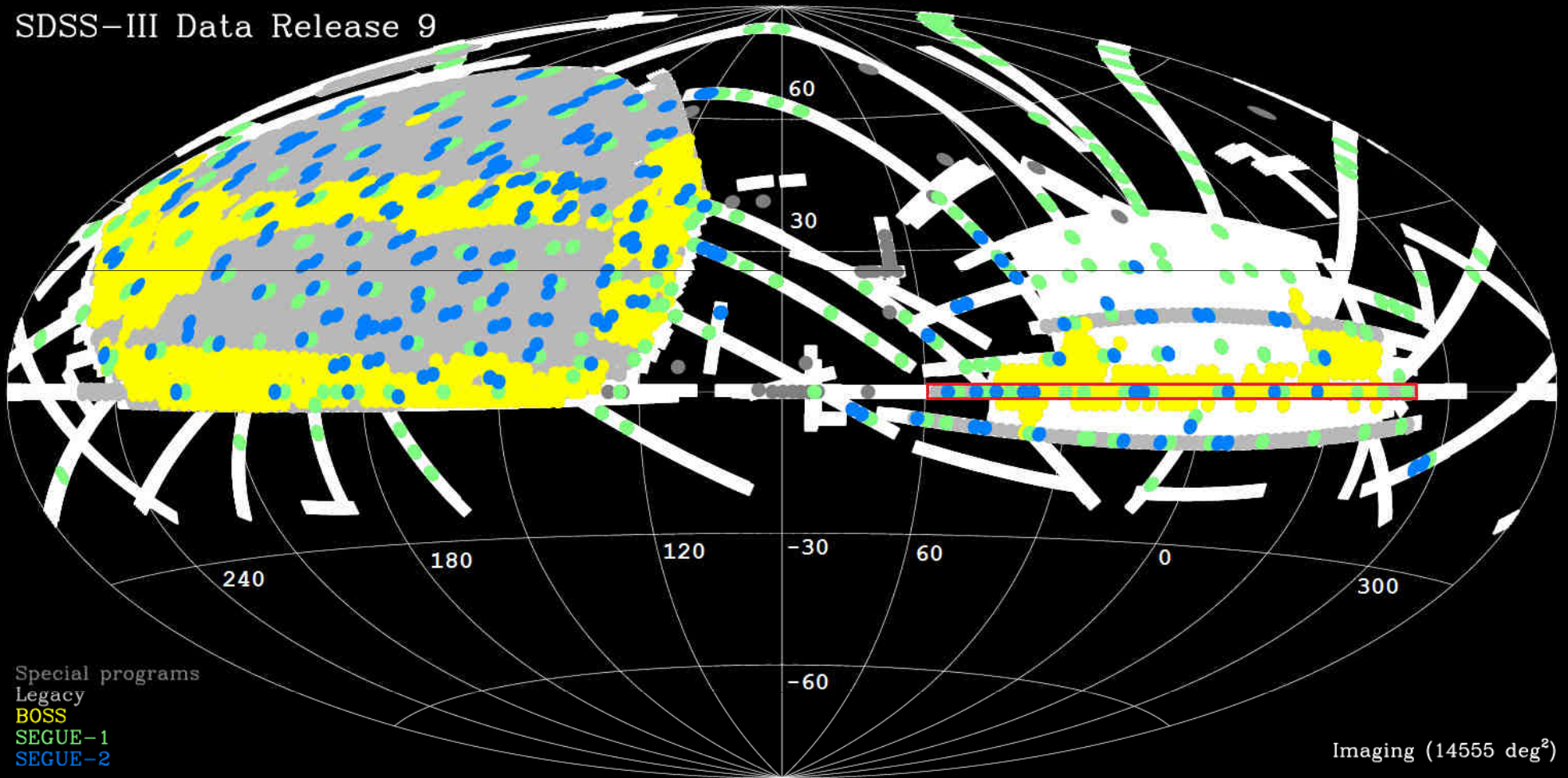


Figure 2: SDSS DR9 imaging footprint (galactic coordinates)
Red rectangle: SDSS Southern co-added survey footprint (270 deg²)
(Source: <http://www.sdss3.org/dr9/>)

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- This work: determining morphological parameters of galaxies
 - ellipticity, position angle
 - → implications: shape and orientation
 - disk galaxies: direction of the rotation axis
 - elliptical galaxies: principal axes of inertia
 - Significance:
 - cosmic shear
 - » weak gravitational lensing
 - angular correlations/spin alignments
 - » between individual galaxies
 - » between galaxies and the LSS

- SDSS position angles (PA):
 - model fit: fitting radial profiles to the galaxy image
 - de Vaucouleurs
 - exponential
 - isophotal fit – fitting to contour lines
 - artifact in the distribution of model fit PAs

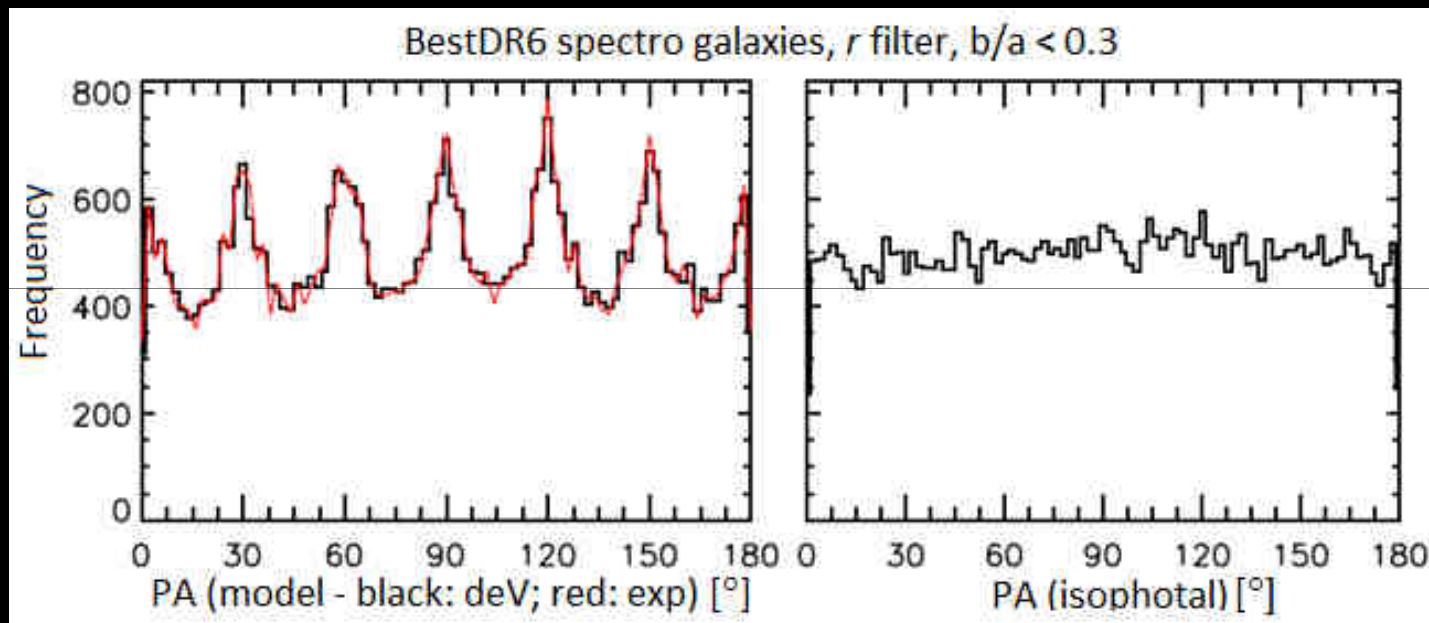
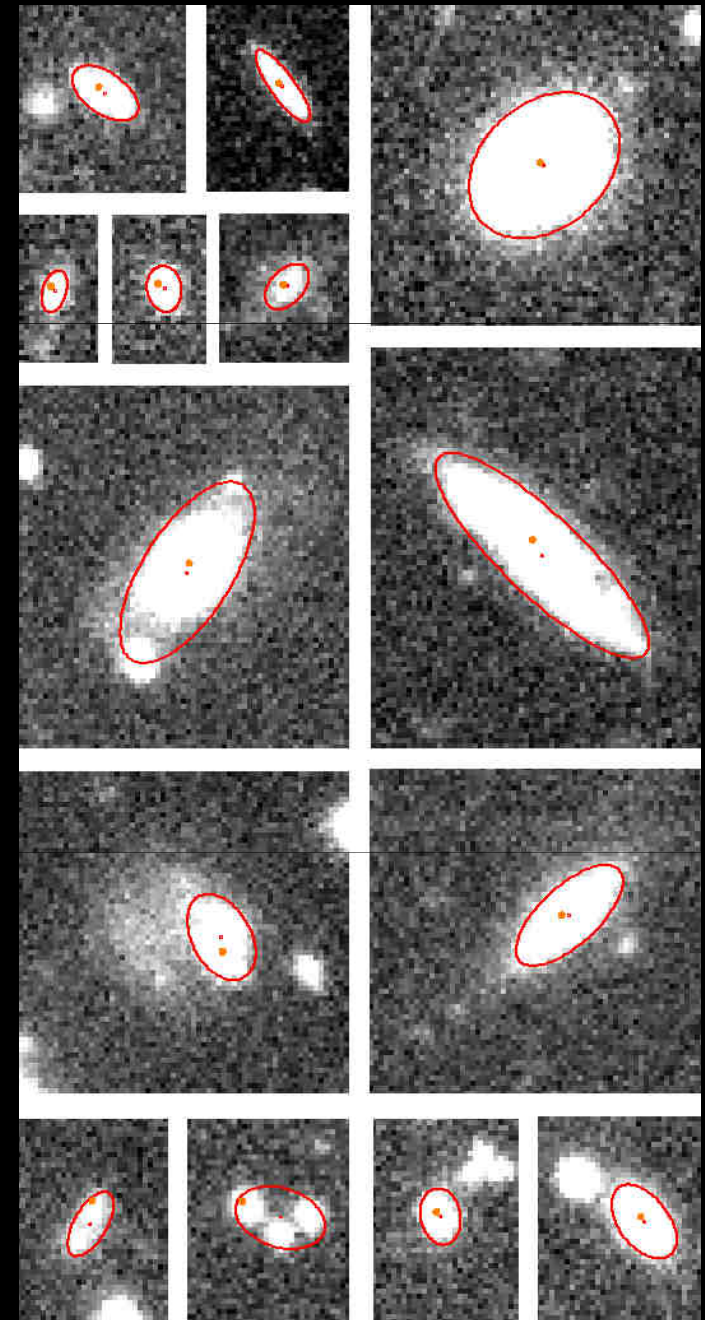


Figure 3: PA distribution of ~ 45000 edge-on galaxies with spectroscopic identification from the SDSS BestDR6 database.

- standalone IDL code
- fitting ellipses to the isophotes of galaxies
 - ellipticity, PA
 - goal: more reliable parameters
- reliability
 - rejected fits:
 - too small contour
 - blended objects
 - ambiguous position matches



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- imaging source: SDSS Southern Survey
 - a.k.a: Stripe82 co-added
 - morfological database
 - fit parameters with uncertainties
 - control parameters (to filter out unreliable fits)
 - Figure 4: comparison of our parameters
 - better correlation with the radial fit parameters
 - Figure 5: face-on spiral galaxies superimposed on the LSS map
 - Future plans
 - detailed statistical analysis
 - search for galaxy alignment effects in the database
 - developing a simple correction process for the distorted PSF

Figure 5: Comparison between the PAs.

Morph. isoPhi:

our isophotal PA

SDSS isoPhi:

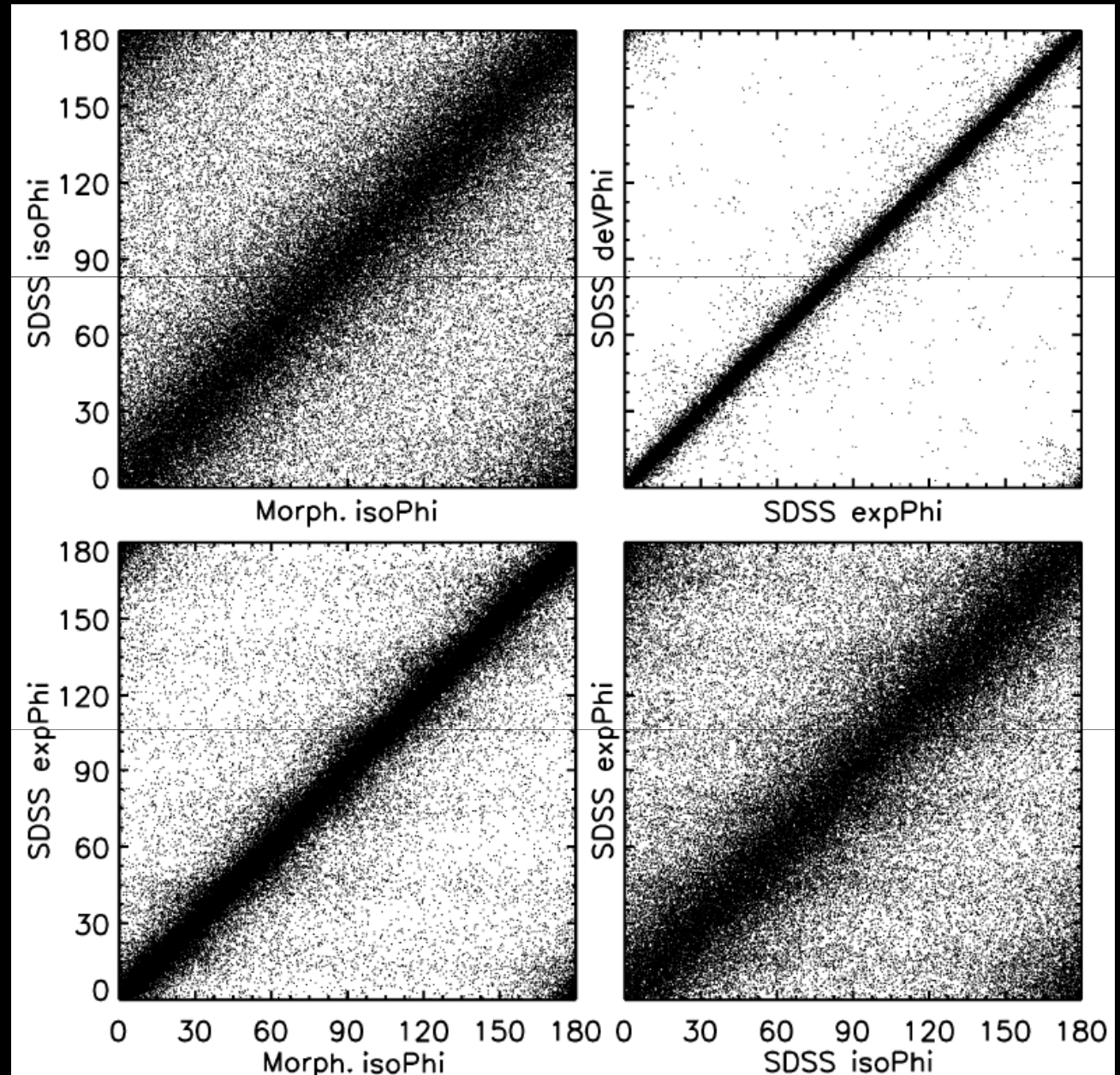
SDSS isophotal PA

SDSS expPhi:

SDSS exponential fit PA

SDSS deVPhi:

SDSS de Vaucouleurs fit PA



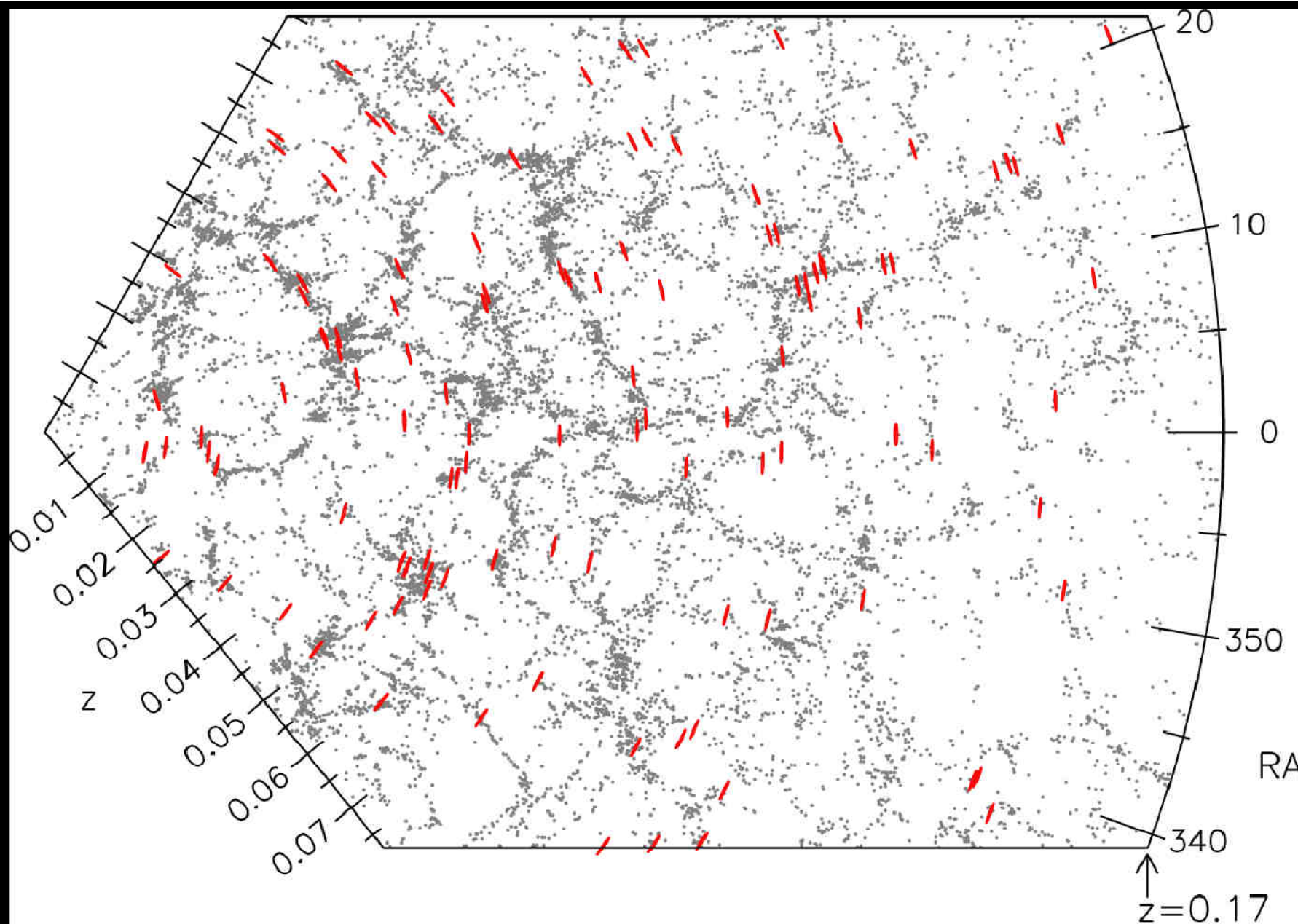


Figure 6: Distribution of face-on spiral galaxies (denoted as red ellipses)