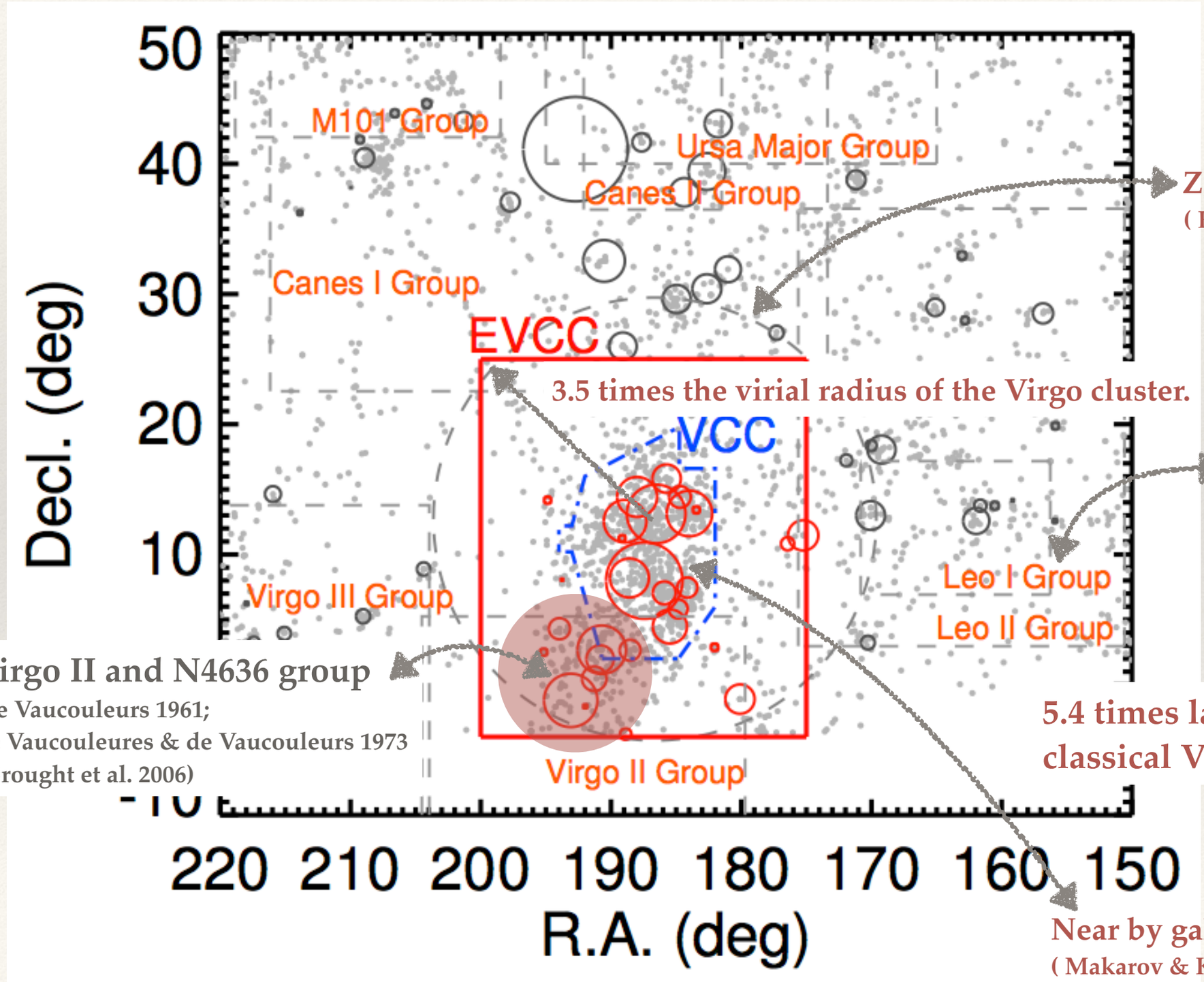
New Catalogs of the Nearby Galaxy Clusters:
Virgo and Ursa Major Clusters

Kim et al. 2014, in prep.
(Extended Vrigo Cluster Catalog)
Pak et al. 2014, in prep.
(Catalog of the Ursa Major Cluster and Properties of Early-Type Galaxies)

Chungnam National University; Kim, Suk

Extended Virgo Cluster Catalog (EVCC)



Zero-velocity surface
(Karachentsev & Nasonova 2010)

3.5 times the virial radius of the Virgo cluster.

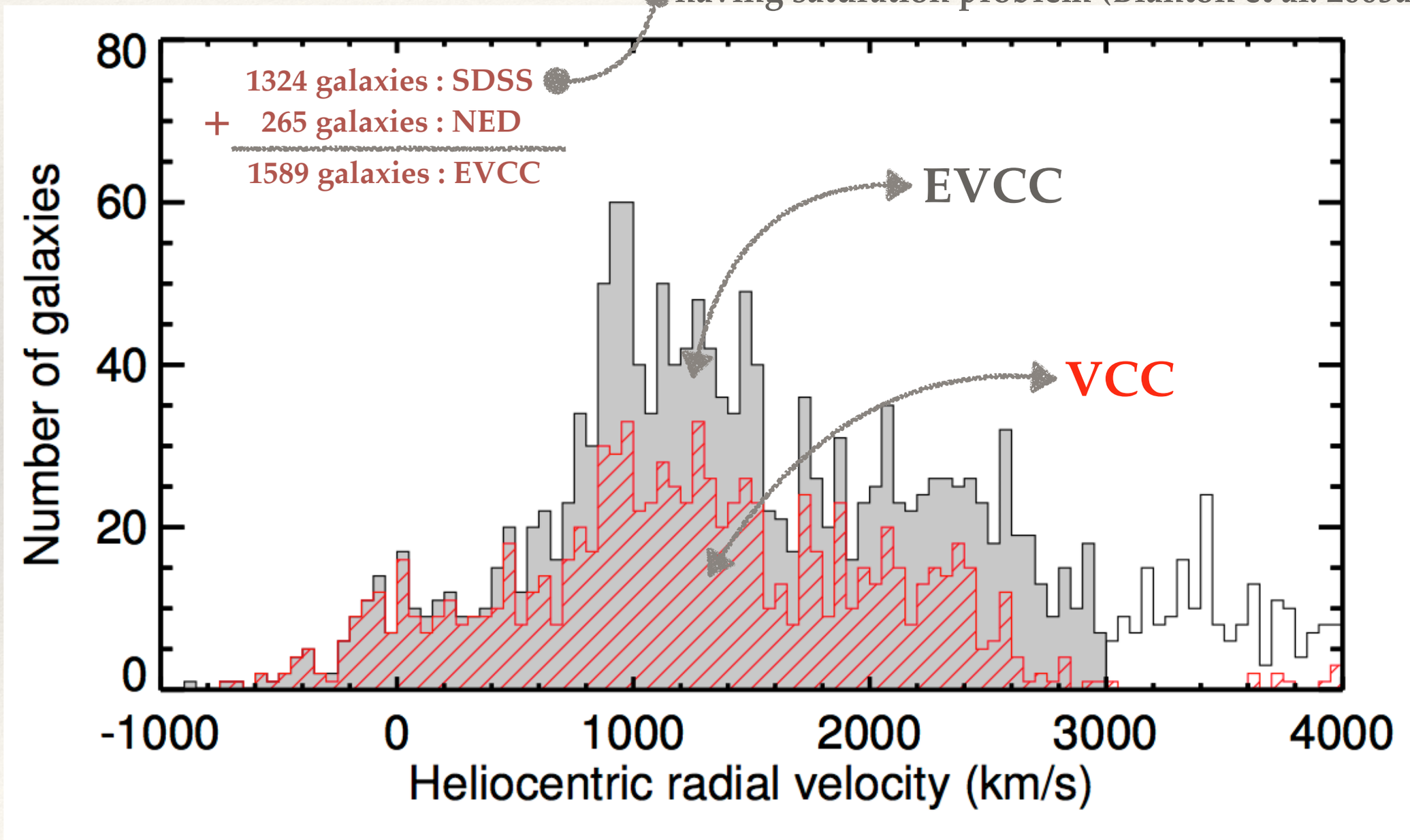
Galaxy Groups
(Fouque et al. 1992, Garcia et al. 1993, Giurucin et al. 2000)

Virgo II and N4636 group
(de Vaucouleurs 1961; de Vaucouleures & de Vaucouleurs 1973 ; Brought et al. 2006)

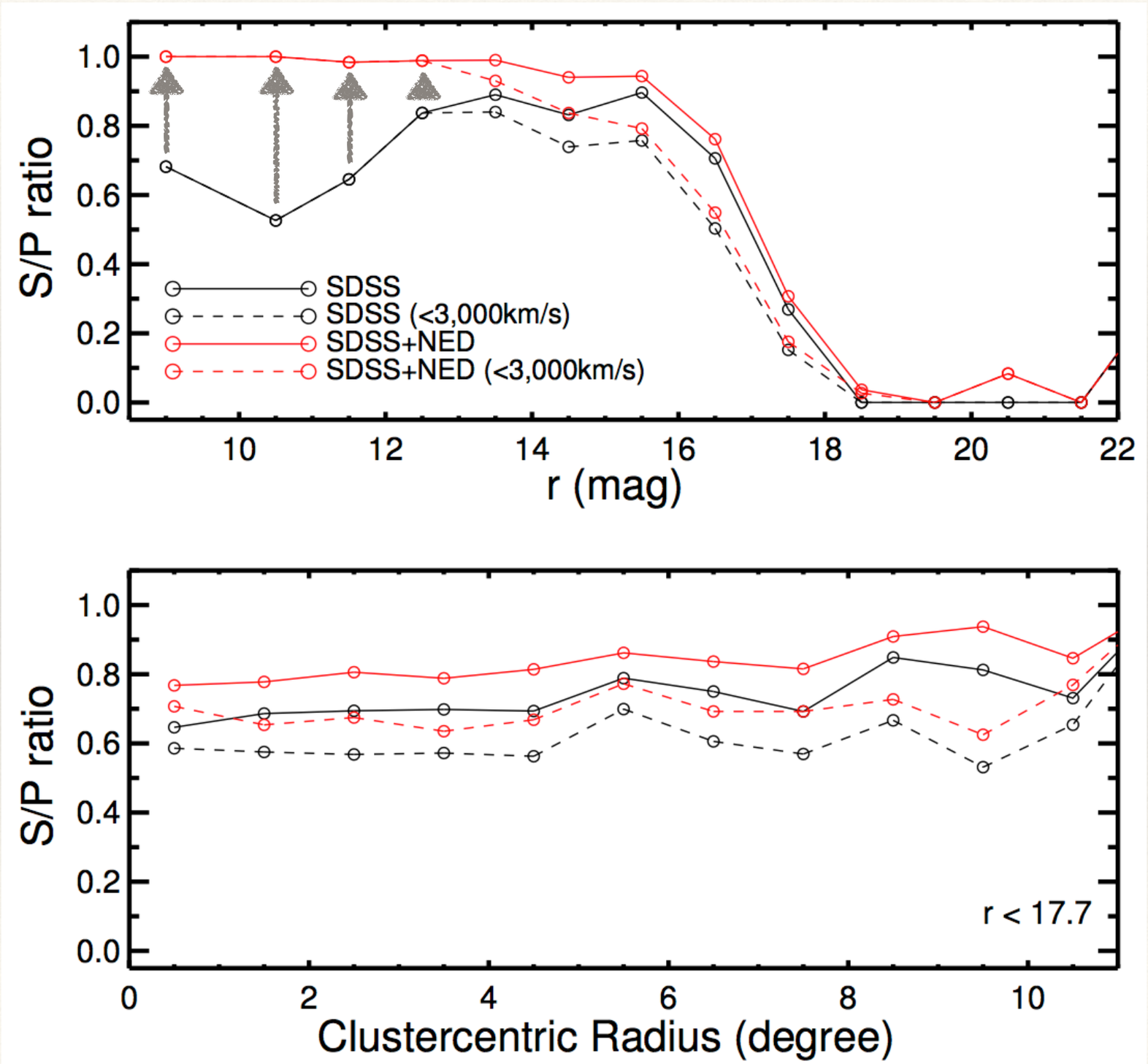
5.4 times larger than the footprint of the classical Virgo Cluster Catalog (VCC)

Near by galaxy group catalog
(Makarov & Karachentsev 2011)

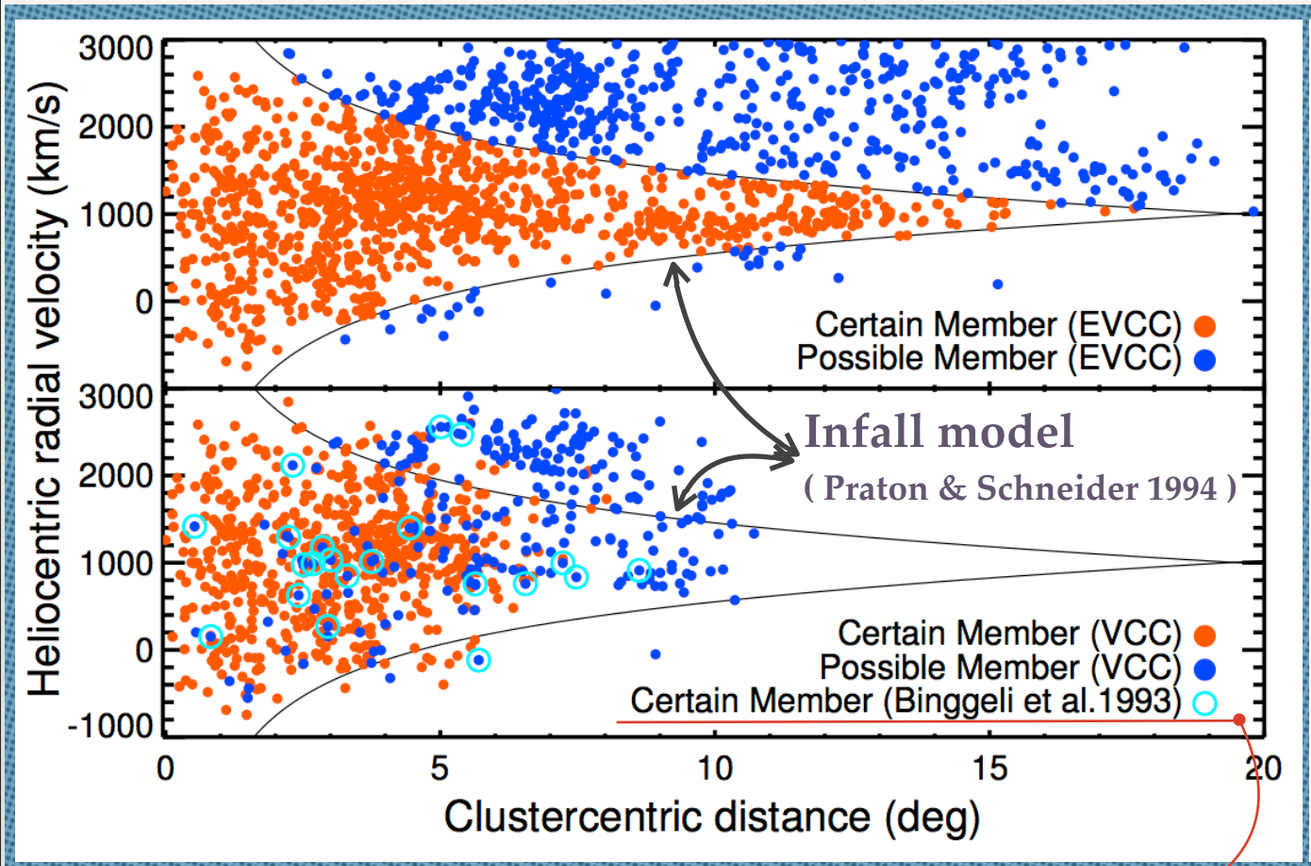
Extended Virgo Cluster Catalog (EVCC)

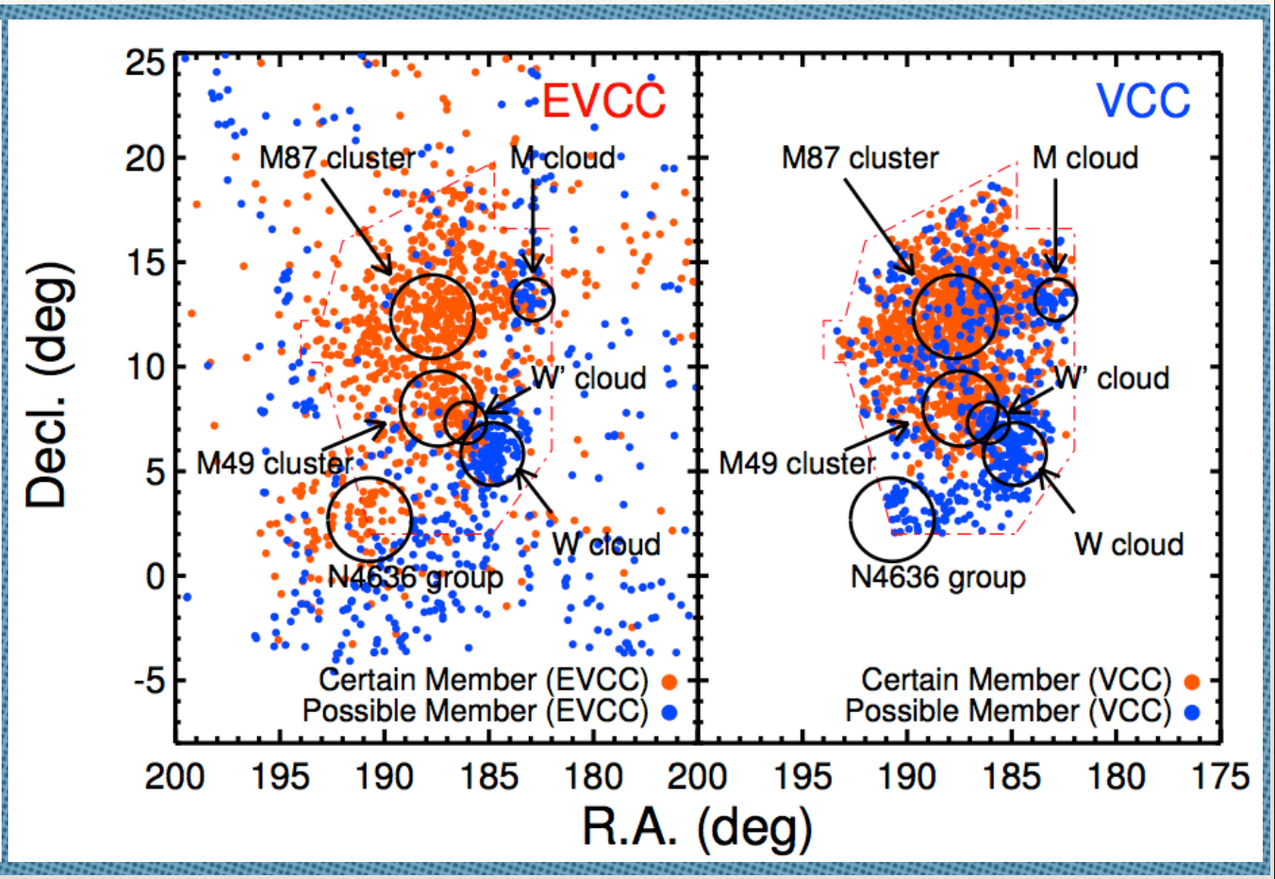


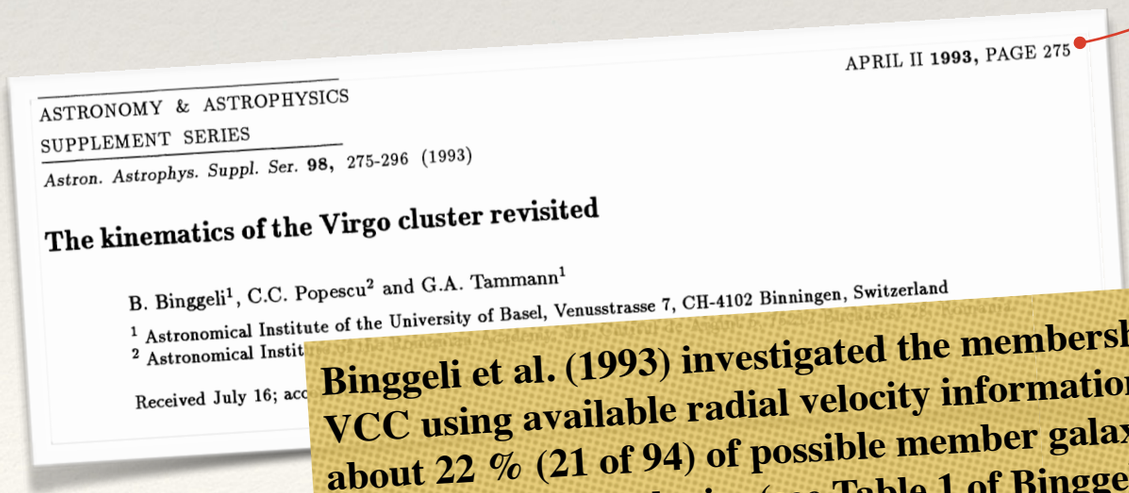
Extended Virgo Cluster Catalog (EVCC)



Extended Virgo Cluster Catalog (EVCC)







ASTRONOMY & ASTROPHYSICS
SUPPLEMENT SERIES
Astron. Astrophys. Suppl. Ser. **98,** 275-296 (1993)

APRIL II **1993,** PAGE 275

The kinematics of the Virgo cluster revisited

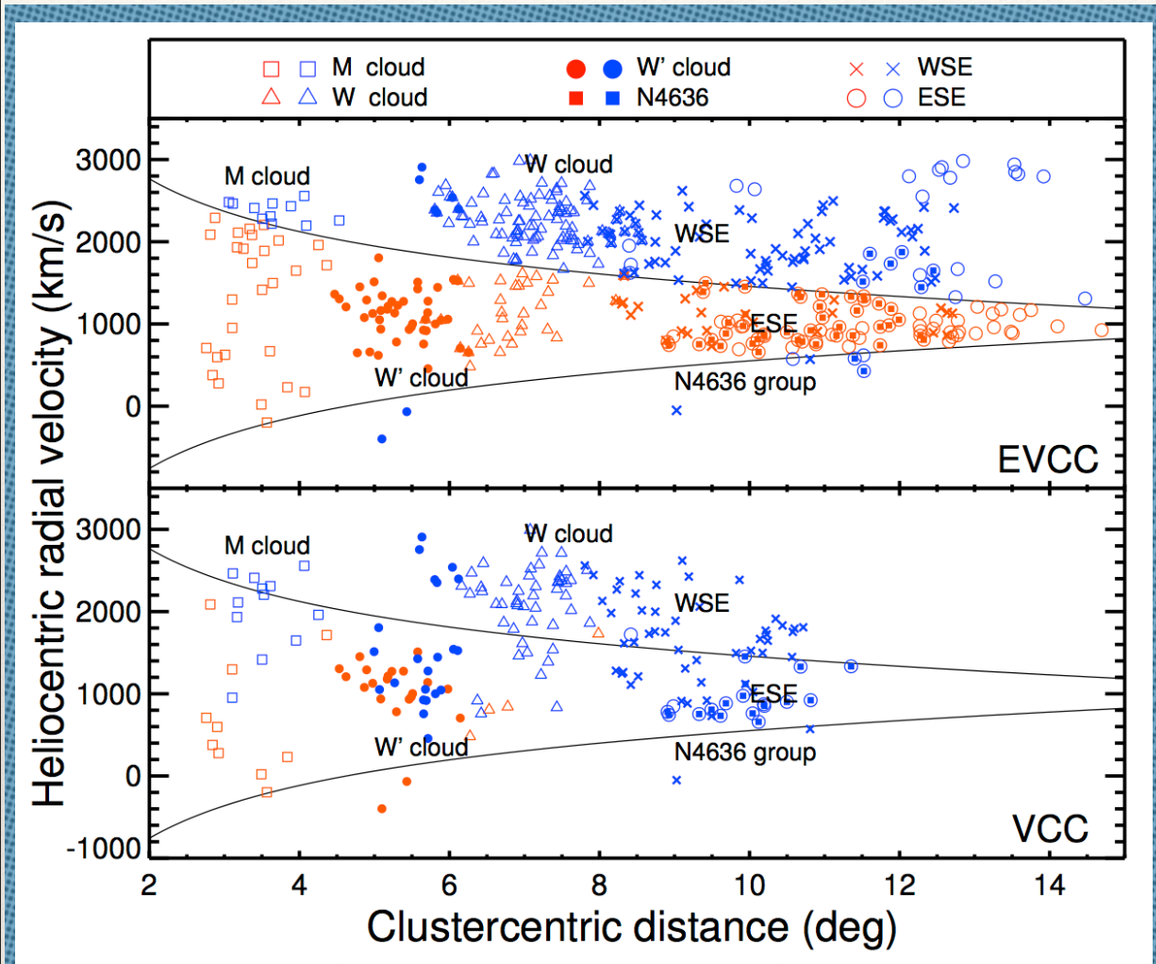
B. Binggeli[1], C.C. Popescu[2] and G.A. Tammann[1]

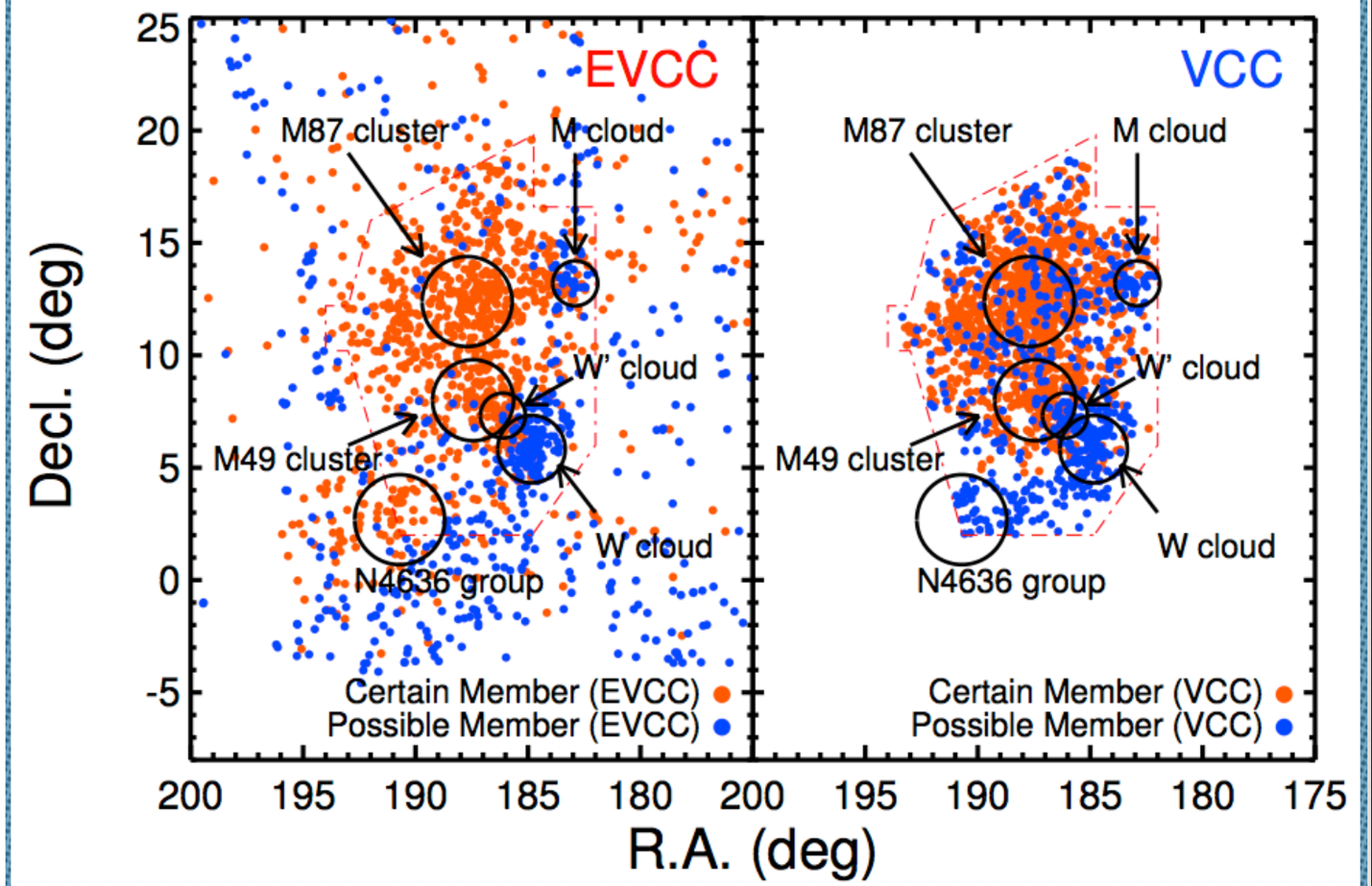
[1] Astronomical Institute of the University of Basel, Venusstrasse 7, CH-4102 Binningen, Switzerland
[2] Astronomical Insti

Received July 16; acc

Binggeli et al. (1993) investigated the membership of 144 galaxies in the VCC using available radial velocity information at that time. As a result, about 22 % (21 of 94) of possible member galaxies were re-classified as certain member galaxies (see Table 1 of Binggeli et al. 1993).

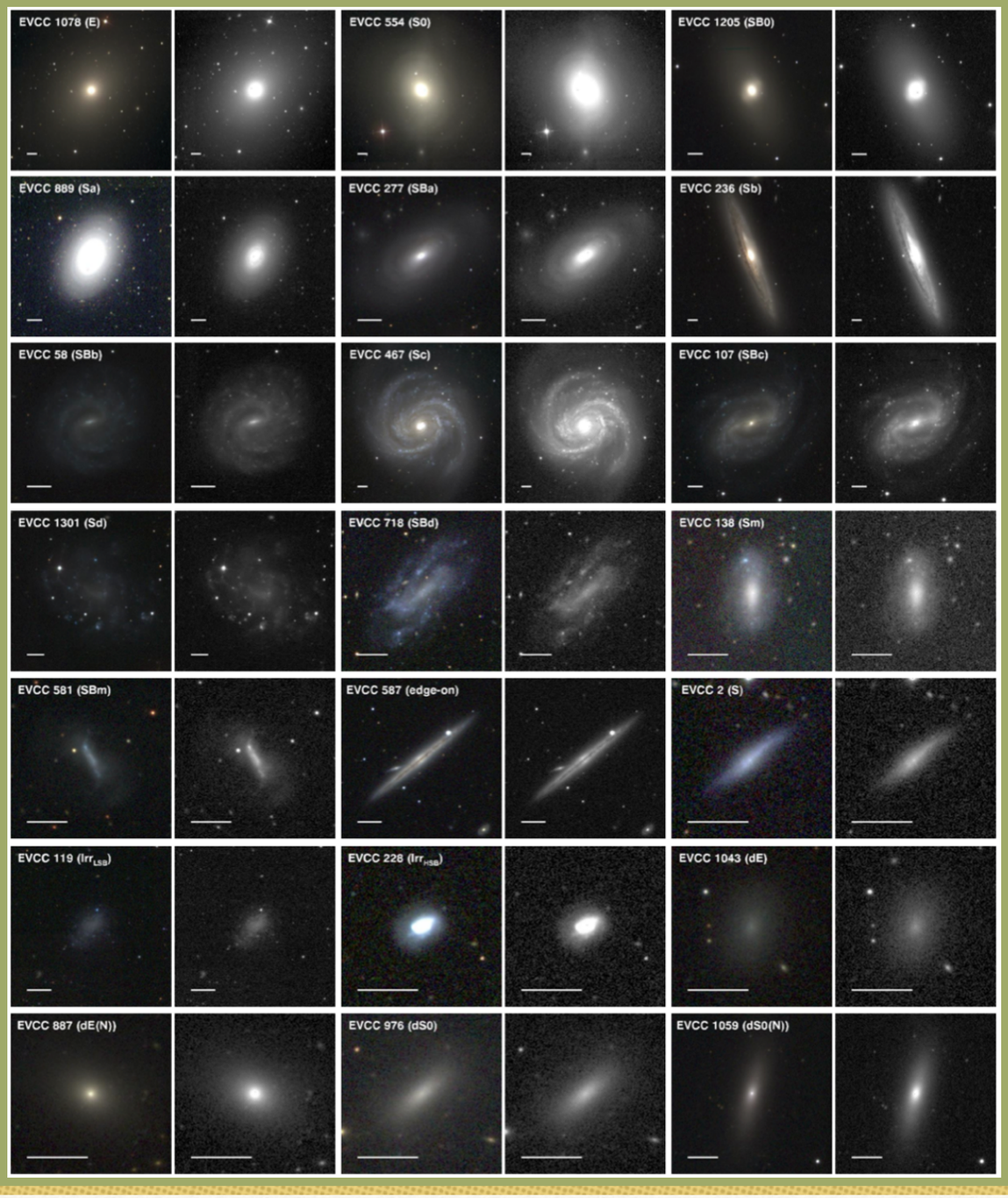
Extended Virgo Cluster Catalog (EVCC)



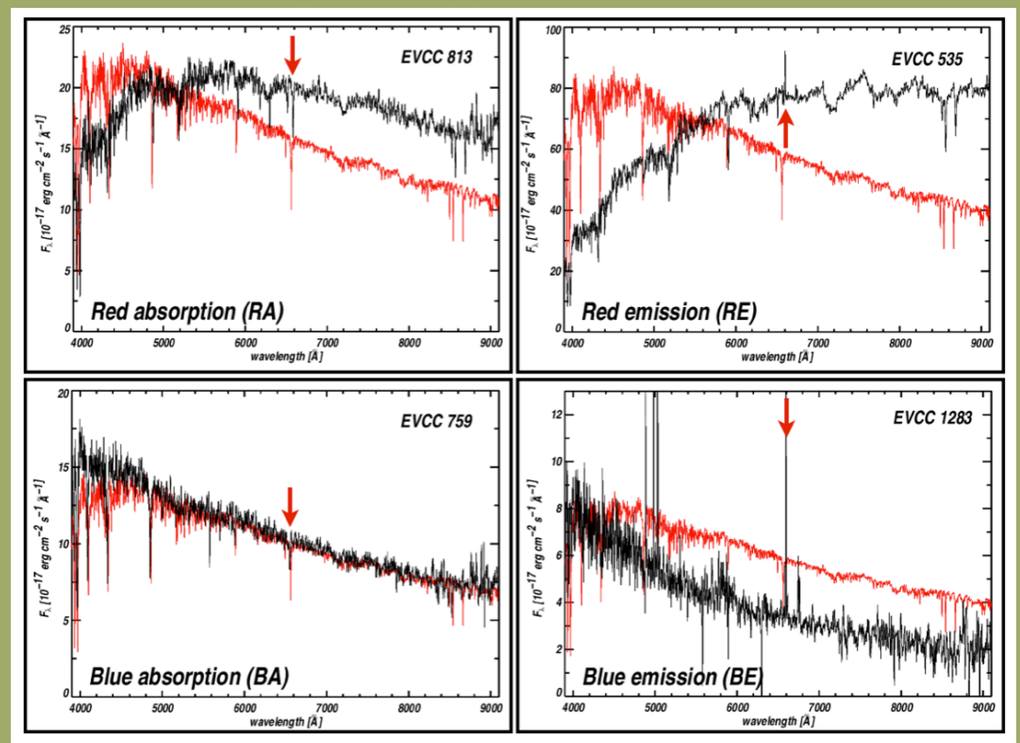


Extended Virgo Cluster Catalog (EVCC)

Primary Morphology



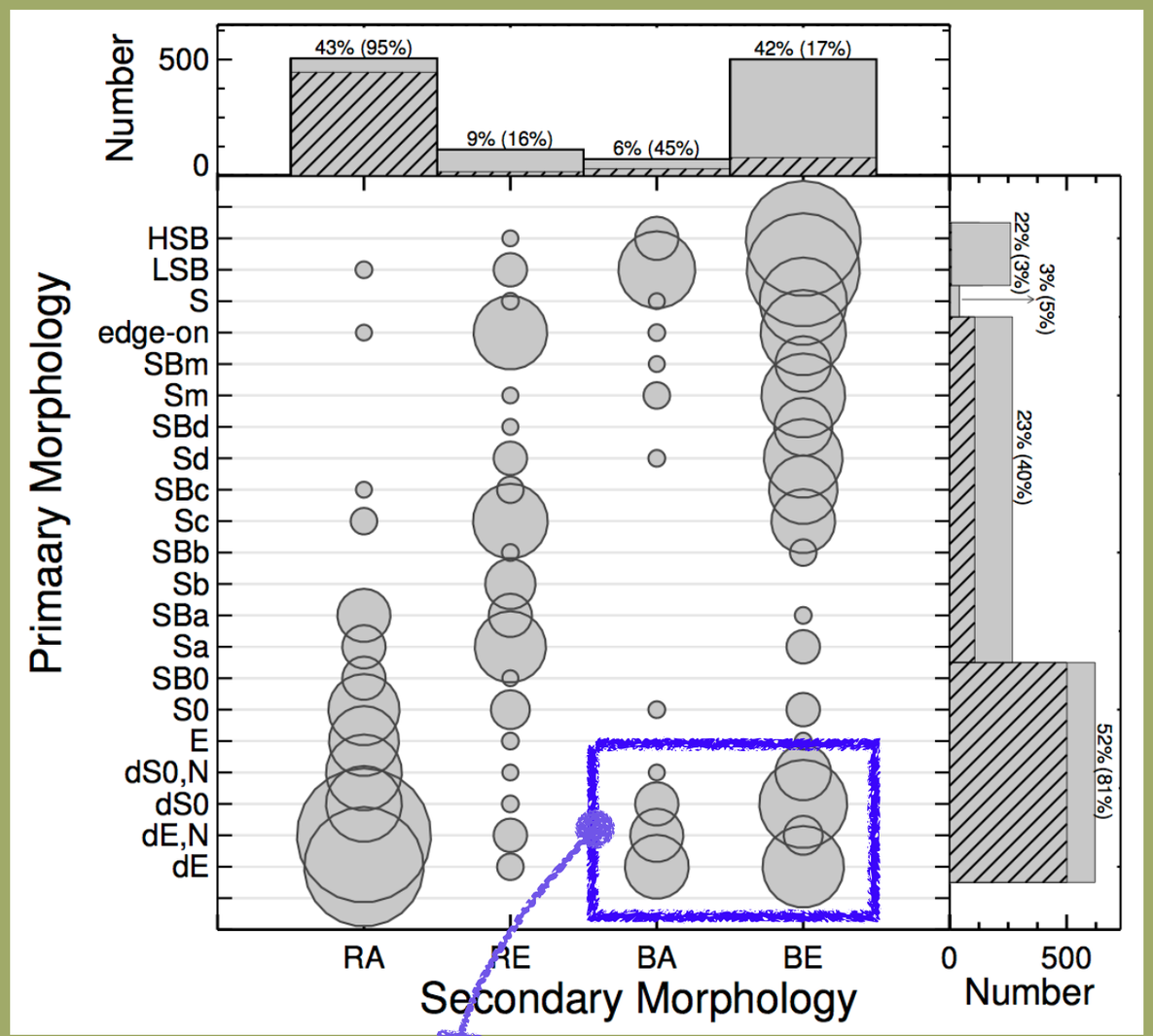
Secondary Morphology

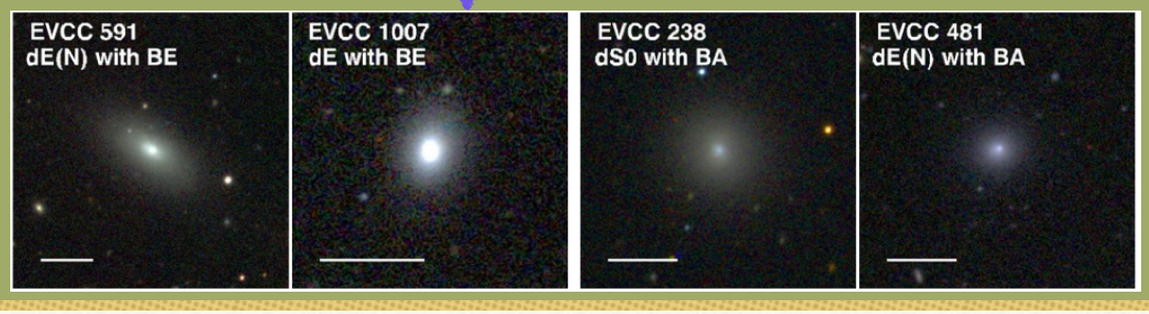


- **Red absorption (RA) galaxy : overall SED shape of a typical early-type red galaxy with HI absorption line.**
- **Red emission (RE) galaxy : overall SED shape of a typical early-type red galaxy, but has HI in emission.**
- **Blue absorption (BA) galaxy : overall SED shape of typical blue galaxy, and has HI absorption line.**
- **Blue emission (BE) galaxy : overall SED shape of typical blue galaxy with HI emission line. In many cases, many emission lines (e.g., Ha, Hb, and [OIII]5007) are prominent compared to the continuum.**

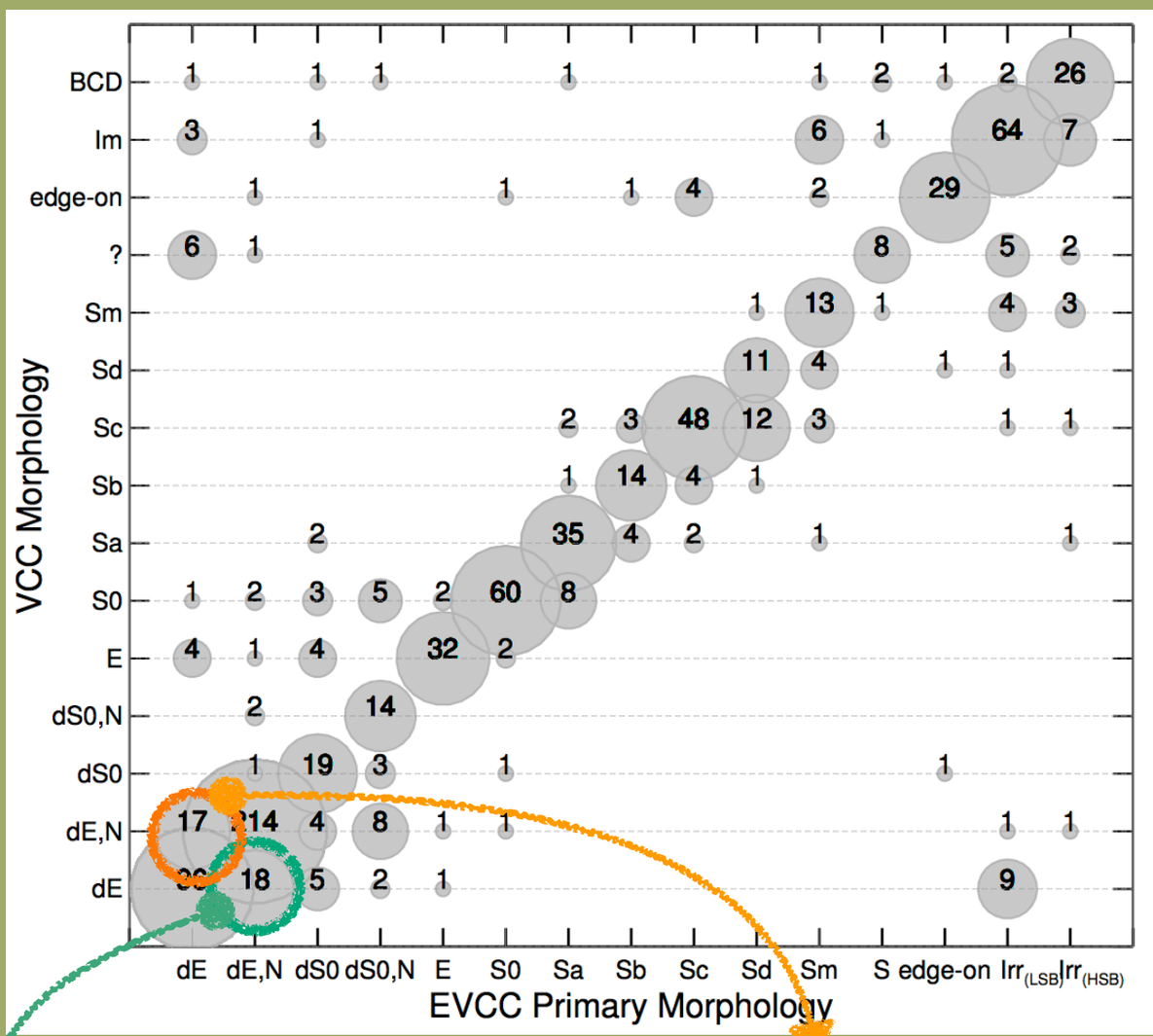
Extended Virgo Cluster Catalog (EVCC)

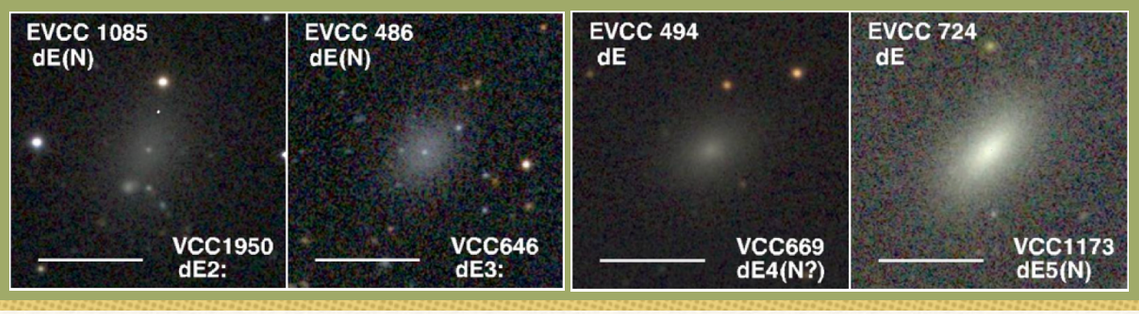
Primary vs. Secondary



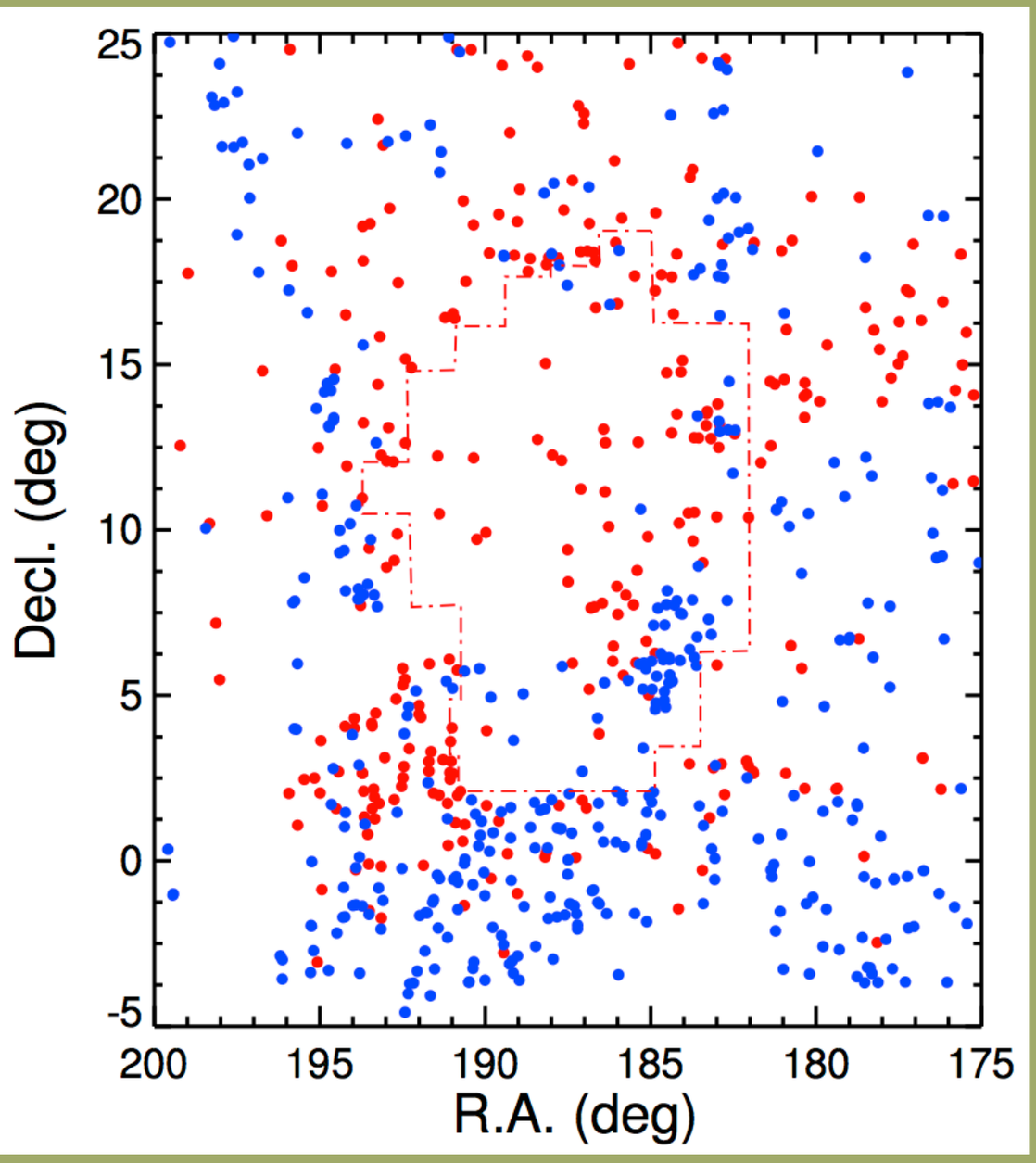


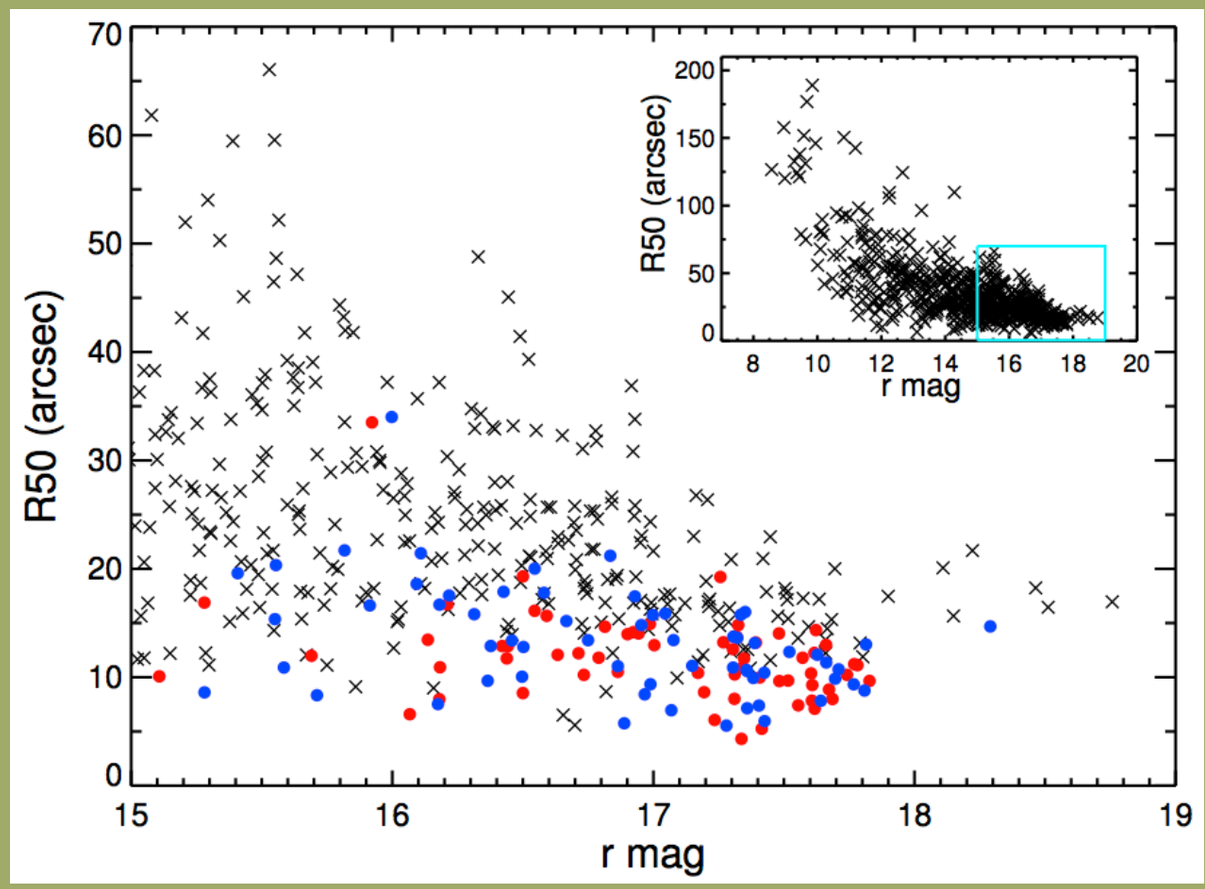
EVCC vs. VCC





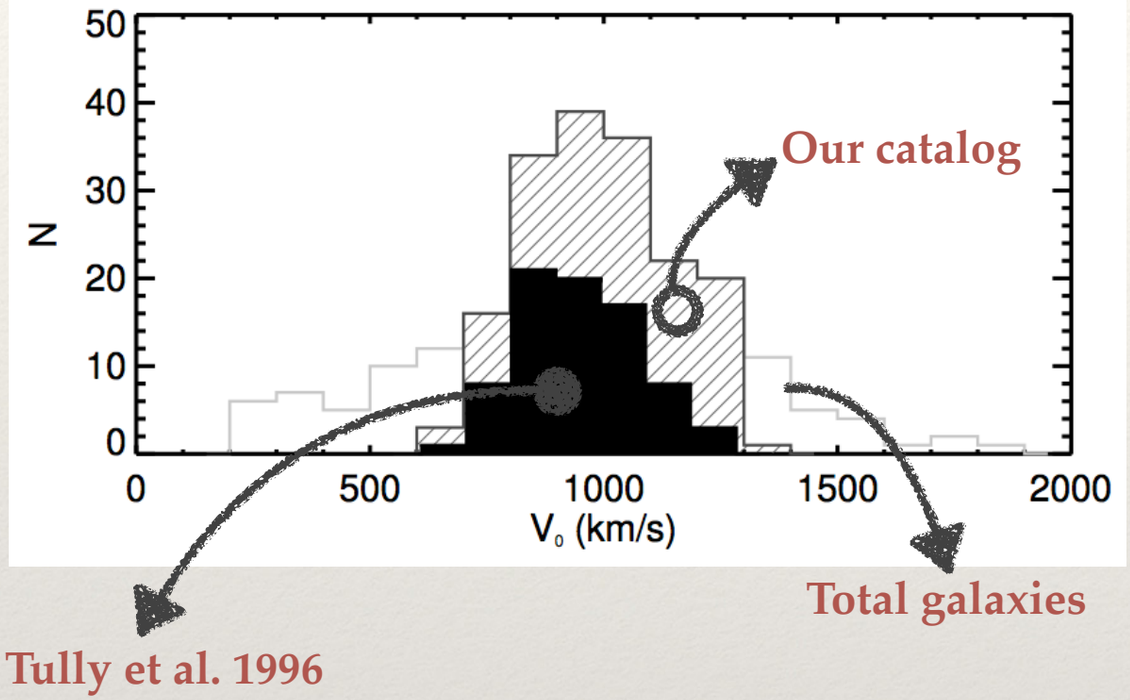
Extended Virgo Cluster Catalog (EVCC)

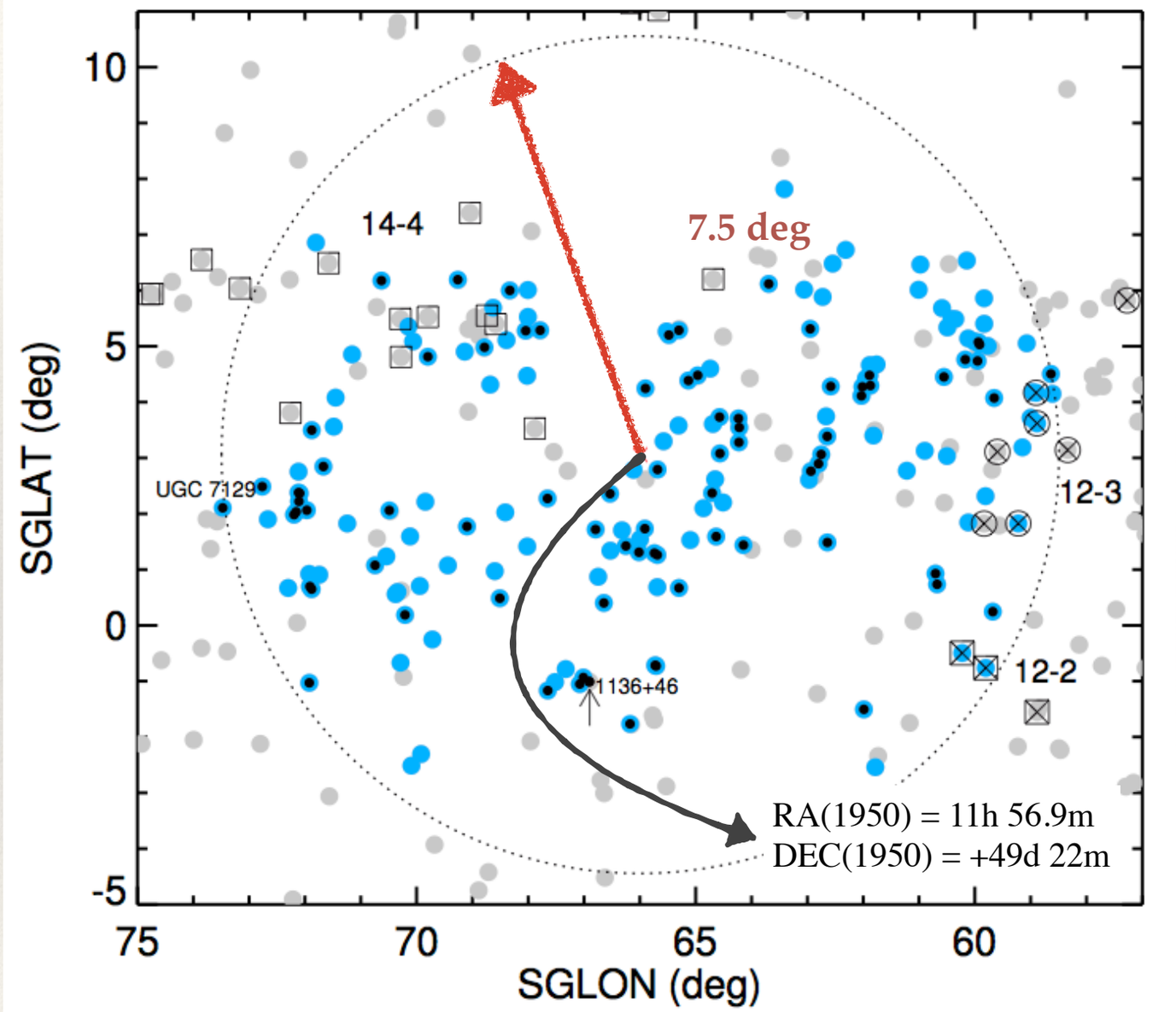




The Ursa Major Cluster

Pak et al. 2014 in prep.



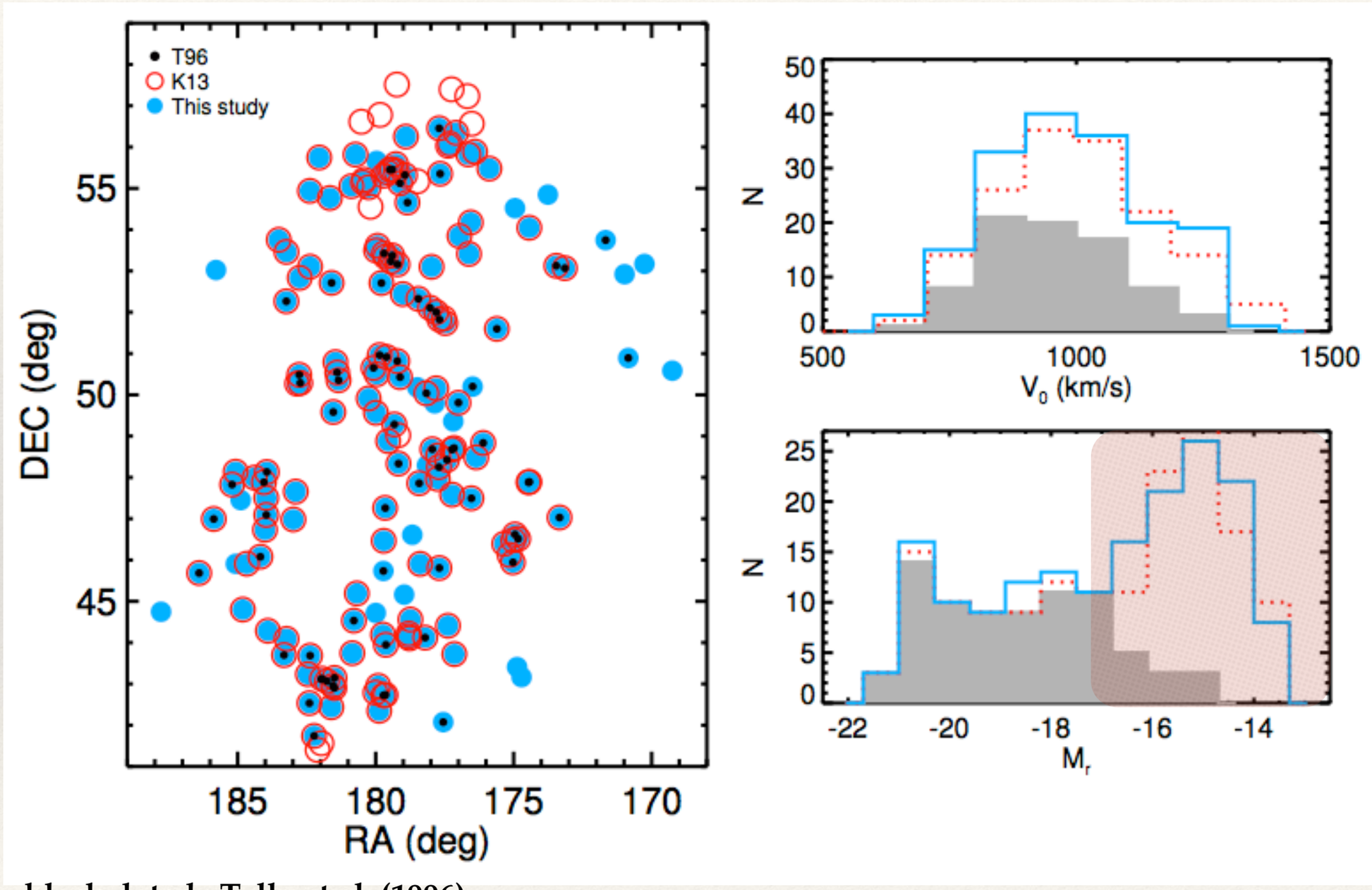


Black filled circles : 79 member galaxies (Tully et al. 1996)

Blue filled circle : 167 member galaxies (Our work)

The Ursa Major Cluster

Pak et al. 2014 in prep.



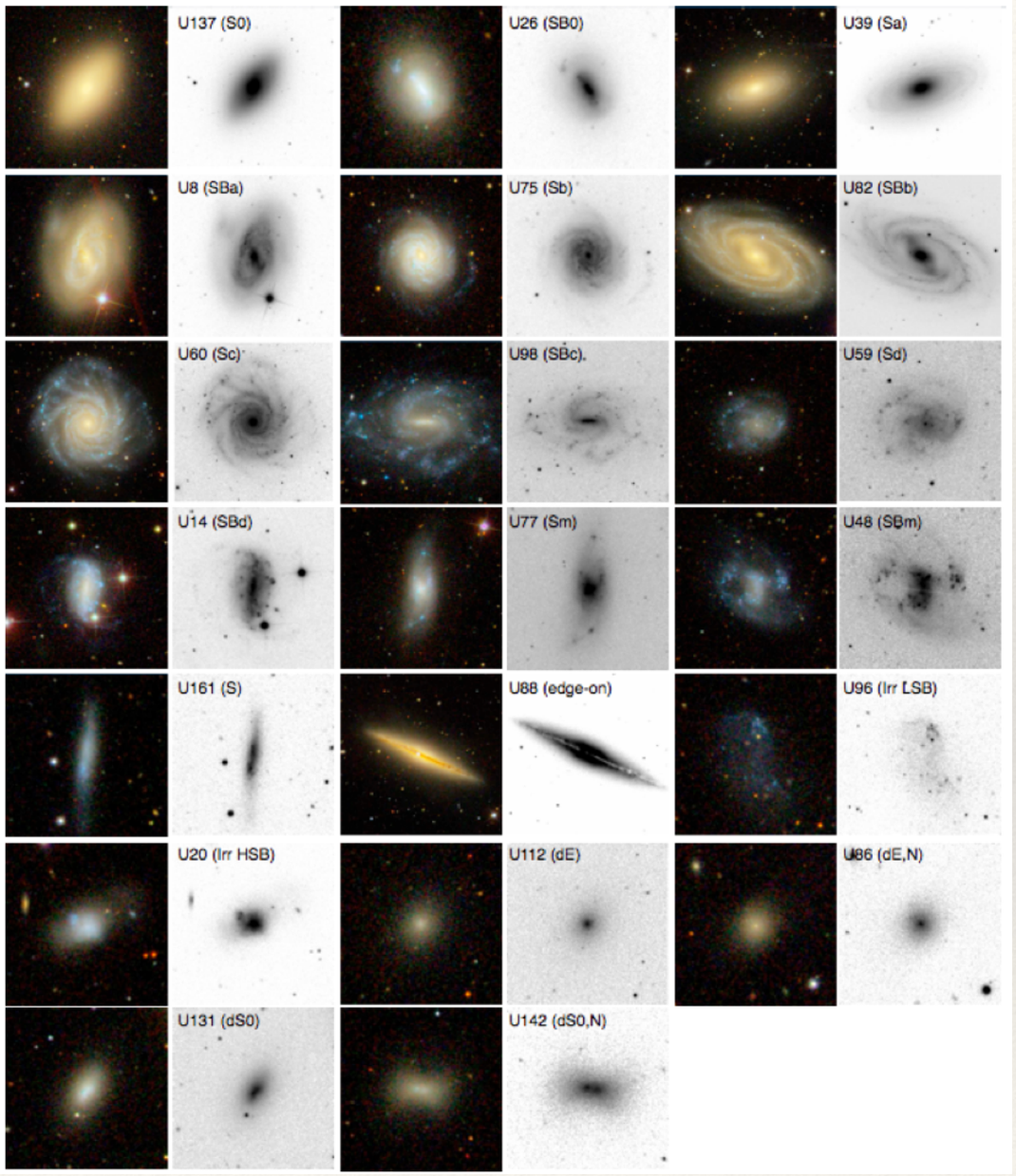
black doted : Tully et al. (1996)

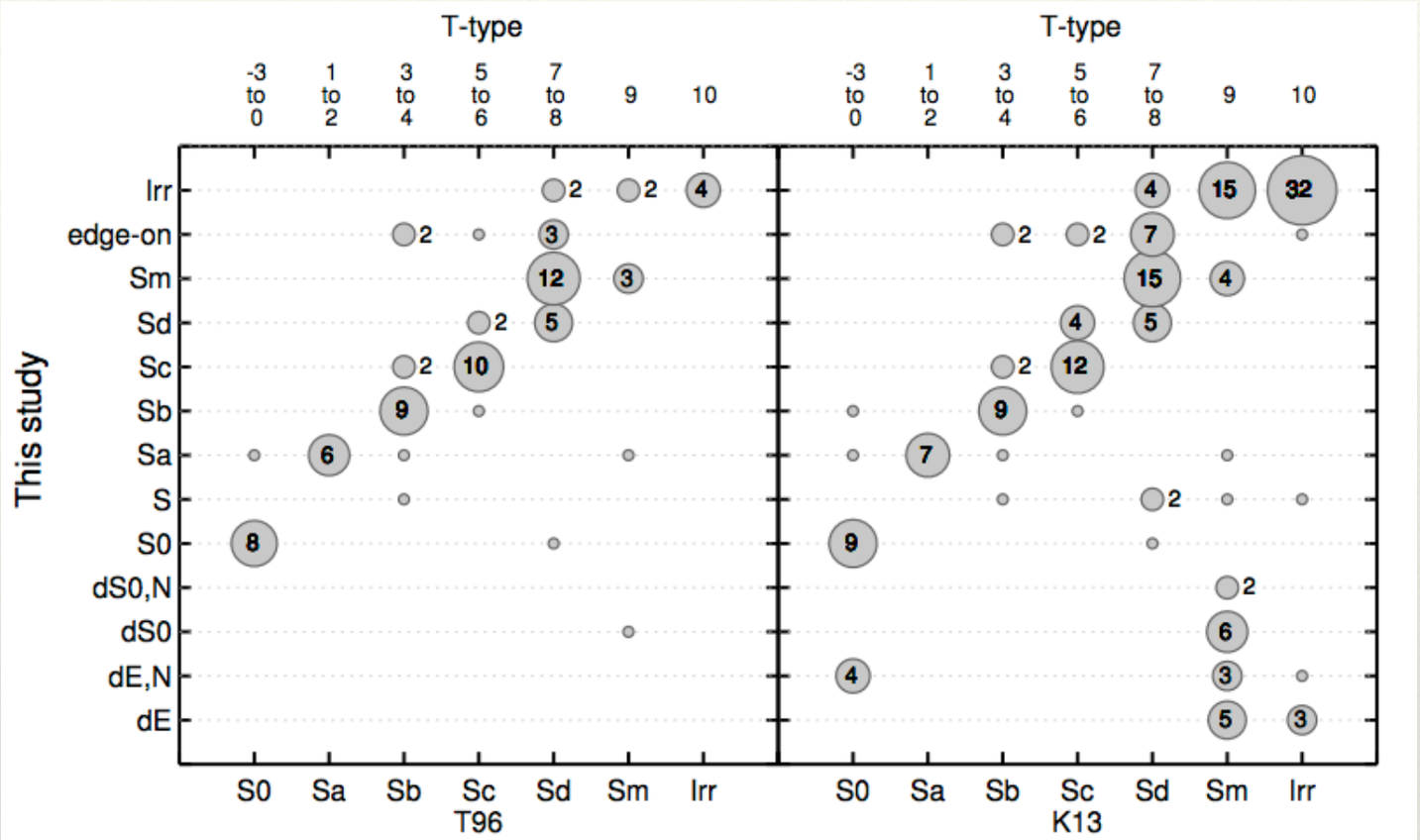
red open circles : Karachentsev et al. (2013)

blue filled circles : This study

The Ursa Major Cluster

Pak et al. 2014 in prep.

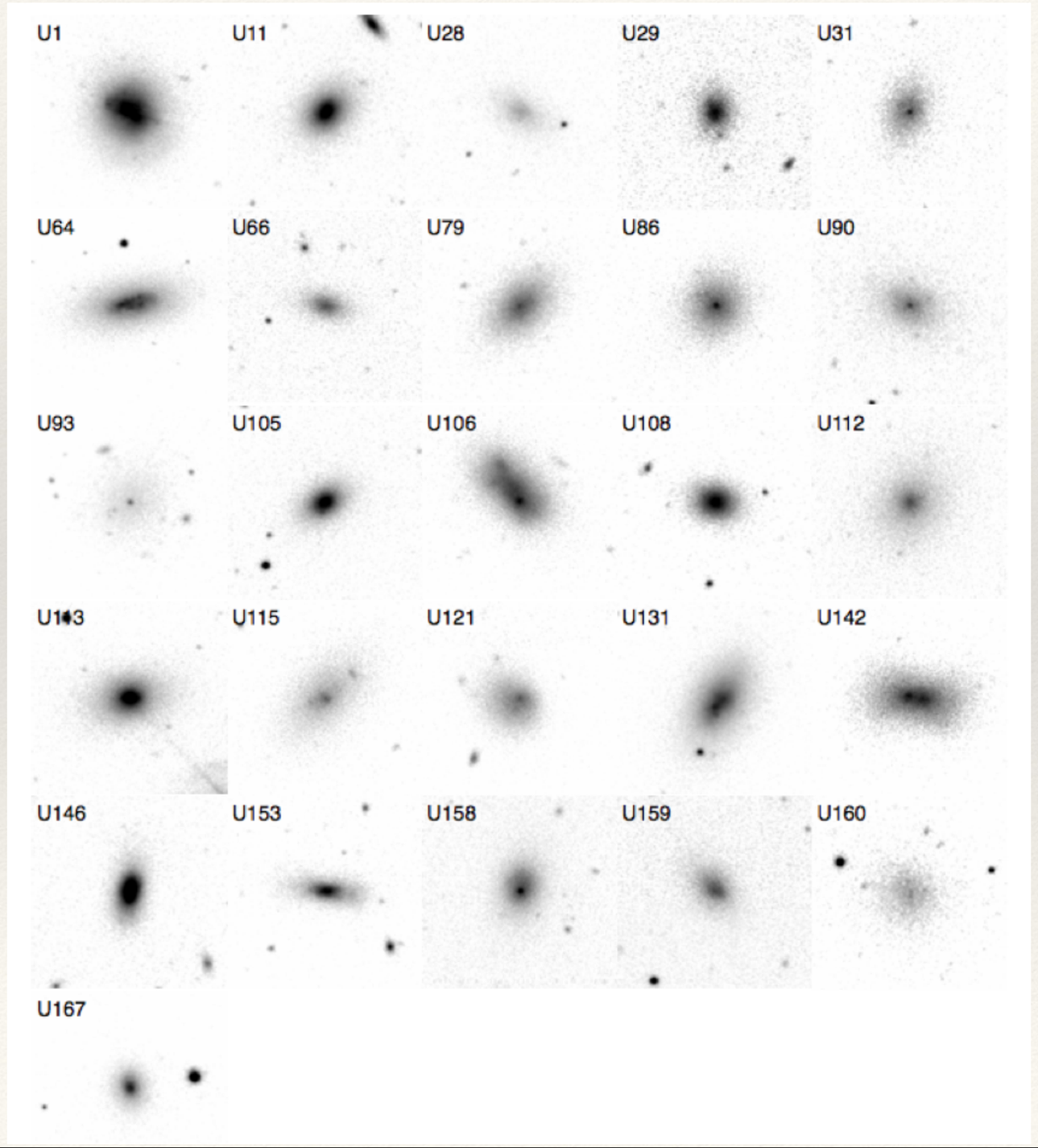


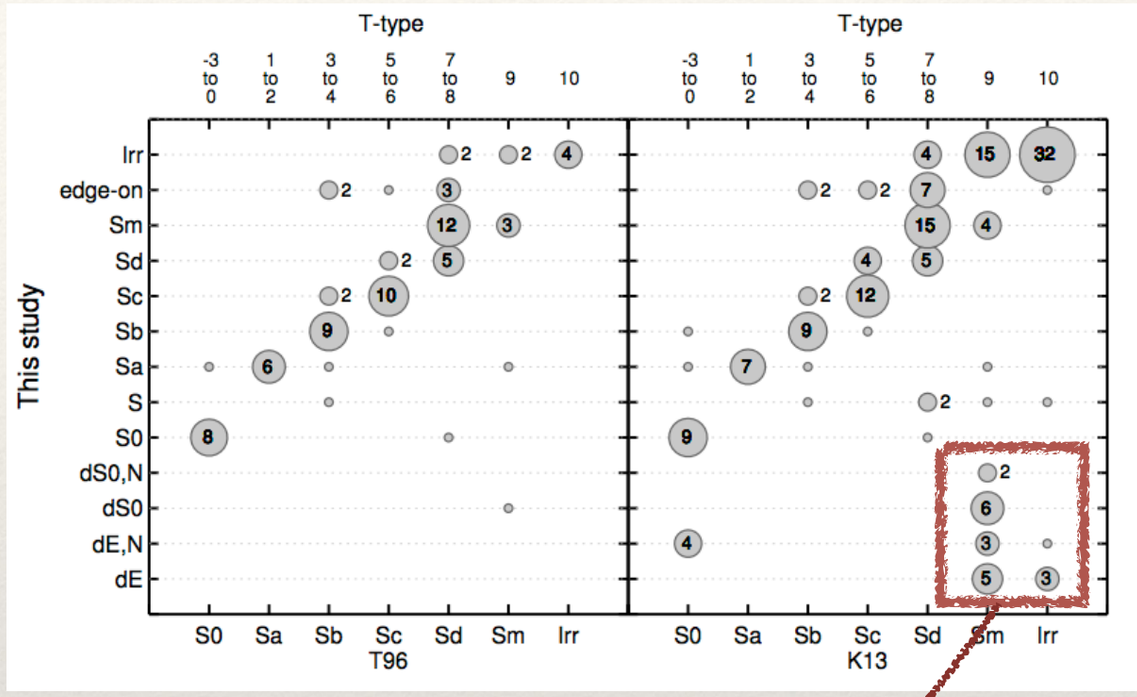


The Ursa Major Cluster

Pak et al. 2014 in prep.

Early type dwarf galaxies

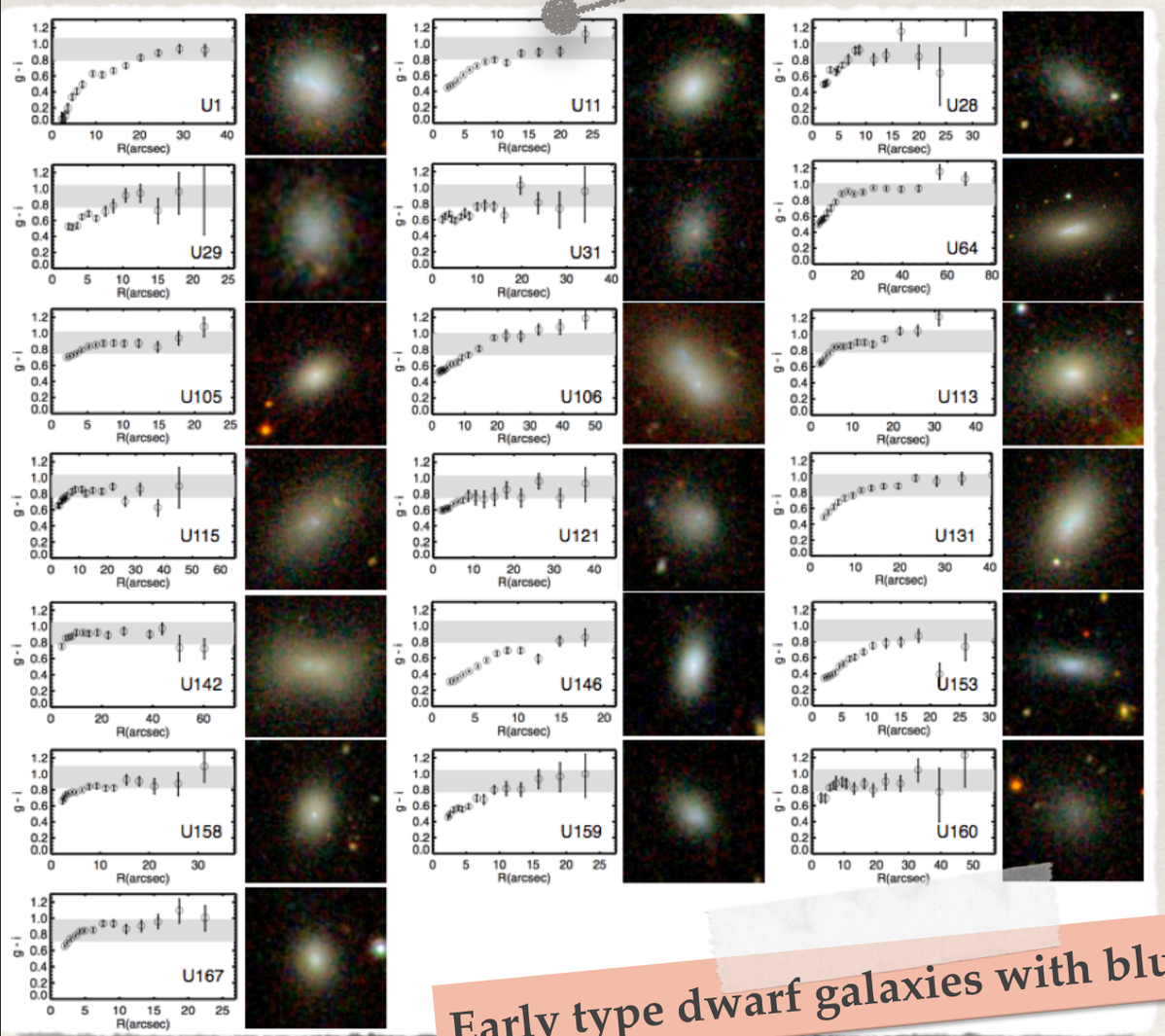




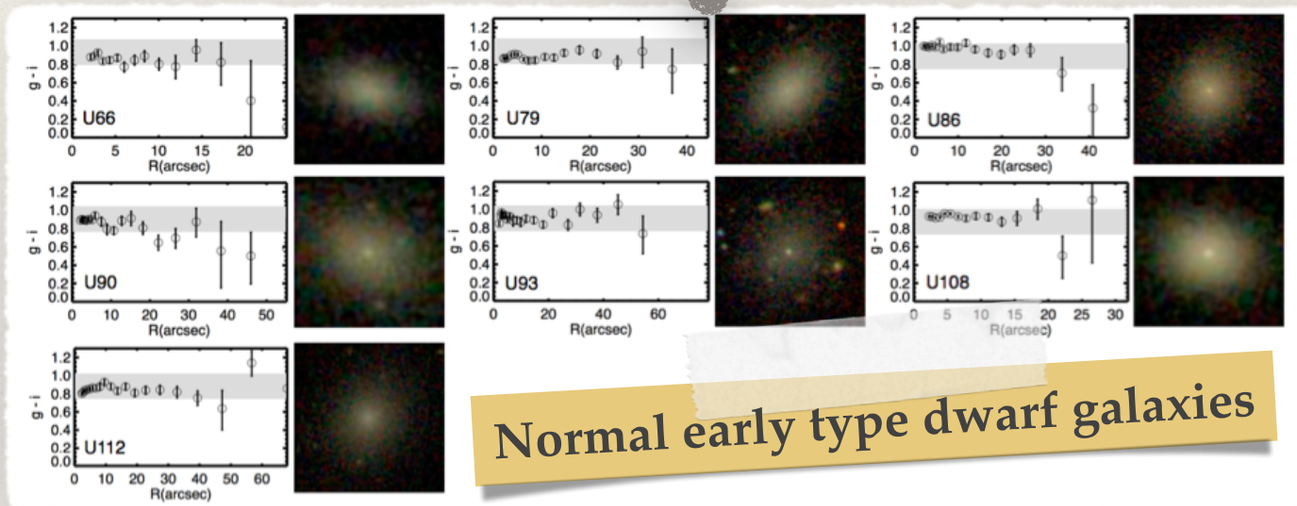
The Ursa Major Cluster

Pak et al. 2014 in prep.

Early-type dwarf galaxies

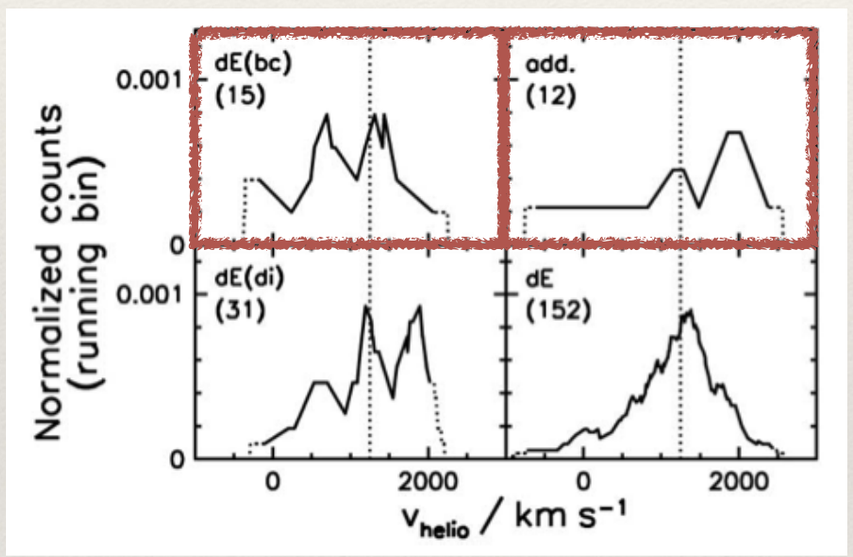


Early type dwarf galaxies with blue center



Normal early type dwarf galaxies

~ 70% of early type dwarf galaxies in the Ursa Major cluster have blue centers with evidence of ongoing or recent star formation.



The dE with blue centers reach a fraction of more than 15% of the dE population.

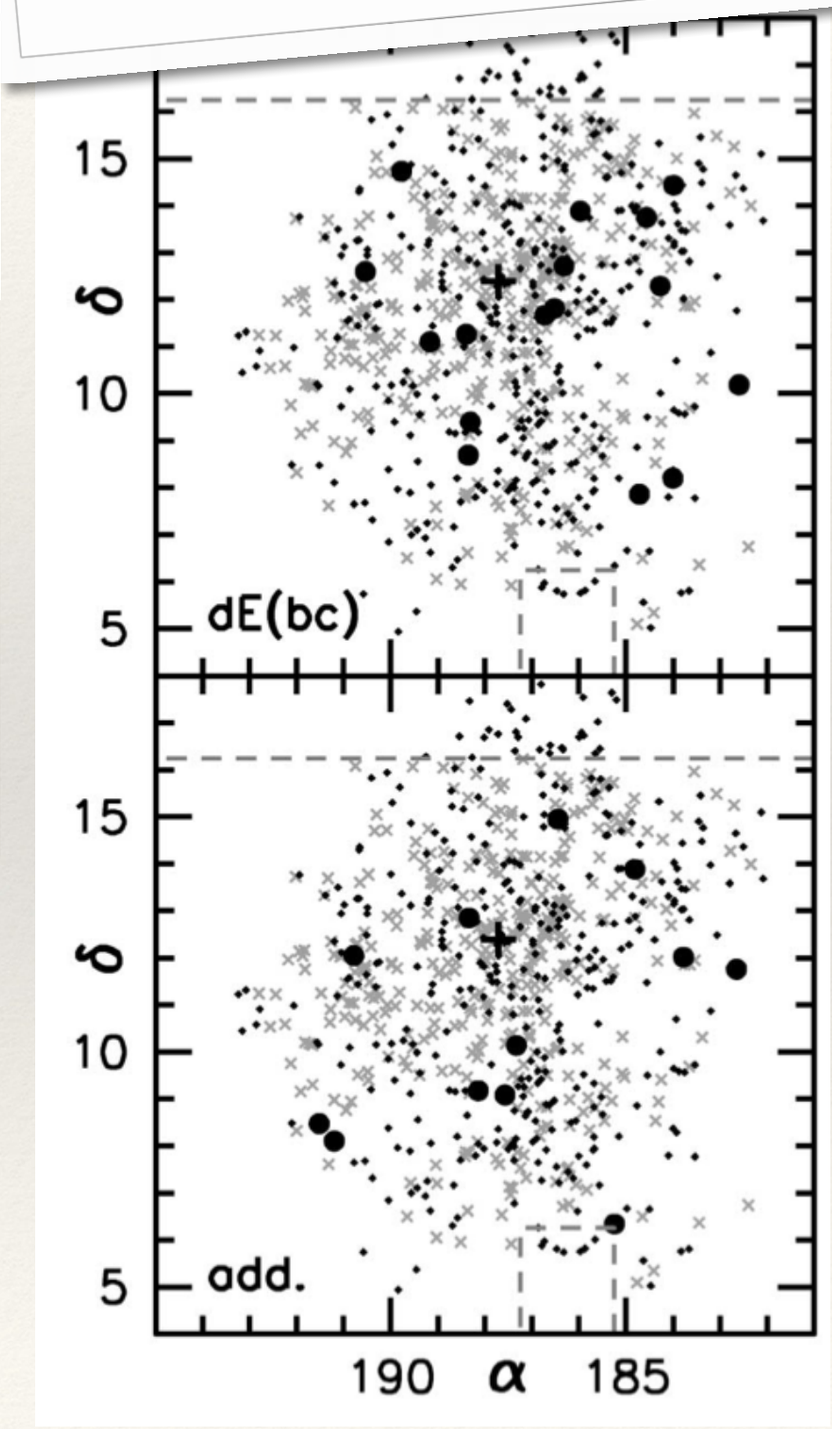
The Astronomical Journal, 132:2432–2452, 2006 December

VIRGO CLUSTER EARLY-TYPE DWARF GALAXIES WITH THE SLOAN DIGITAL SKY SURVEY. II. EARLY-TYPE DWARFS WITH CENTRAL STAR FORMATION

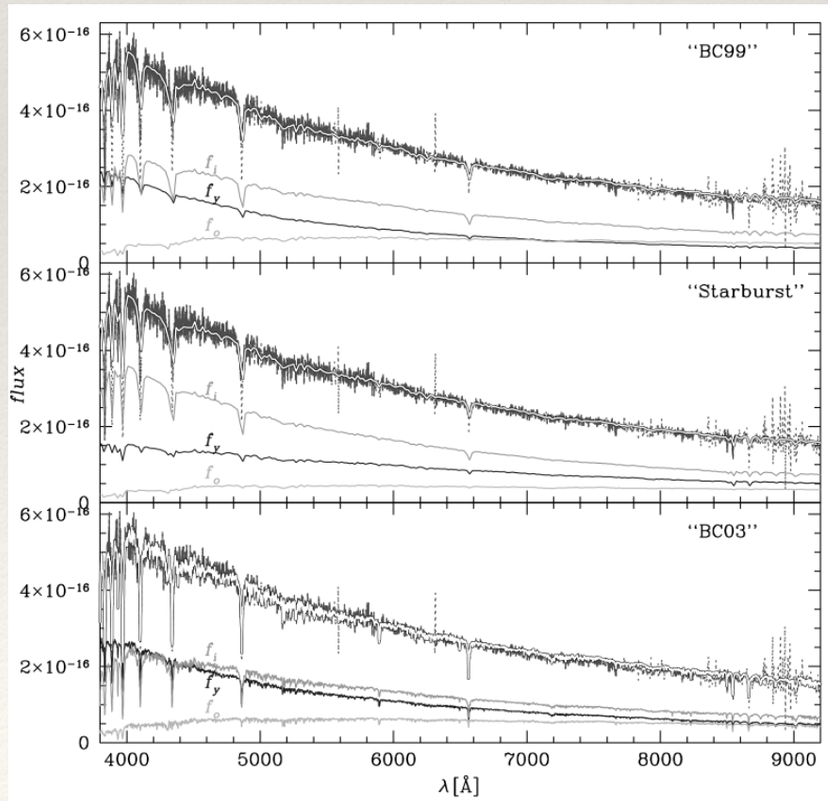
Thorsten Lisker, Katharina Glatt, Pieter Westera, and Eva K. Grebel
Astronomical Institute, Department of Physics and Astronomy, University of Basel,
Venusstrasse 7, CH-4102 Binningen, Switzerland; tlisker@astro.unibas.ch

Received 2006 June 27; accepted 2006 August 10

prep.



The dE with blue centers will appear like ordinary dEs within approximately one gigayear or less after the last episode of star formation.

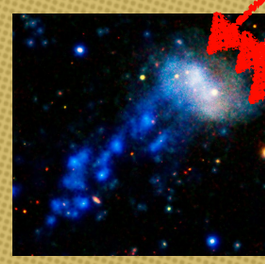


The Ursa Major Cluster

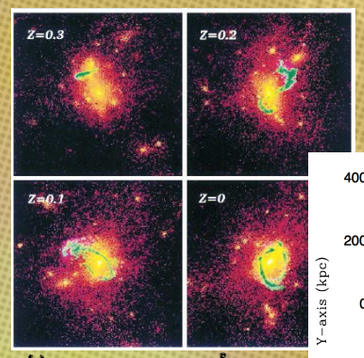
Pak et al. 2014 in prep.

Formation of dE with blue centers

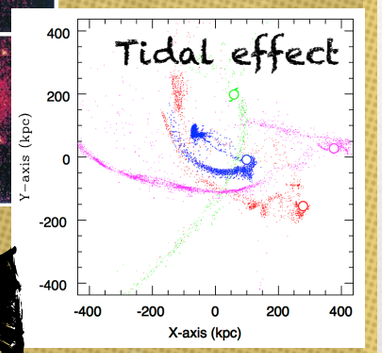
Virgo Cluster; Lisker et al. (2006b)



ram-pressure stripping



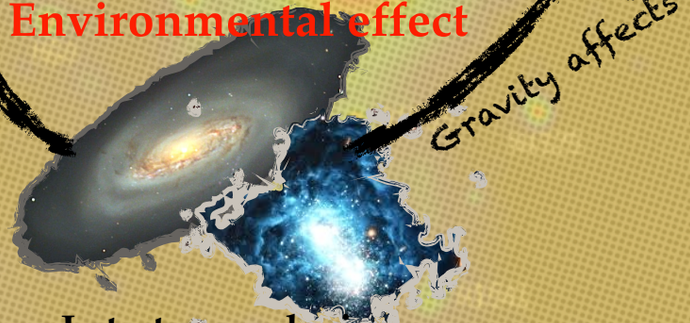
Harassment



Environmental effect

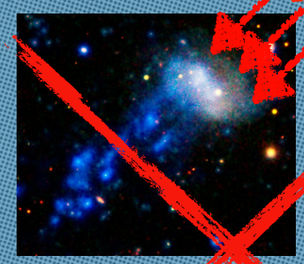
with ICM

Gravity affects

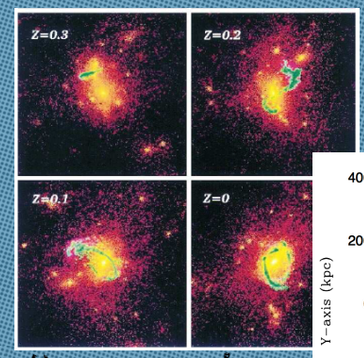


Late-type galaxies

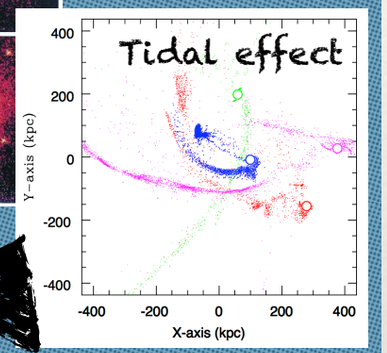
Ursa Major Cluster



ram-pressure stripping



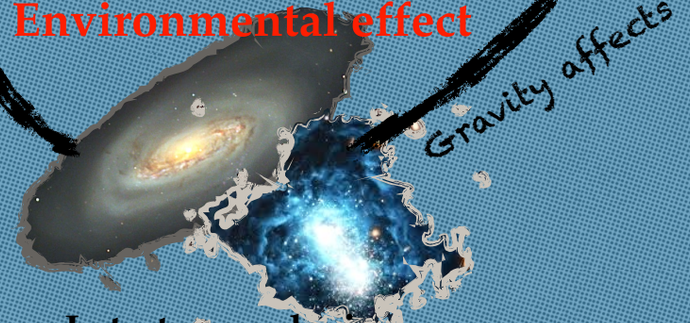
Harassment



Environmental effect

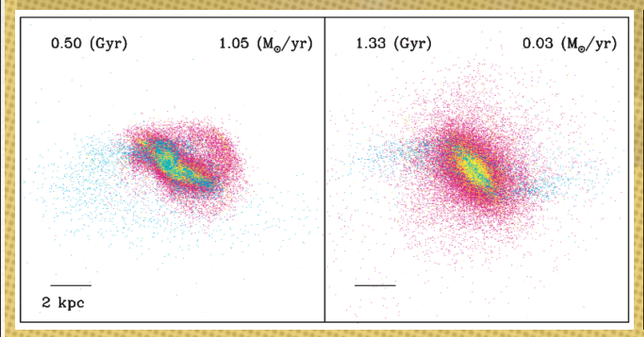
with ICM

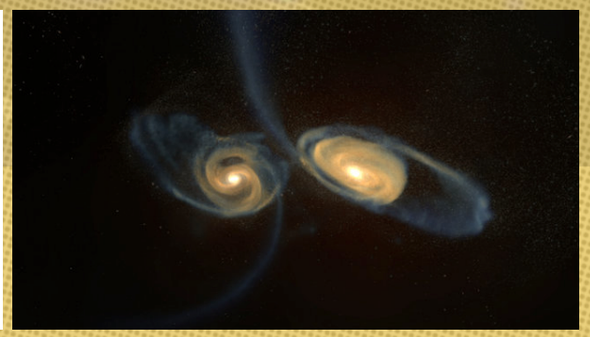
Gravity affects



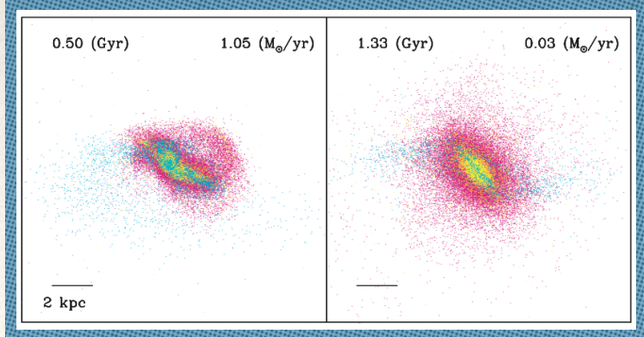
Late-type galaxies

Merging



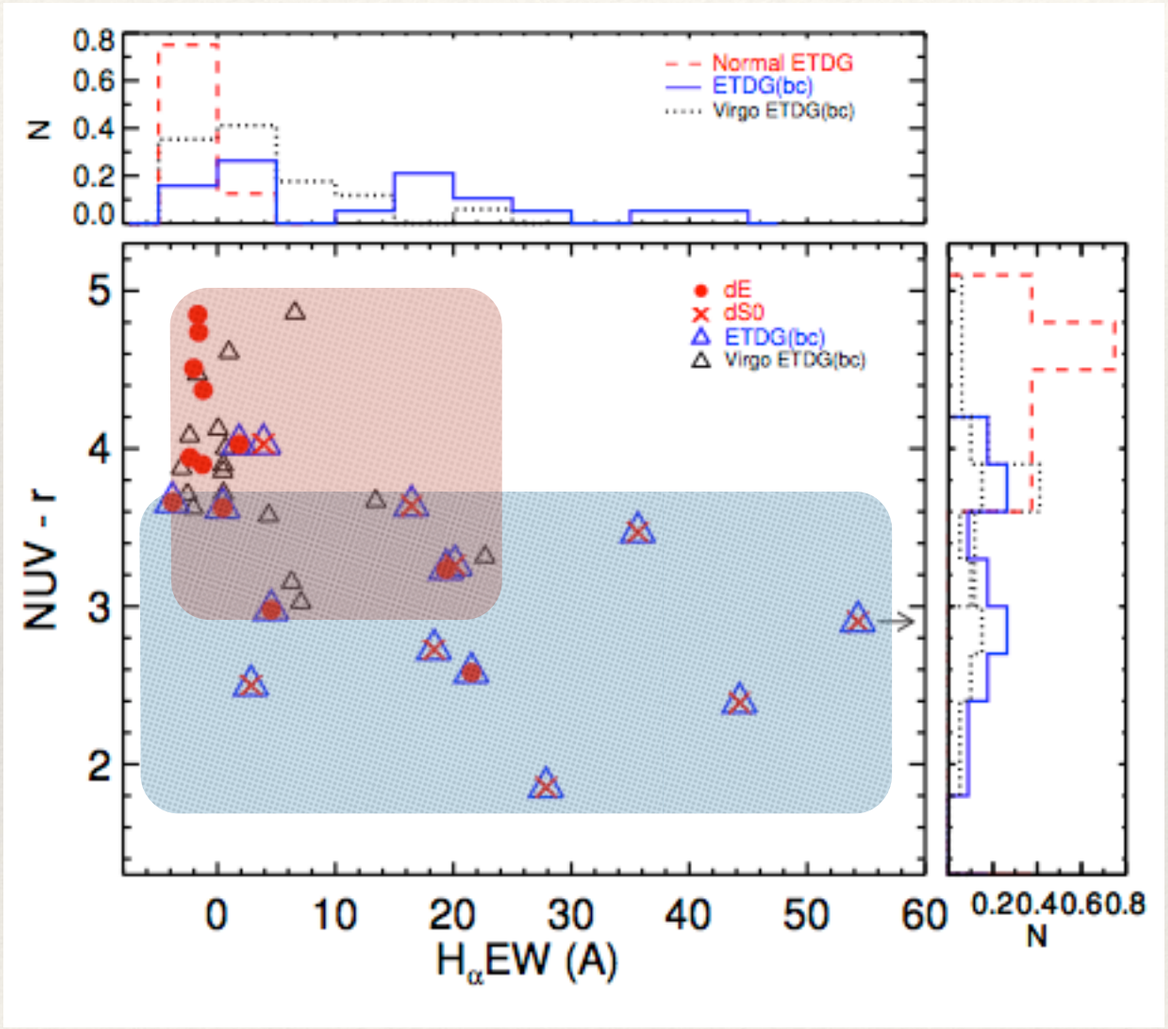


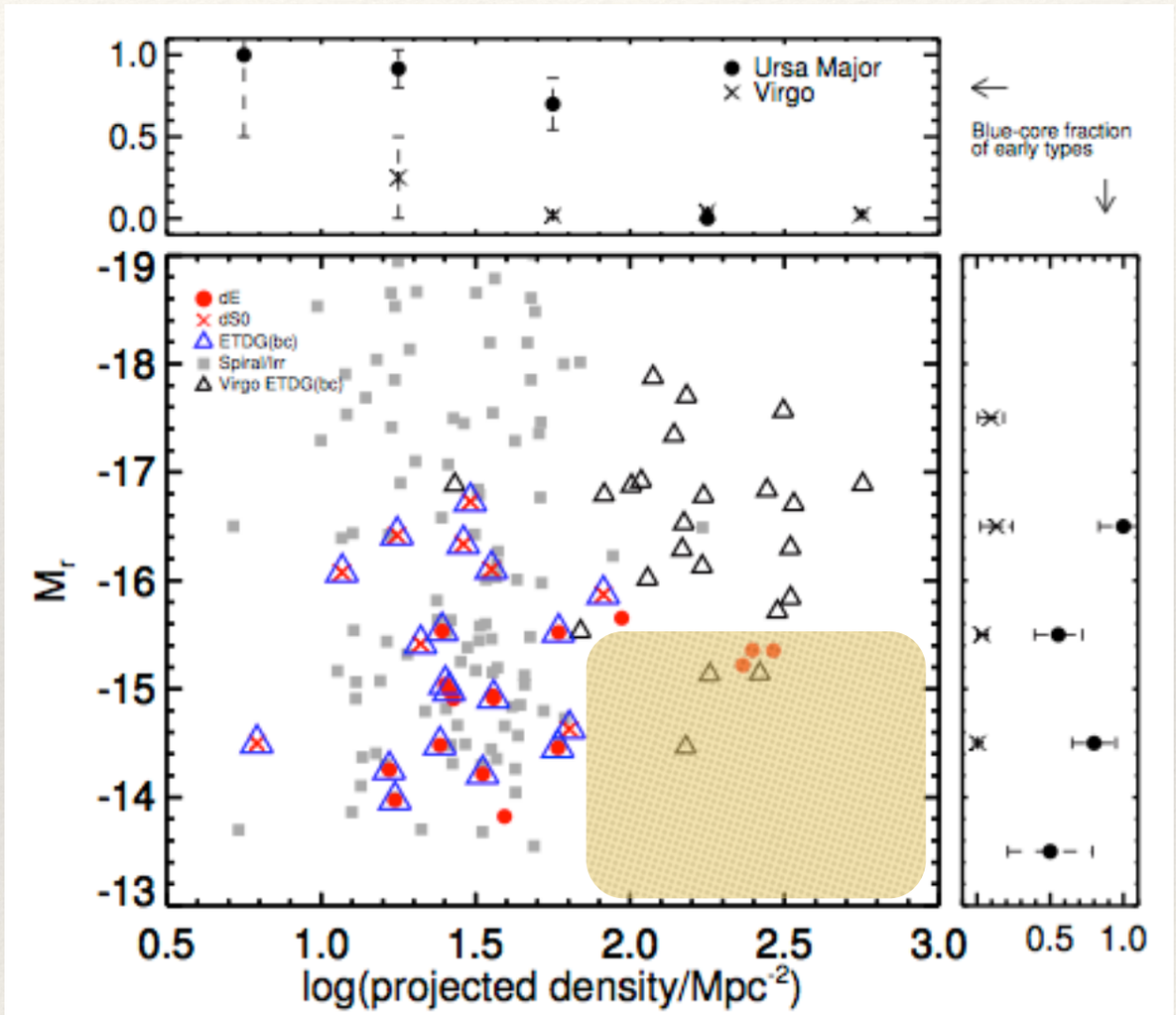
Merging



The Ursa Major Cluster

Pak et al. 2014 in prep.





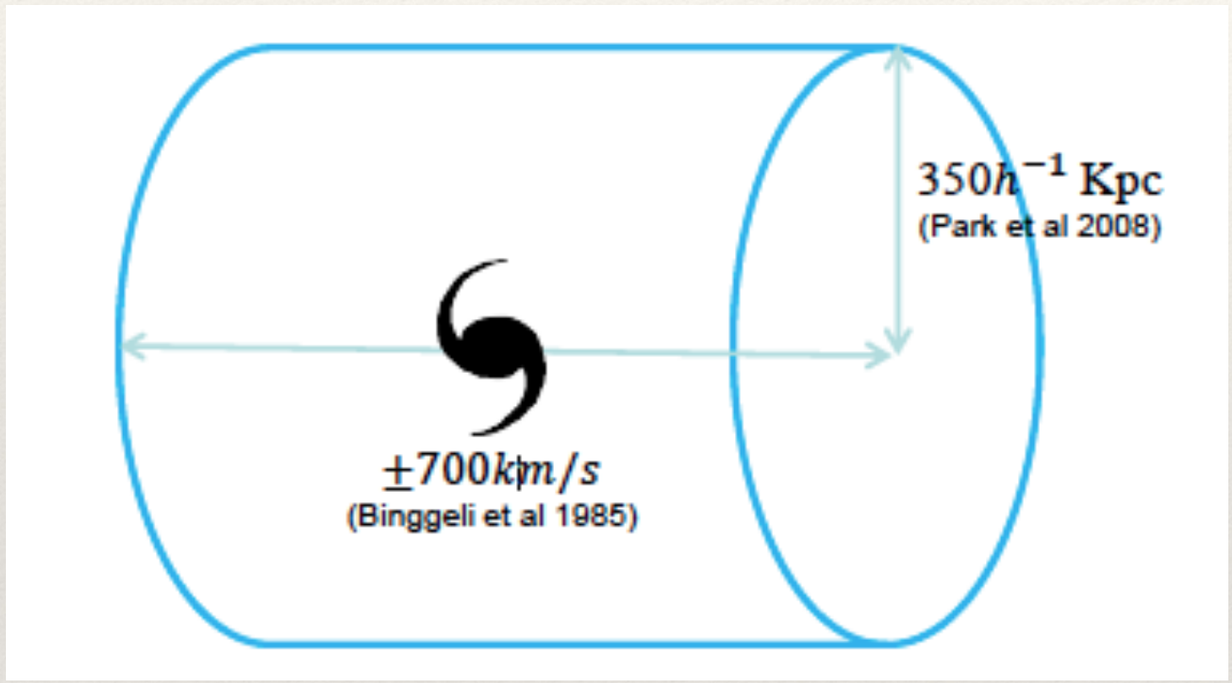
Virgo Cluster : ~15% of early type dwarf galaxies have blue centers

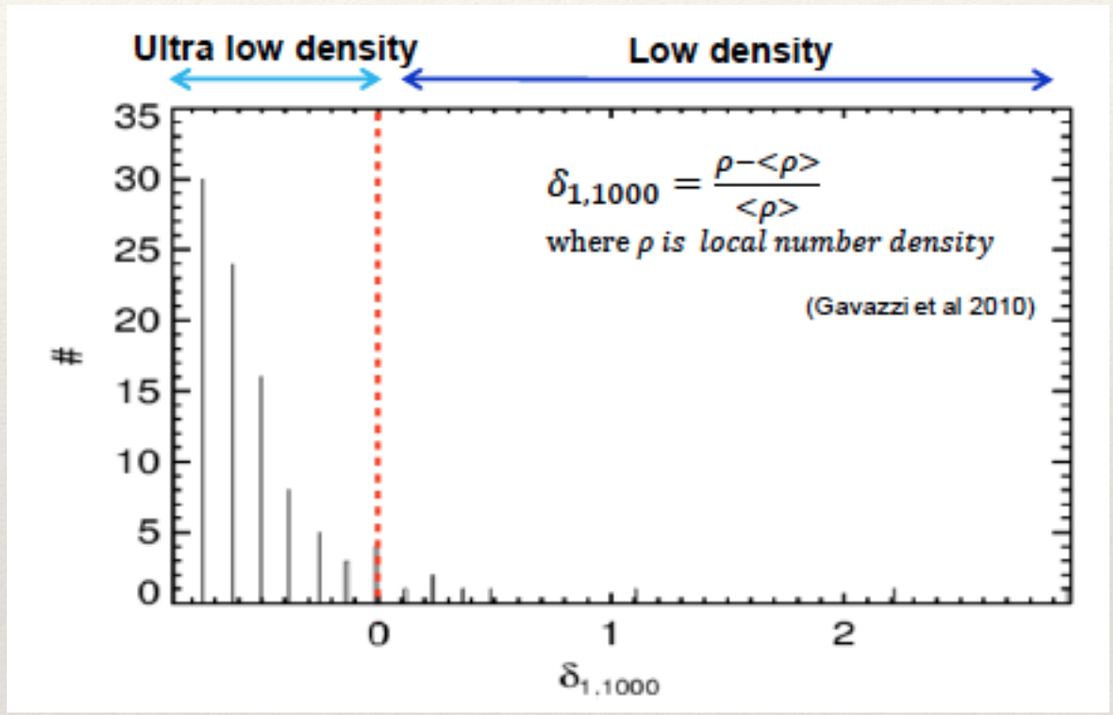
Ursa Major Cluster : ~70% of early type dwarf galaxies have blue centers

Isolated early type dwarf galaxies

Kim et al. 2014 in prep.

Using SDSS DR8

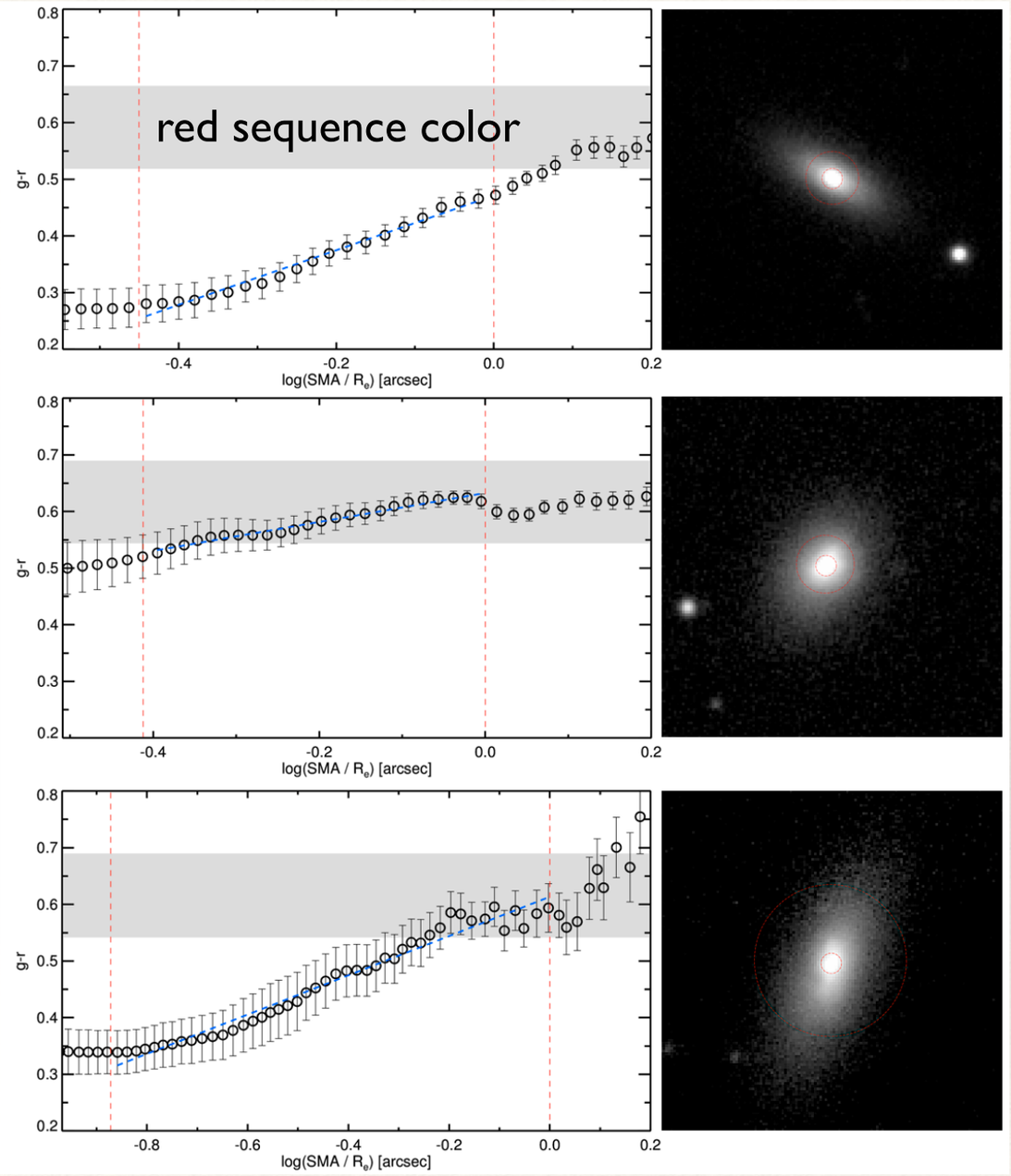


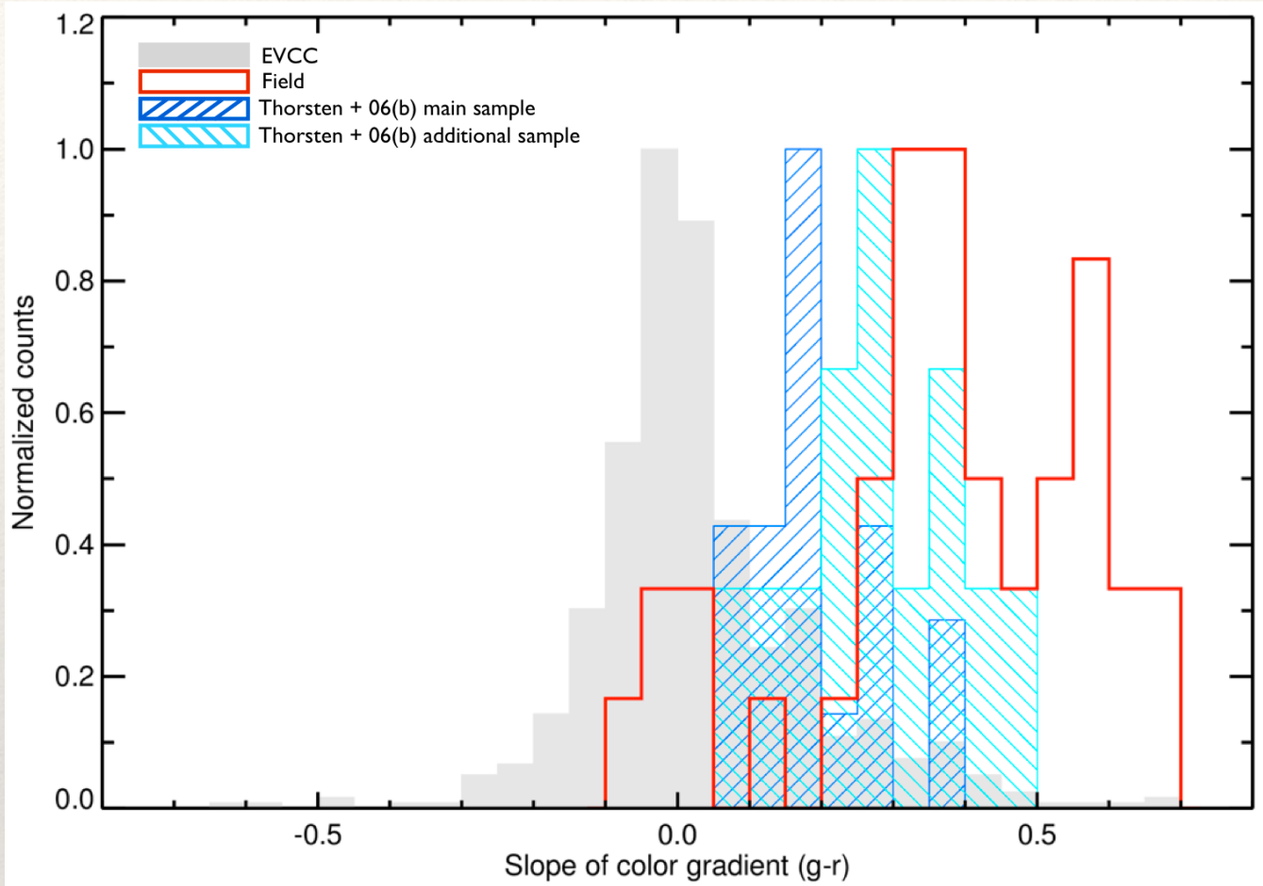


Total isolated galaxies : 505
Early type dwarf galaxies : 39/505 (7.7%)

Isolated early type dwarf galaxies

Kim et al. 2014 in prep.



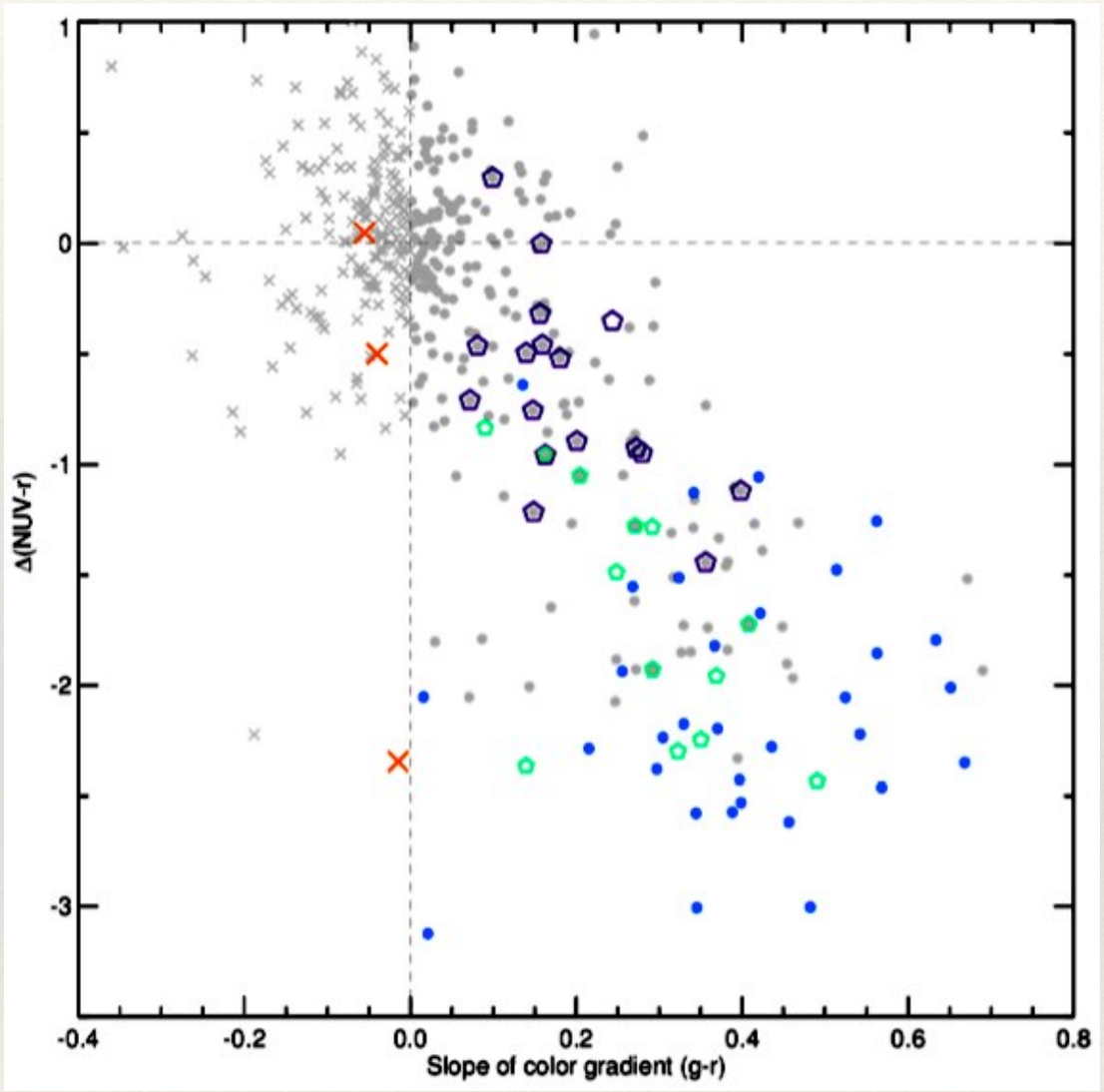


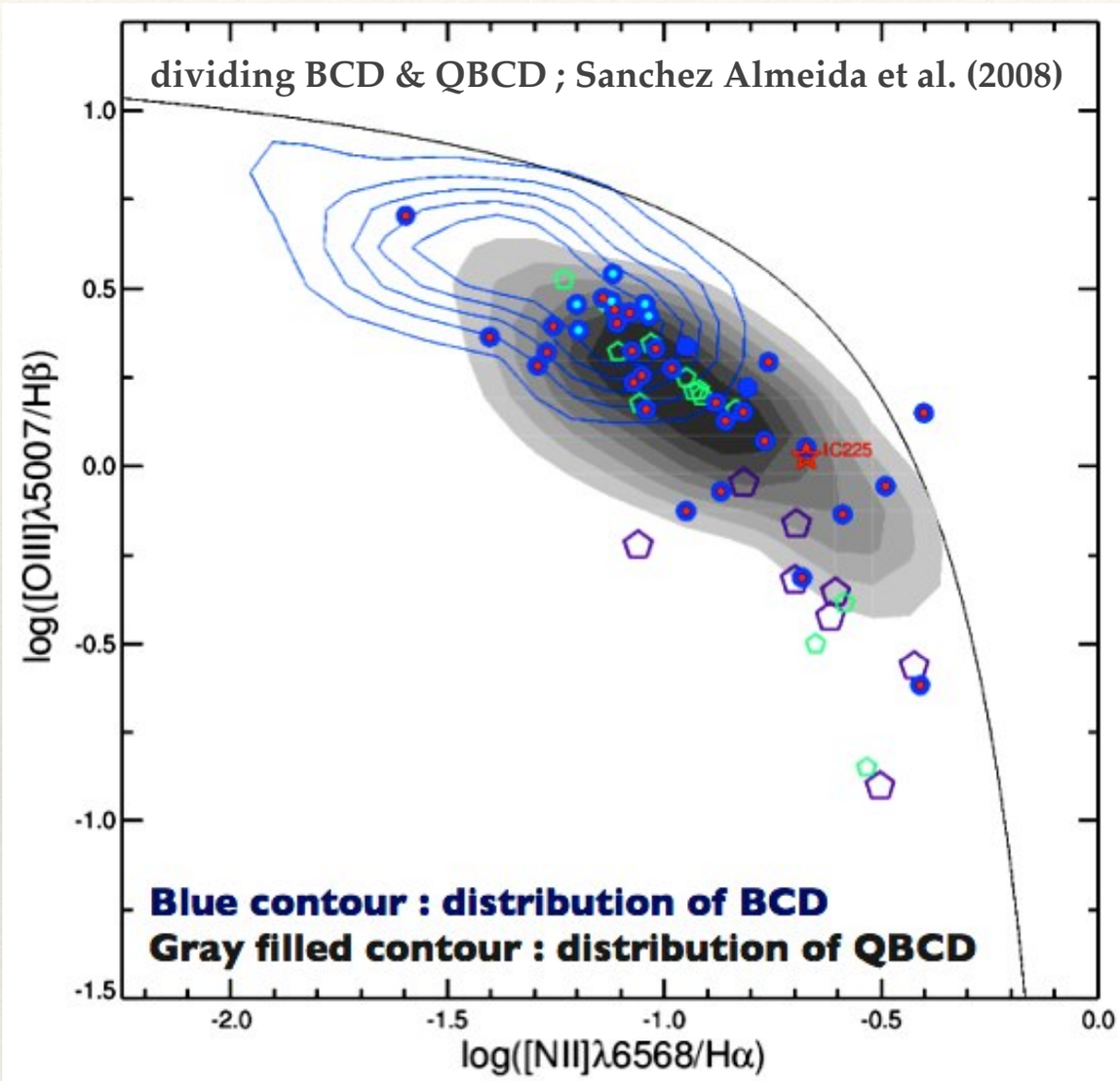
1) 92%(36/39) of ETDGs in the field shows positive color gradients (red histogram).

2) All blue-centered early-type dwarf galaxies in the Virgo cluster (i.e., main and additional sample from Lisker + 06b) show positive color gradient.

Isolated early type dwarf galaxies

Kim et al. 2014 in prep.

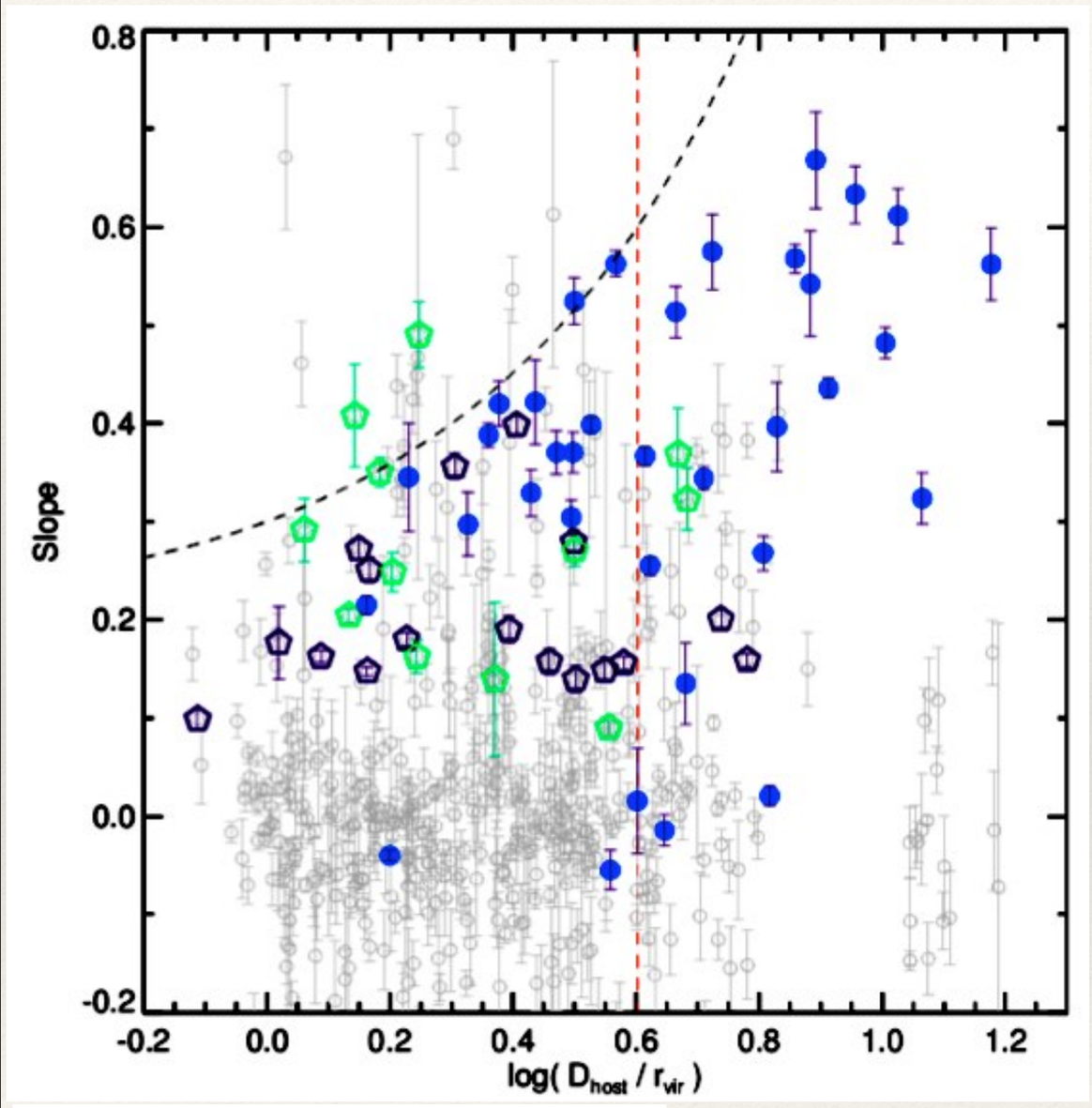




N-ETDGs in the EVCC
P-ETDGs in the EVCC
N-ETDGs in the field
P-ETDGs in the field
Main sample of Lisker et al. (2006b)
Additional sample of Lisker et al. (2006b)
QBCD of P-ETDGs
BCD of P-ETDGs

Isolated early type dwarf galaxies

Kim et al. 2014 in prep.



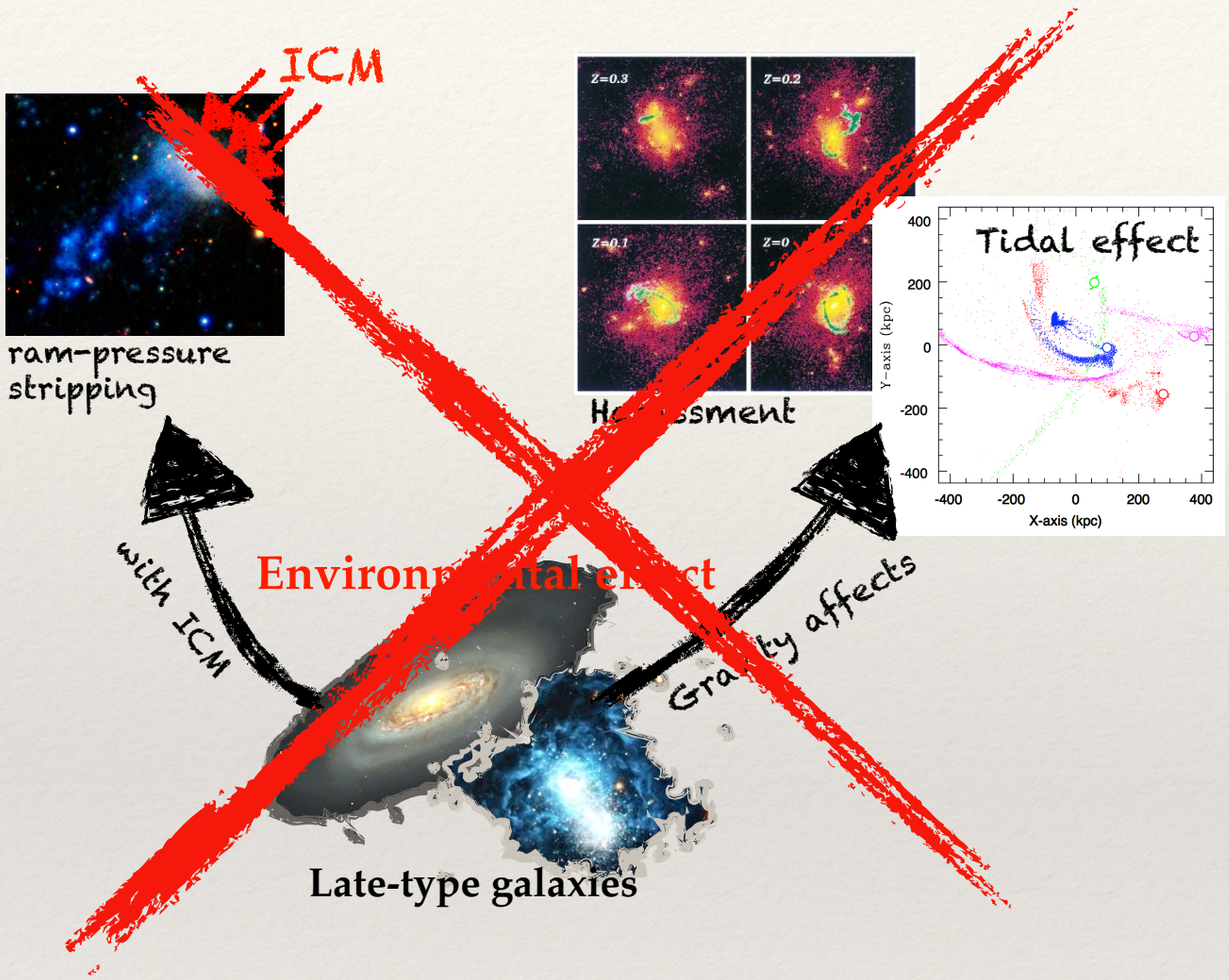
We estimate environments for ETDGs relative to more luminous neighbor galaxies.The 2MASS Extended Source Catalog was used to identify luminous galaxy hosts.To quantify environment, we determine the distance, D_{host}, for each of ETDG to its nearest luminous neighbor.We compare the distribution of color gradient slope of ETDGs in the field to those in the Virgo cluster as a function of distance from its host galaxy, in units of the host's virial radius. In the case of P-ETDGs in the field, a correlation between the color gradient slope and distance from the host galaxy is shown.As the P- ETDGs are located near to luminous host galaxy, their strengths of color gradient appear to decrease, indicating that star formation activity of P-ETDGs in their centers are diminished.This is somewhat consistent with the result of Geha et al. (2012) where the majority of quenched dwarf galaxies are within $2r_{vir}$ of a massive host galaxy and would thus be considered as satellite galaxies (see also Wang et al. 2009).

- N-ETDGs in the EVCC
- P-ETDGs in the EVCC
- N-ETDGs in the field
- P-ETDGs in the field
- Main sample of Lisker et al. (2006b)
- Additional sample of Lisker et al. (2006b)

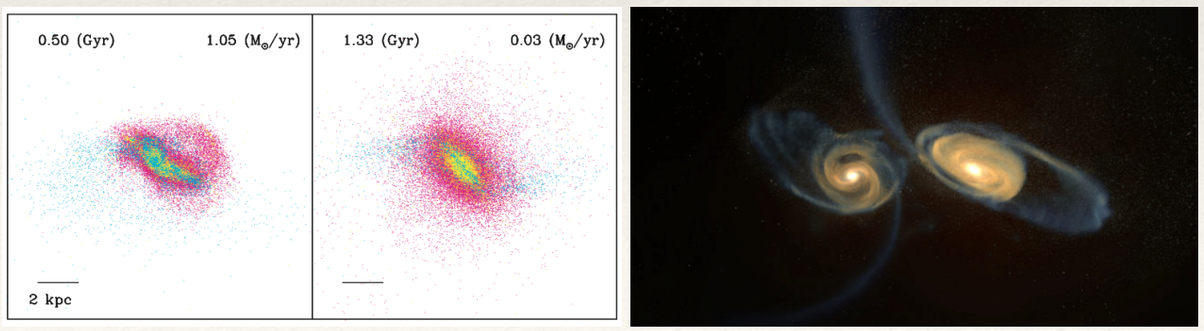
D_{host} : distance for each of our galaxies to its nearest “luminous” neighbor ($M_k < -23$, $2.5 \times 10^{10}\ M_{sun}$).
r_{vir} : virial radius of luminous neighbor.

Evolution of dwarf elliptical galaxies with blue center in various environmental effect

Kim et al. 2014 in prep.



Merging



Ursa major cluster

Gravity affects + Merging

70%

Virgo Cluster

Having various environmental effect

(Gravity affects + with ICM) + Merging

15%

Field

Merging

92%

'In order to determine evolution of galaxies, the first thing we need to do is to understand environmental effects.'

Thanks