Nuclear star clusters in 228 spiral galaxies with Hubble

Iskren Georgiev

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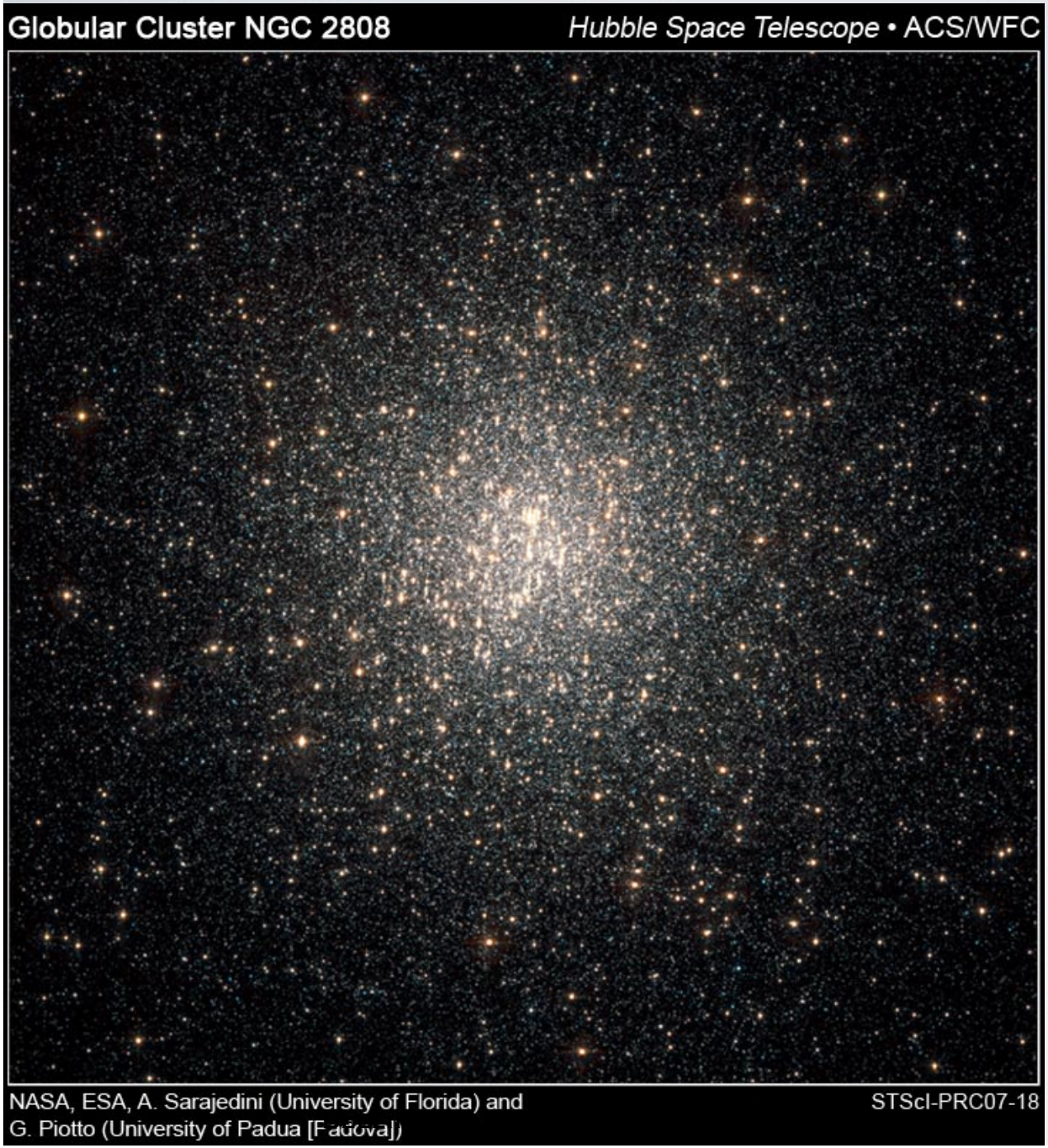
ESTEC, Noordwijk, Netherlands

In collaboration with: **T.Böker, P.Goudfrooij, Th. Puzia, M.Hilker, S.Mieske, H.Baumgardth**

Massive/globular star clusters



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- Size (R_{EFF} = 3 pc)
- Density (10^3 ✶/pc^3)
- coeval stellar population

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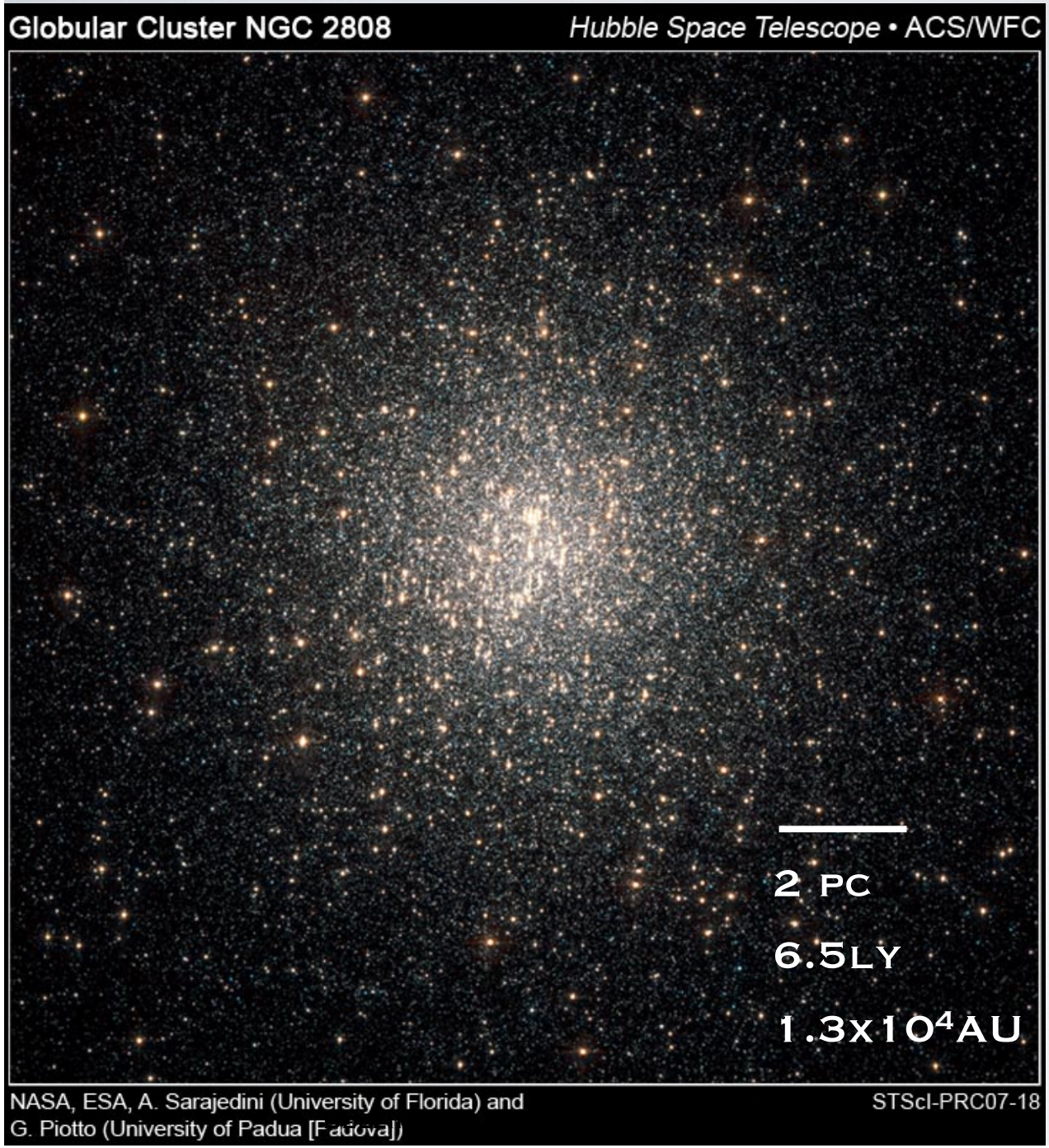

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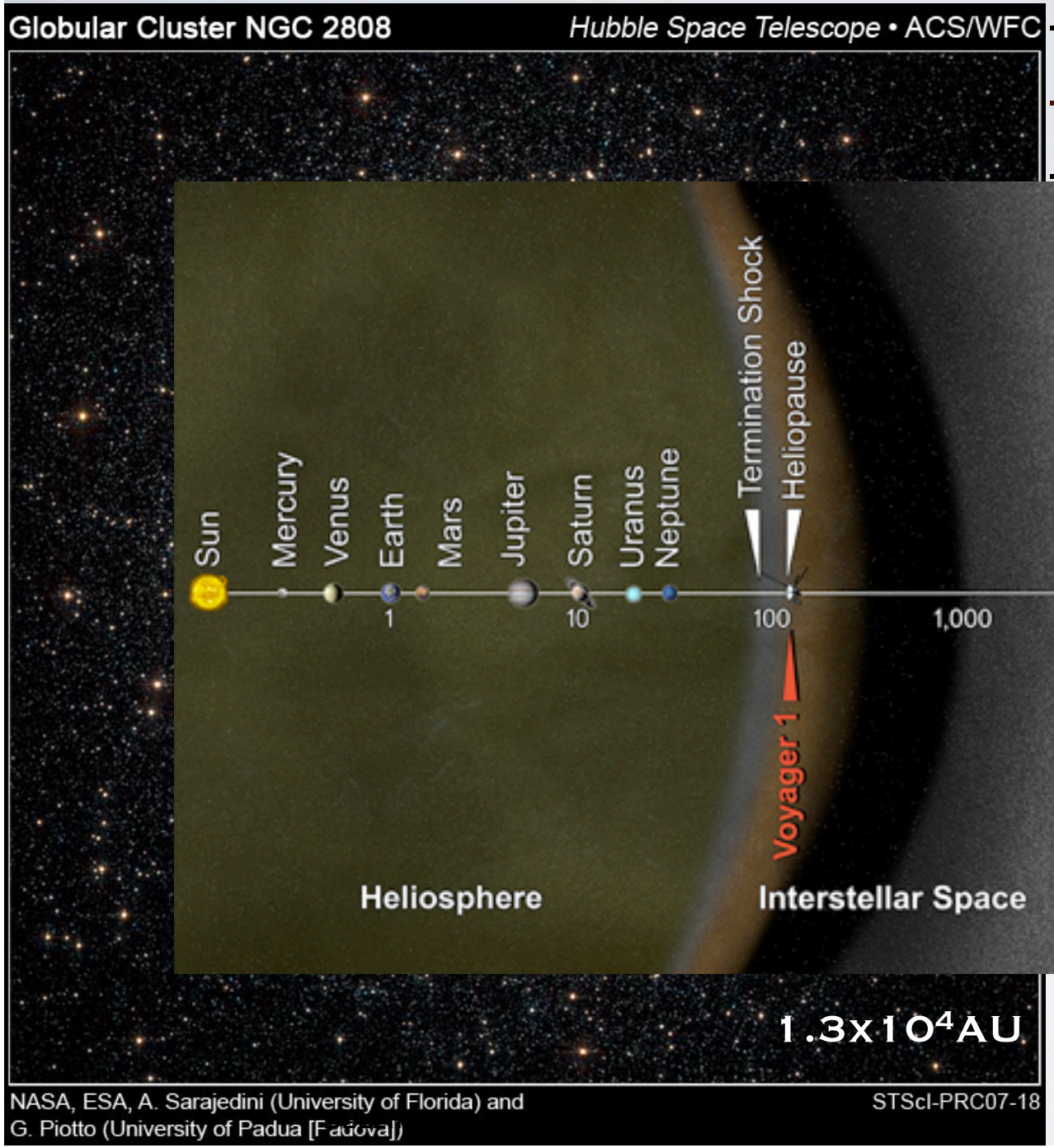

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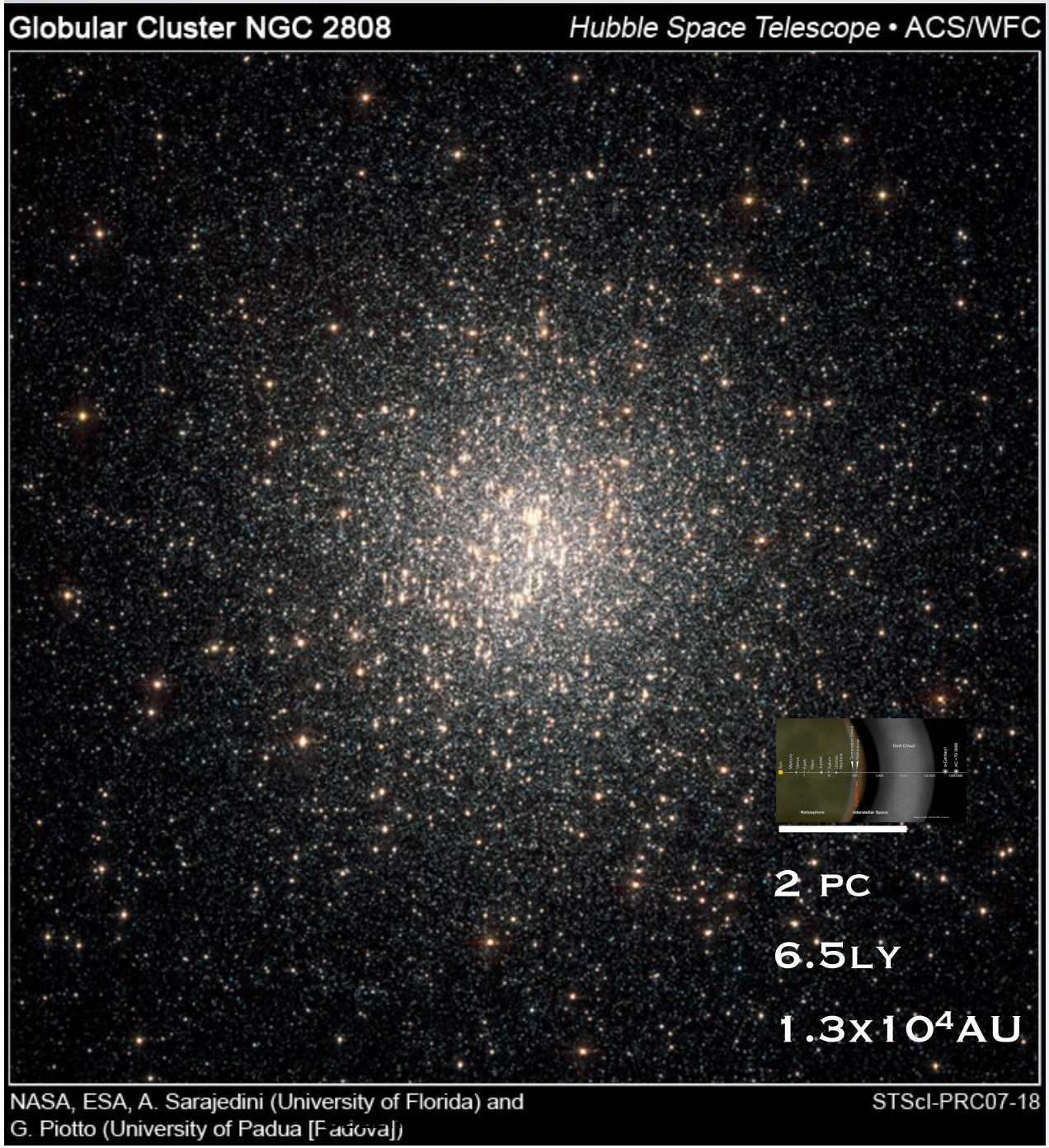

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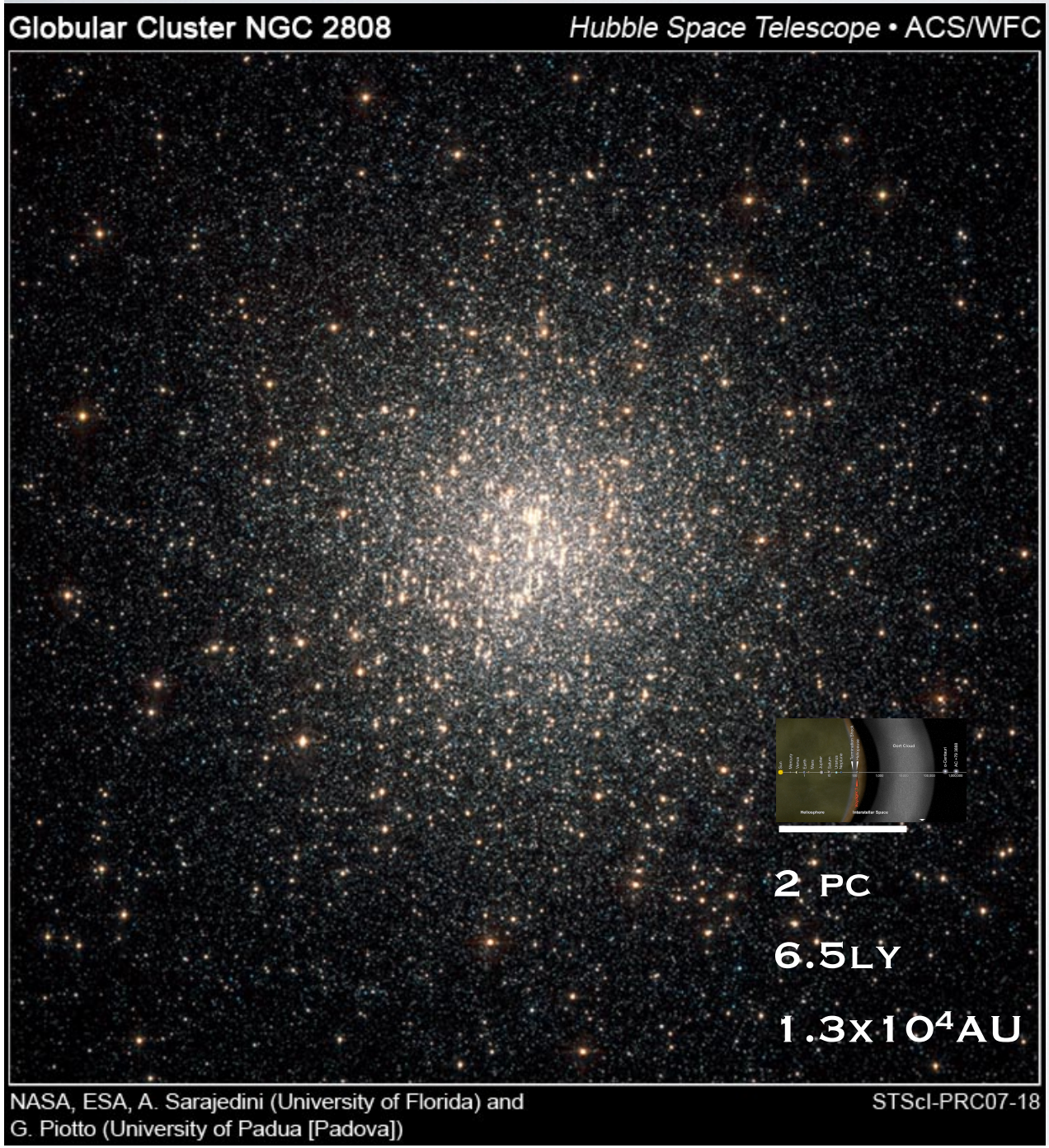

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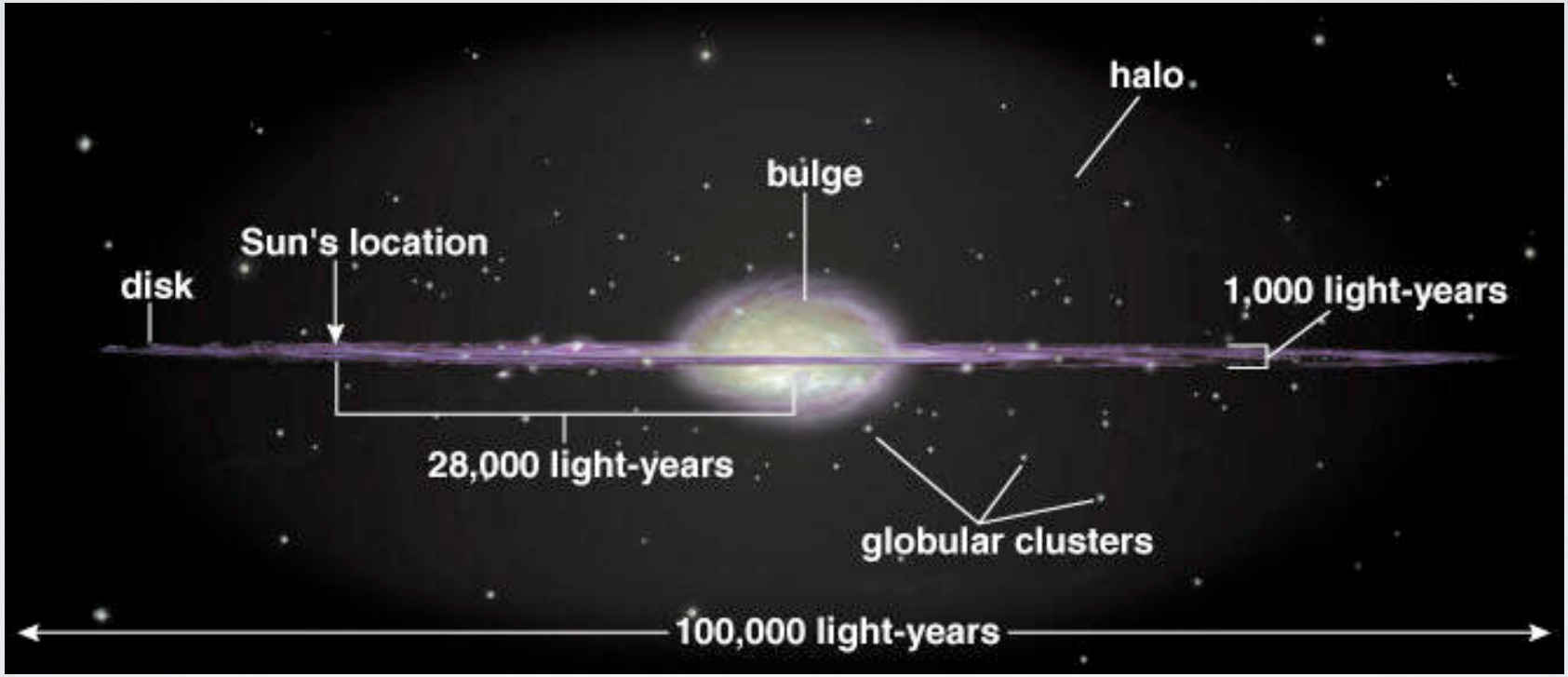

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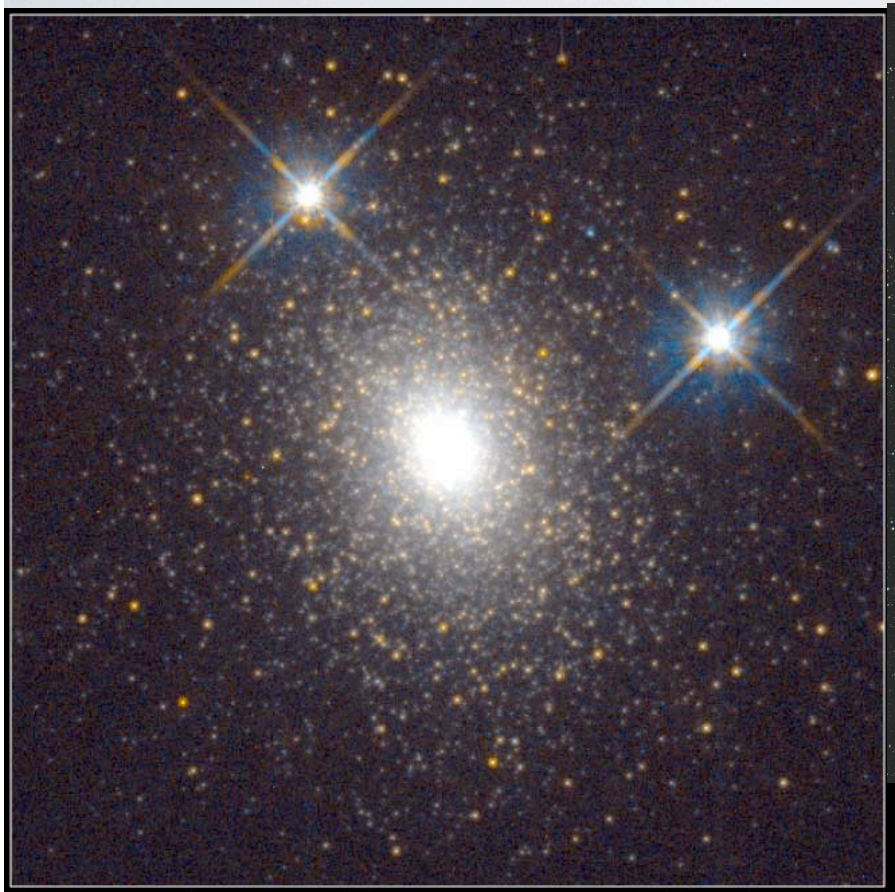
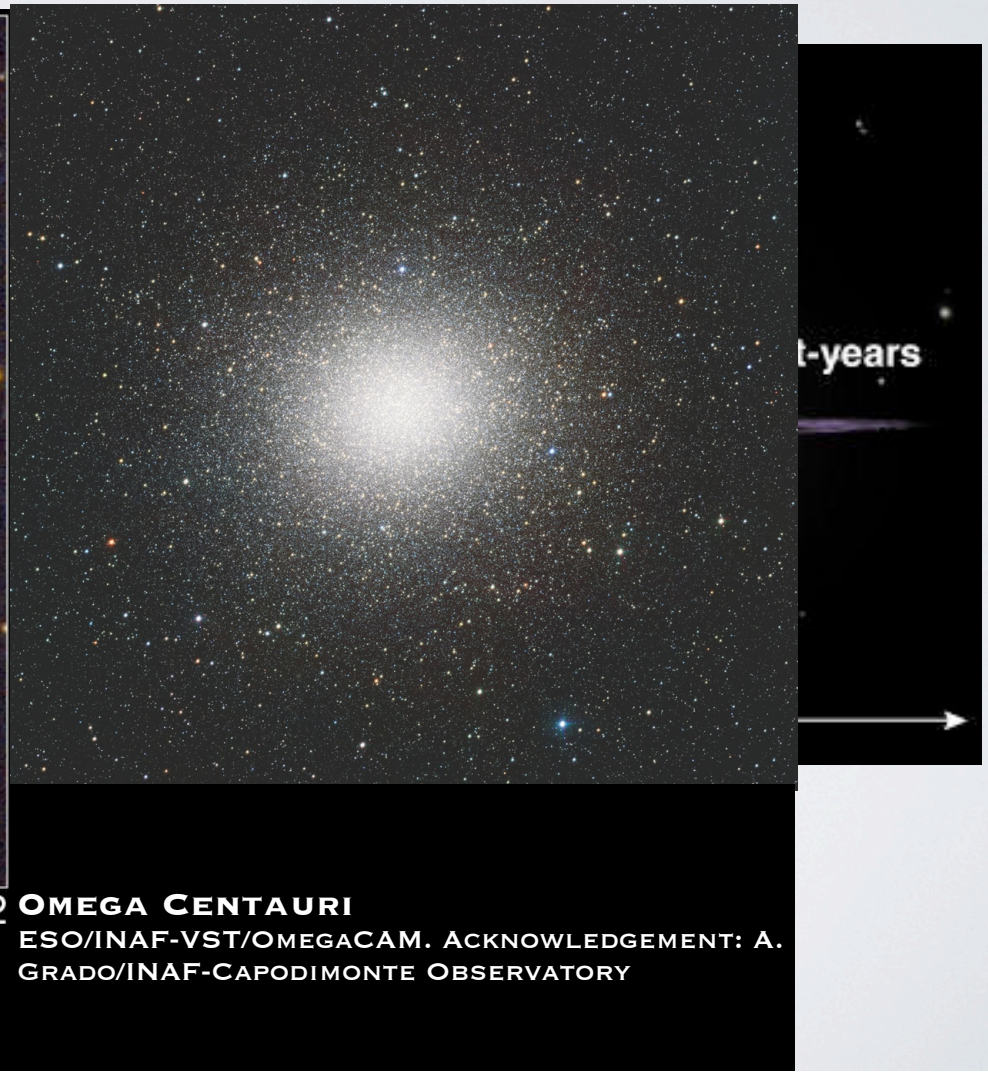


Globular Cluster G1
in Galaxy M31

HST · WFPC2

PRC96-11 · ST ScI OPO · April 24, 1996

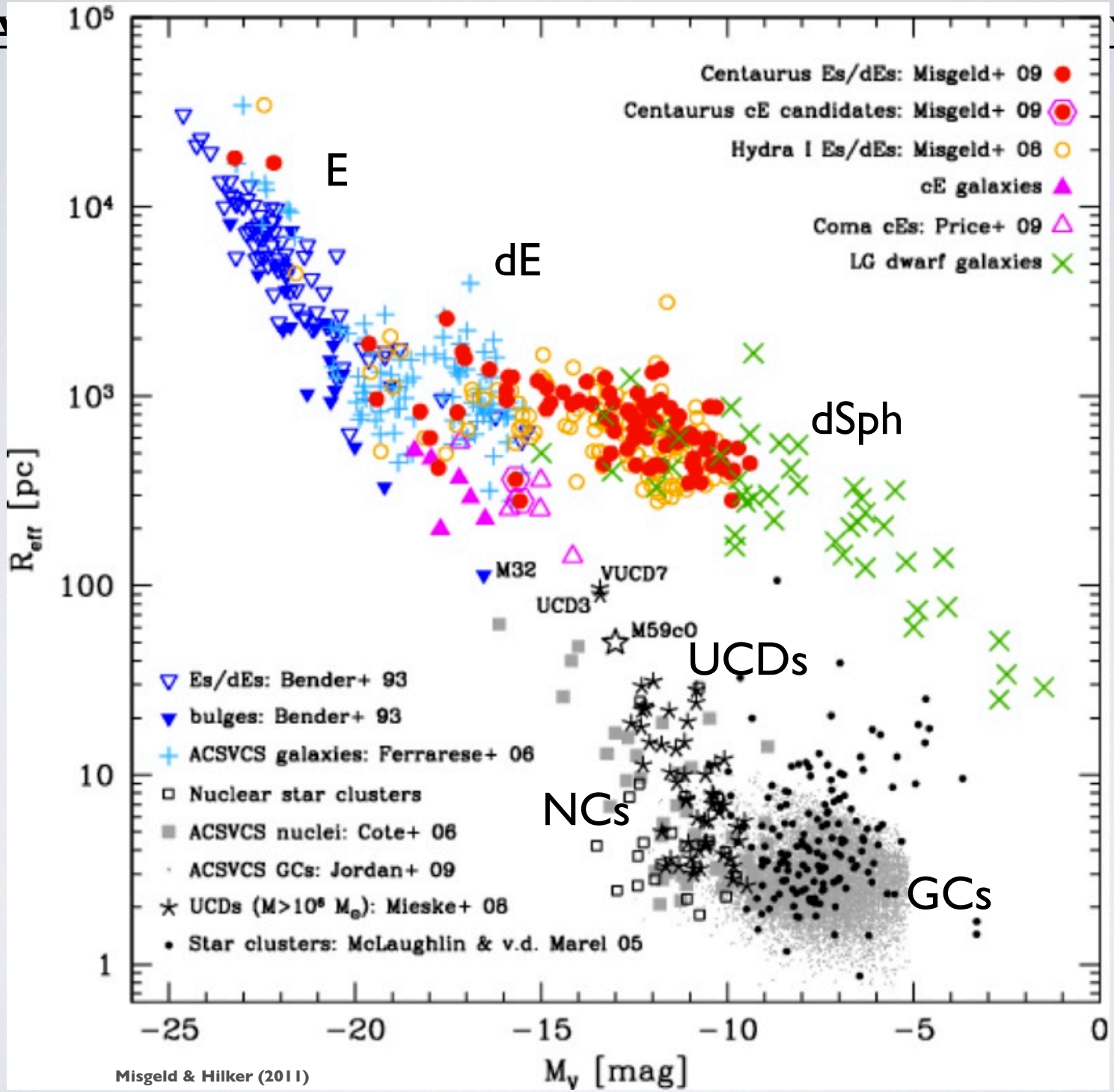
Michael Rich, Kenneth Mighell, and James D. Neill (Columbia University), Wendy Freedman (Carnegie Observatories) and NASA



Omega Centauri

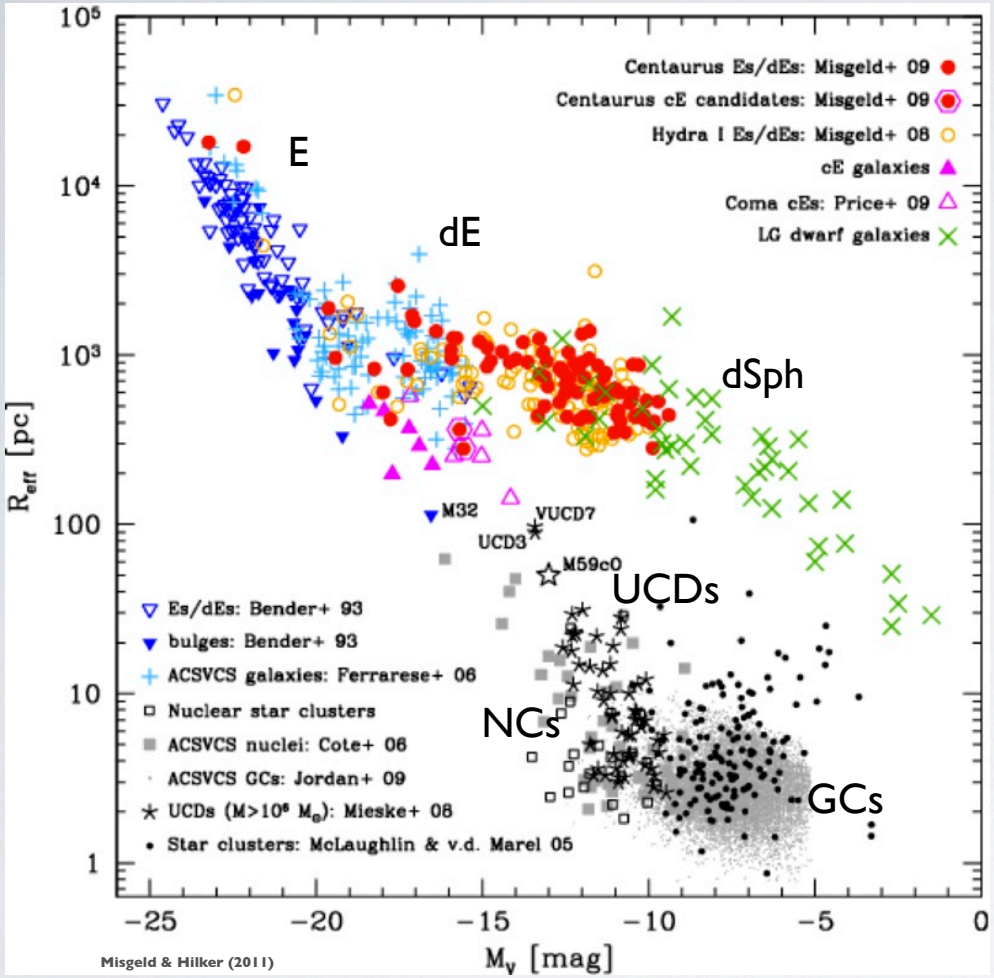
ESO/INAF-VST/OmegaCAM. Acknowledgement: A. Grado/INAF-Capodimonte Observatory

NUCLEA YSTEMS



Misgeld & Hilker (2011)

Nuclear clusters in the Family of Stellar systems



* NCs Formation channels

- Connection to UCDs (stripped nuclei?)
- in situ via gas accretion
- in spiraled massive GCs
- cluster mergers

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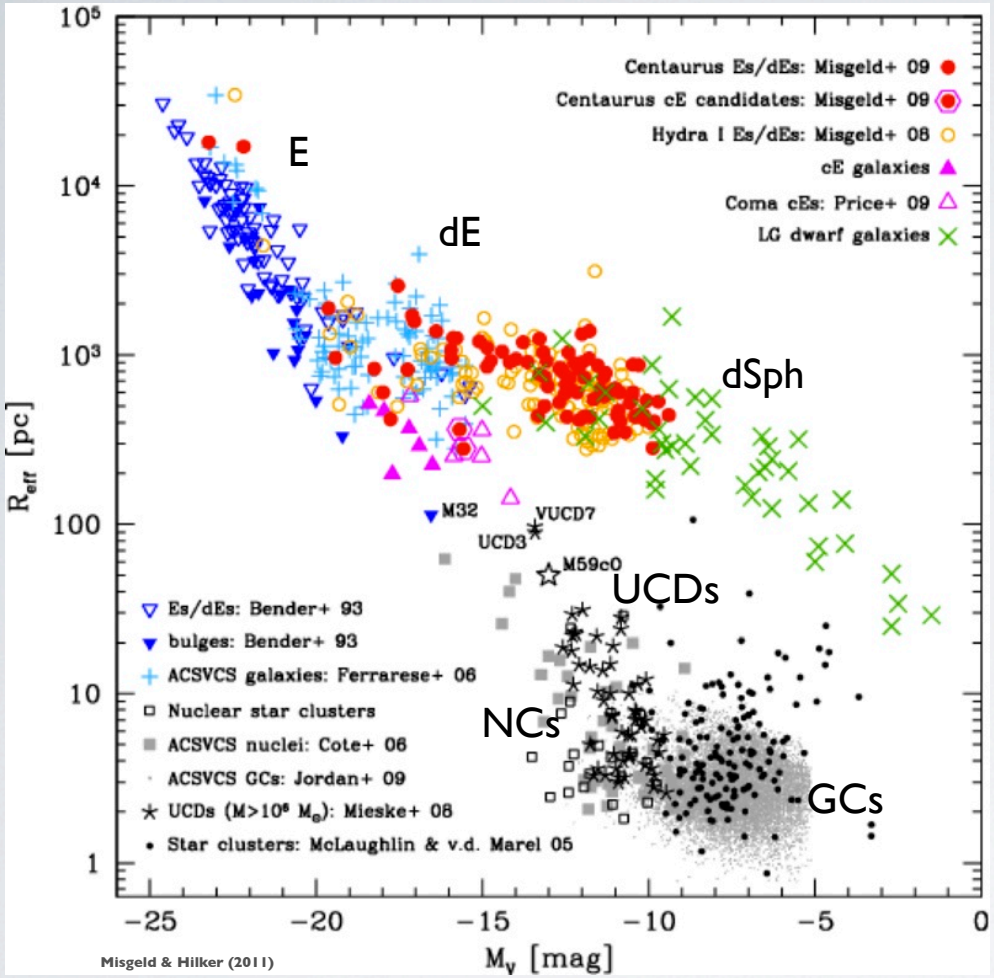
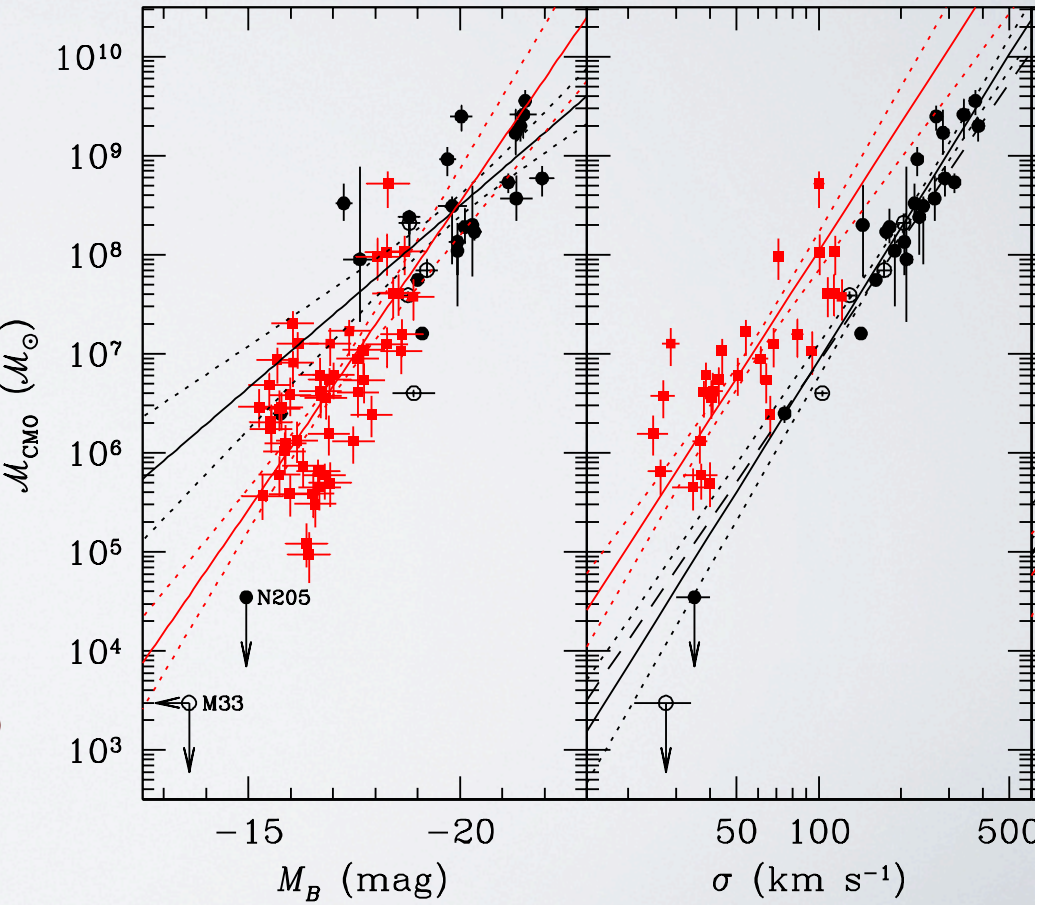


* Galactic nuclei

- cluster to BH dominated nucleus
- connections and interplay between NCs and BHs

Ferrarese et al. (2006)



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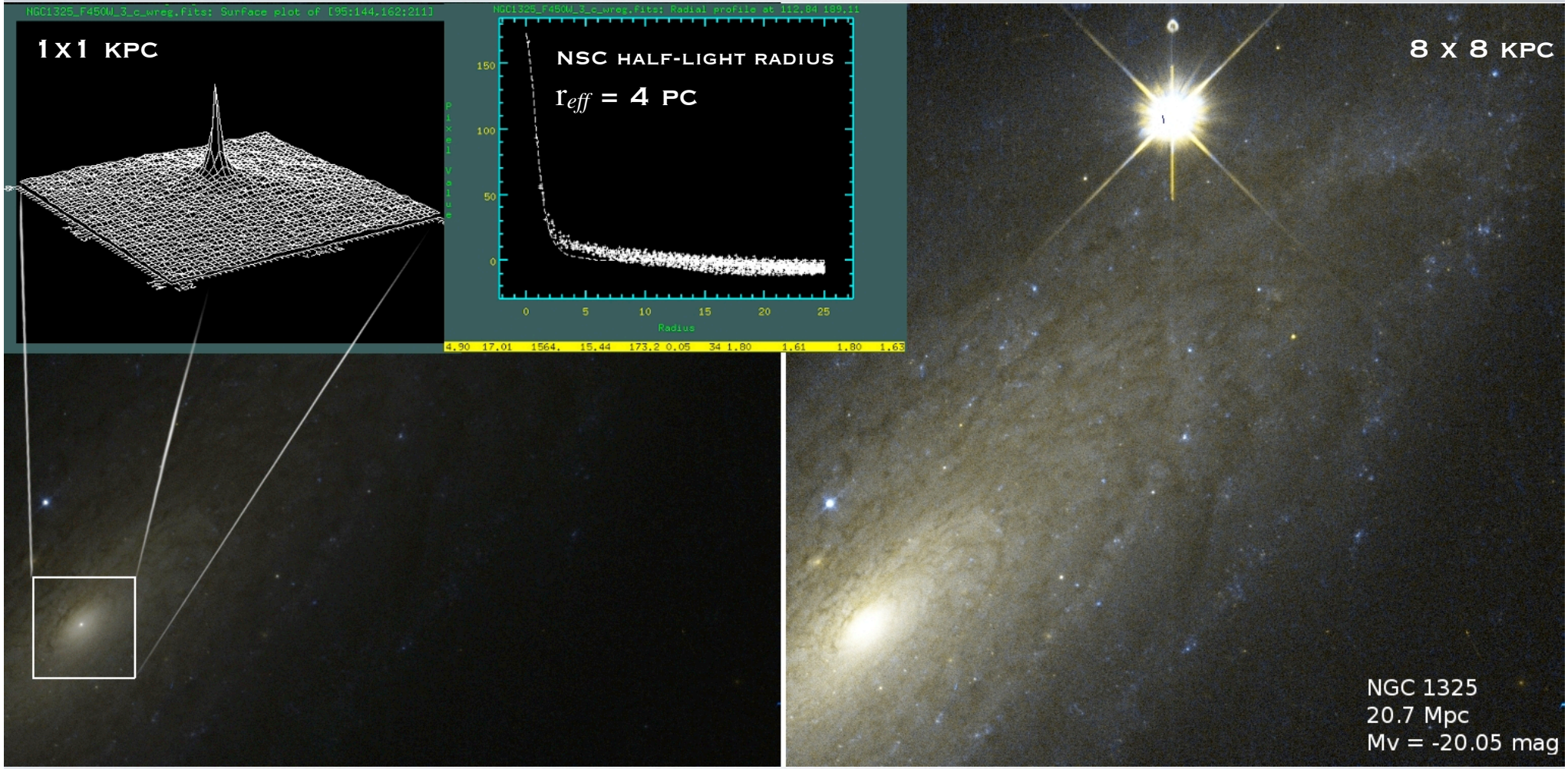
Nuclear Star Clusters in late type Spirals



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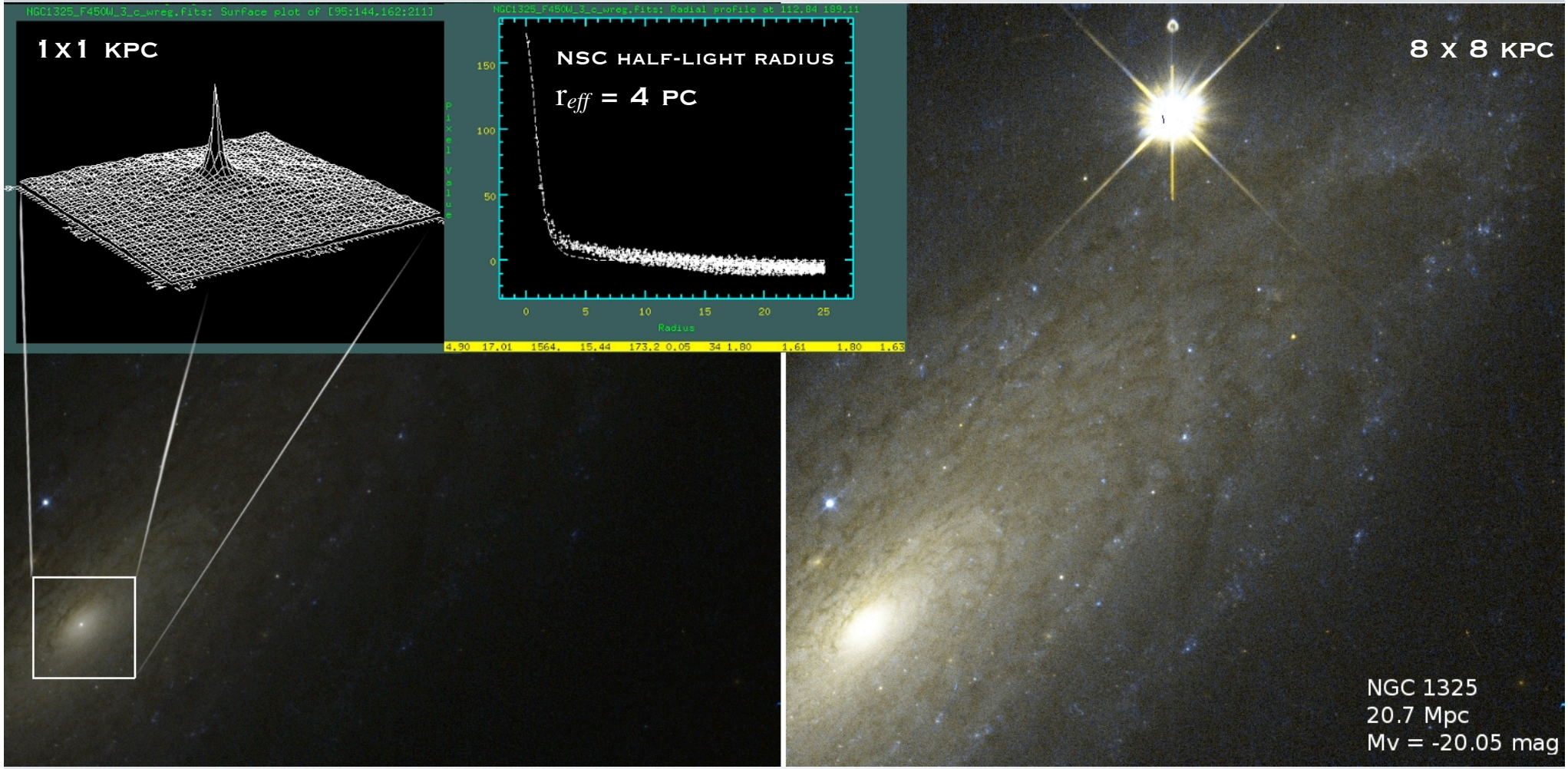

– The largest database of **nuclear star clusters** (NSCs) of >200 spiral galaxies with **Hubble Space Telescope WFPC2** imaging in the archive

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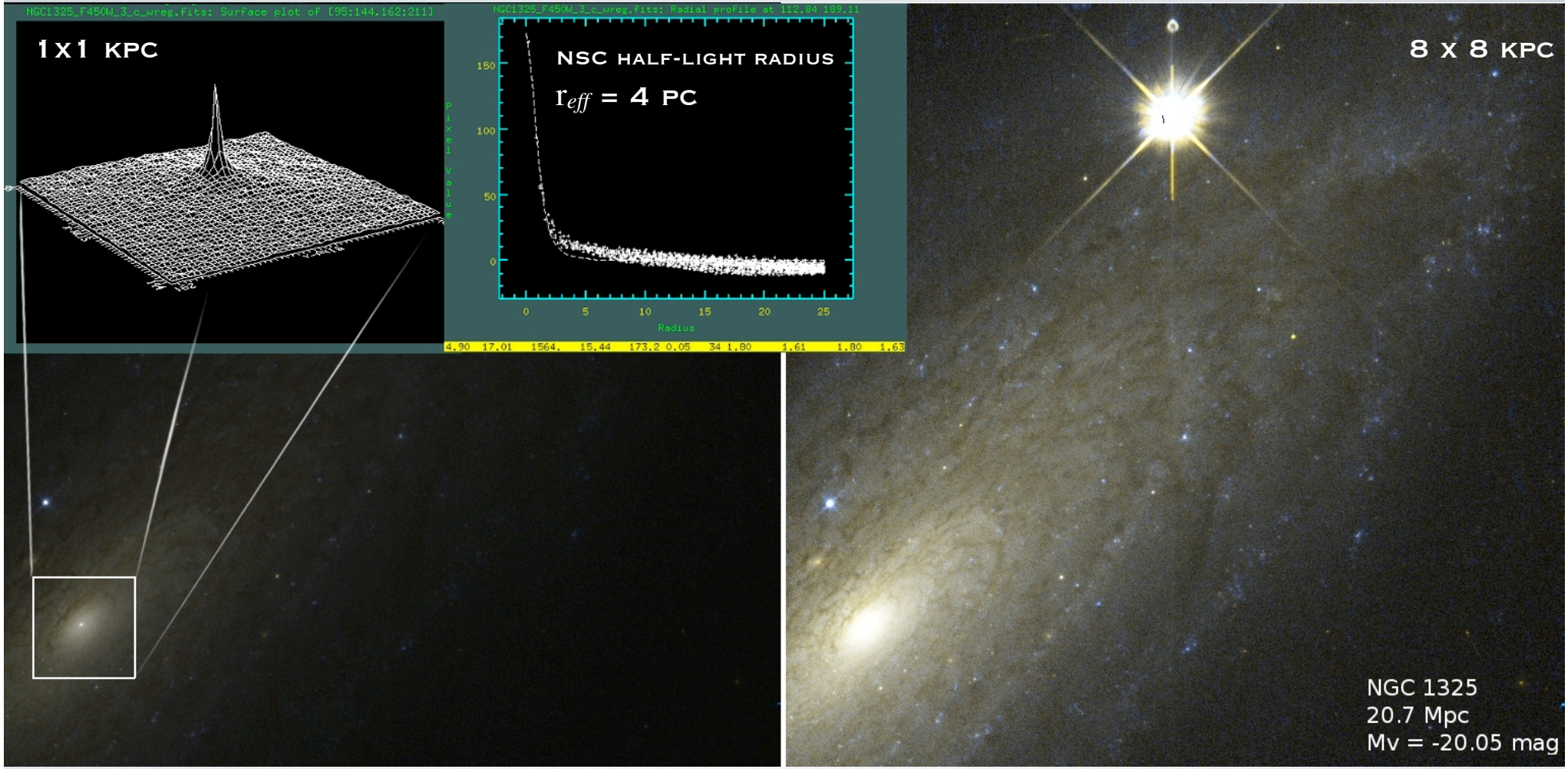

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– a homogeneous measurement of **structural and photometric** properties of NSCs

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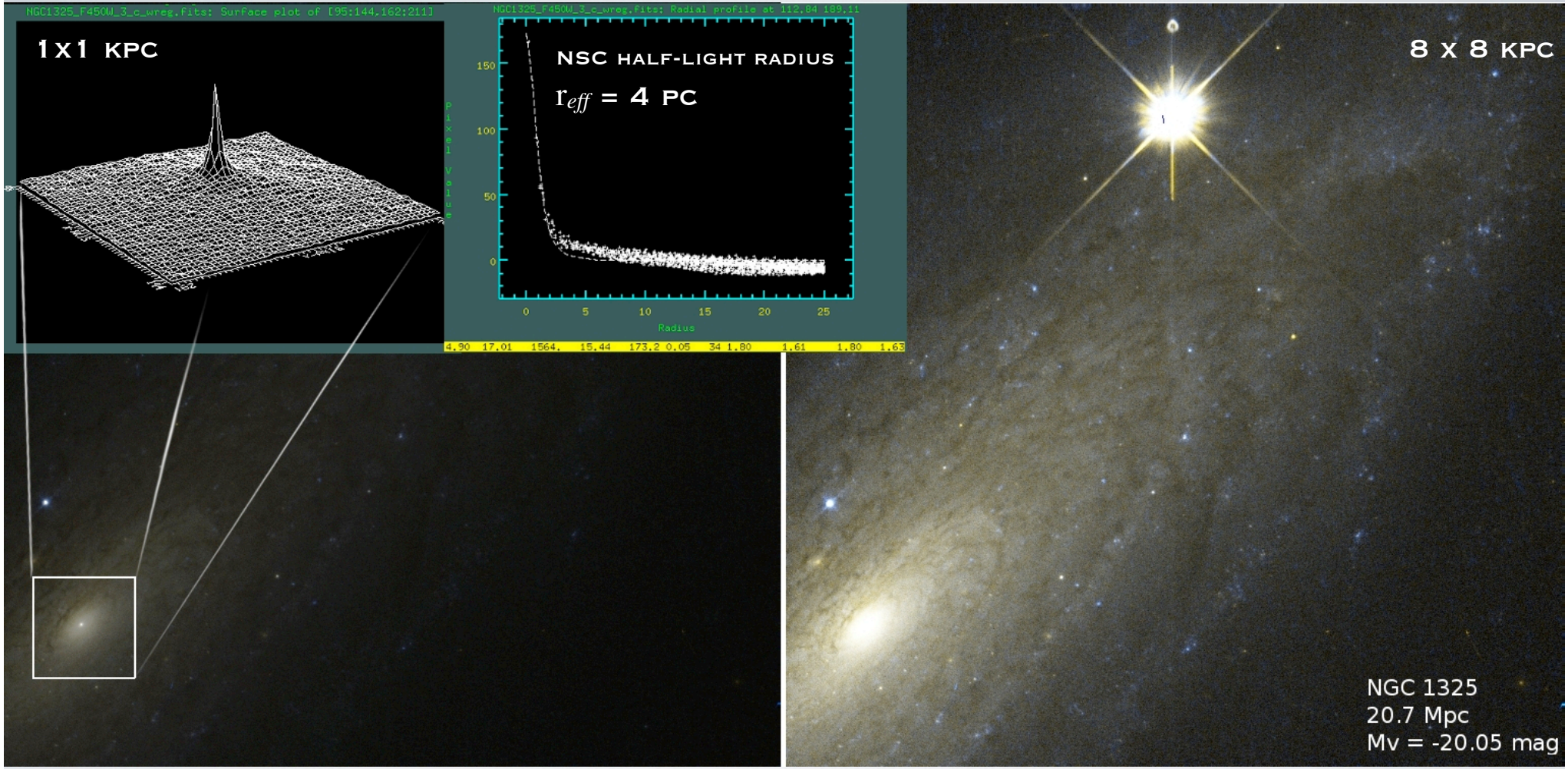

– The largest database of **nuclear star clusters** (NSCs) of >200 spiral galaxies with **Hubble Space Telescope WFPC2** imaging in the archive

– a homogeneous measurement of **structural and photometric** properties of NSCs

– Formation, evolution, relation to massive globular clusters and Ultra Compact Dwarf galaxies, and co-existence of **NSCs and Massive Black Holes**

Galaxy sample, NSCs and WFPC2 characteristics

Galaxy sample

Low-inclination <88

Nearby < 35 Mpc

>5000

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HST/WFPC2 archive:

340 galaxies

47 programs

9 filters (UV to I)

65 GB raw data

Galaxy sample, NSCs and WFPC2 characteristics

http://archives.esac.esa.int/hst

Galaxy sample

ESA Hubble Science Archive

A classical search interface is available here. The HLA grism data is also available from a dedicated search interface.

Query form | Result table | Get data | New | HST@ESAC Webpages | Additional Queries | Contact | Acknowledgement | ESAC/CADC/STScI

Fetch marked datasets | Programmatic access

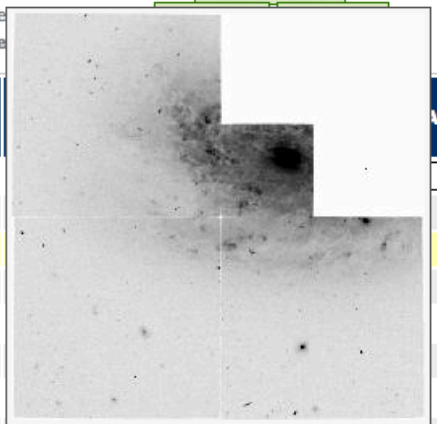
Results **1-426** sorted by Release Date

Show 500 results per page

Click column heading to sort list - Click rows to select Reset selection

Text boxes under columns se

Select all rows **on this page**



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File upload	Preview					Archive	Instrument	Detector	Filter Grism Prism	Data Type	Member Number	Dataset Name	Release Date	PI Name	Proposal ID	
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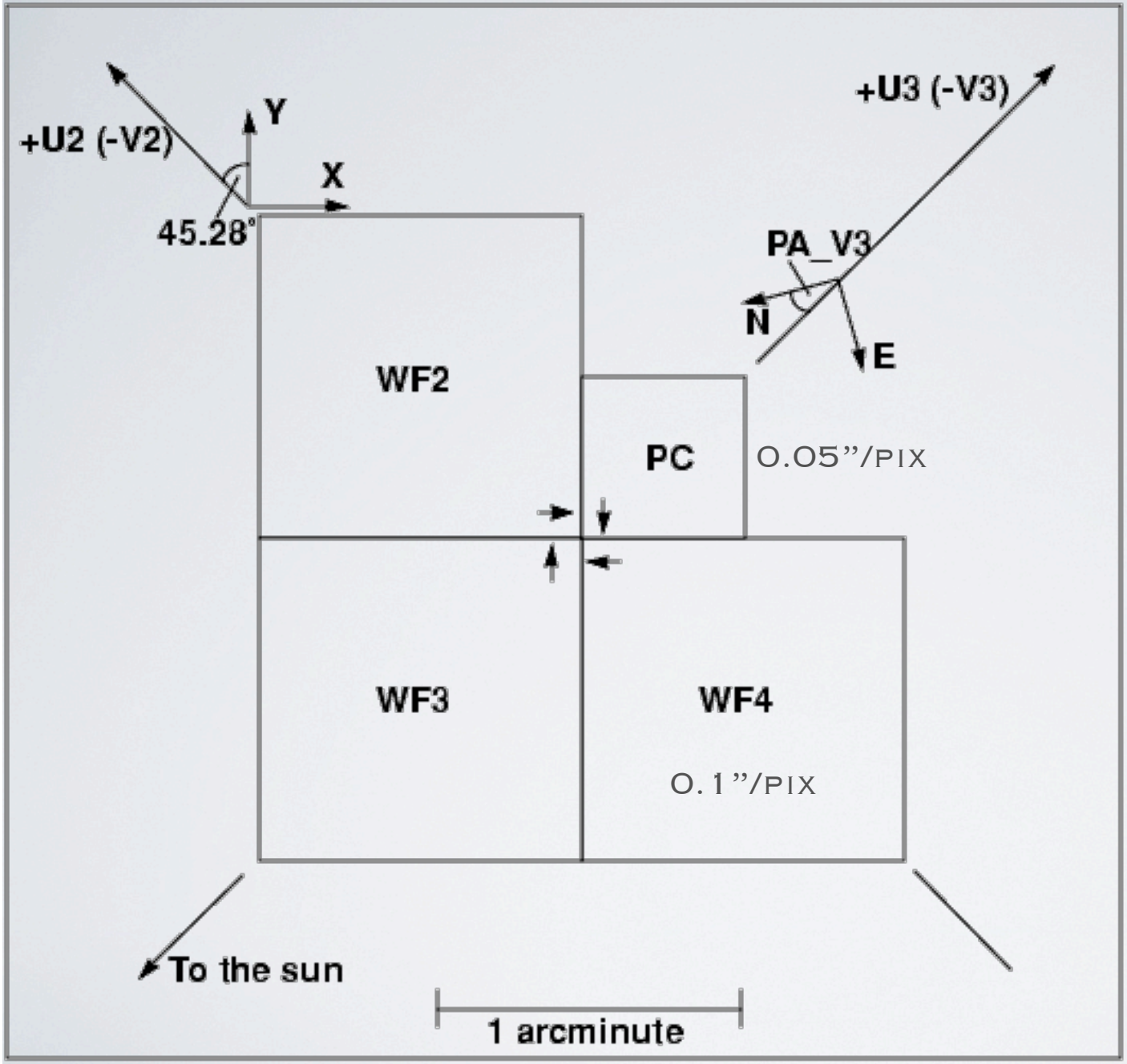

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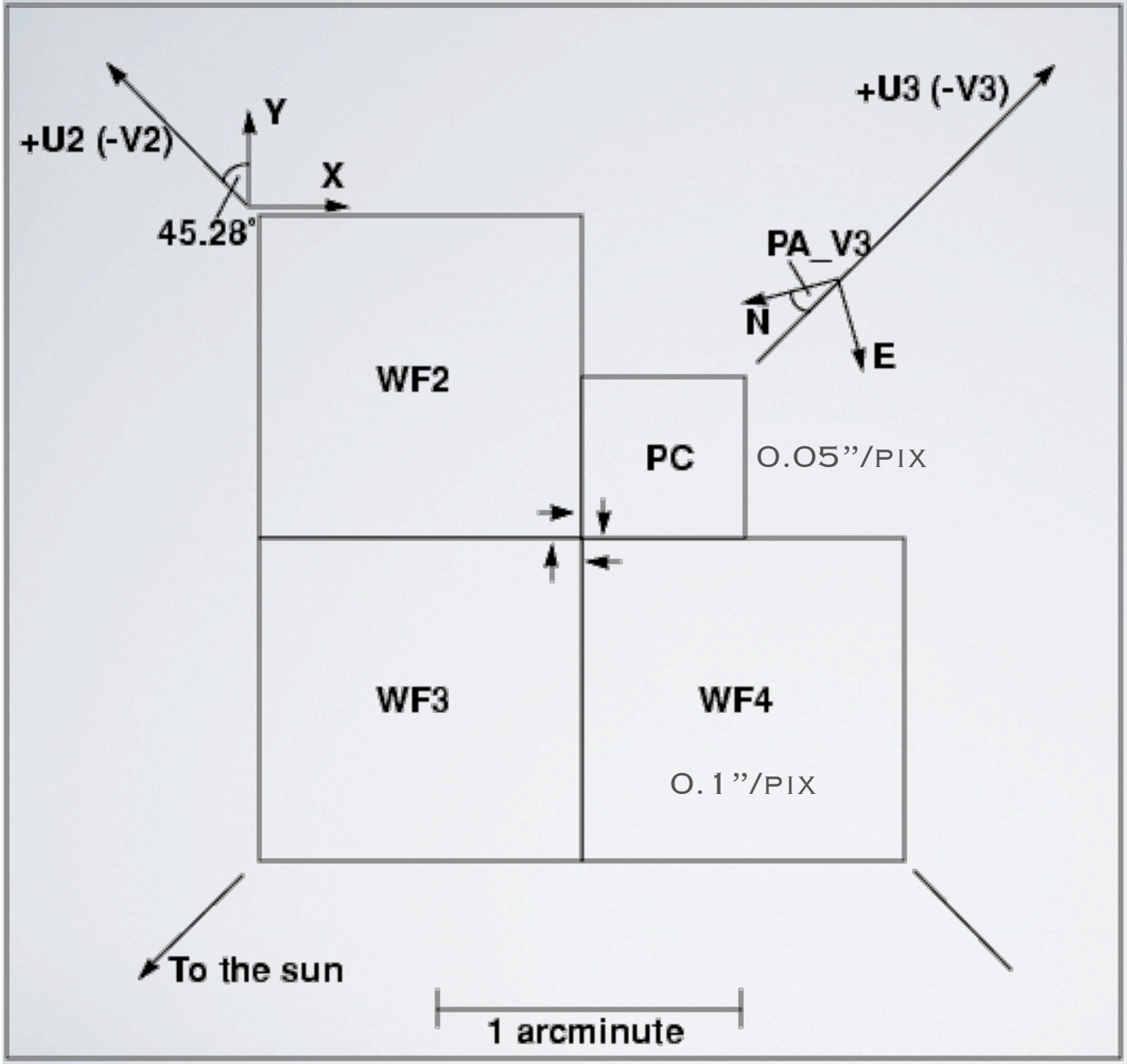

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structure and photometry for **228** Nuclear Star Clusters

Measuring Nuclear Star Cluster properties

With the Hubble Space Telescope - Wide Field and Planetary Camera 2 (WFPC2)

TinyTIM PSFs

- position
- filter
- breathing etc.

Krist et al. (2011)

Georgiev & Böker (in prep.)

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ISHAPE

- TinyTim PSF
- Analytic model
- Best χ^2 fit model
- 10% of PSF FWHM

Larsen (1999)

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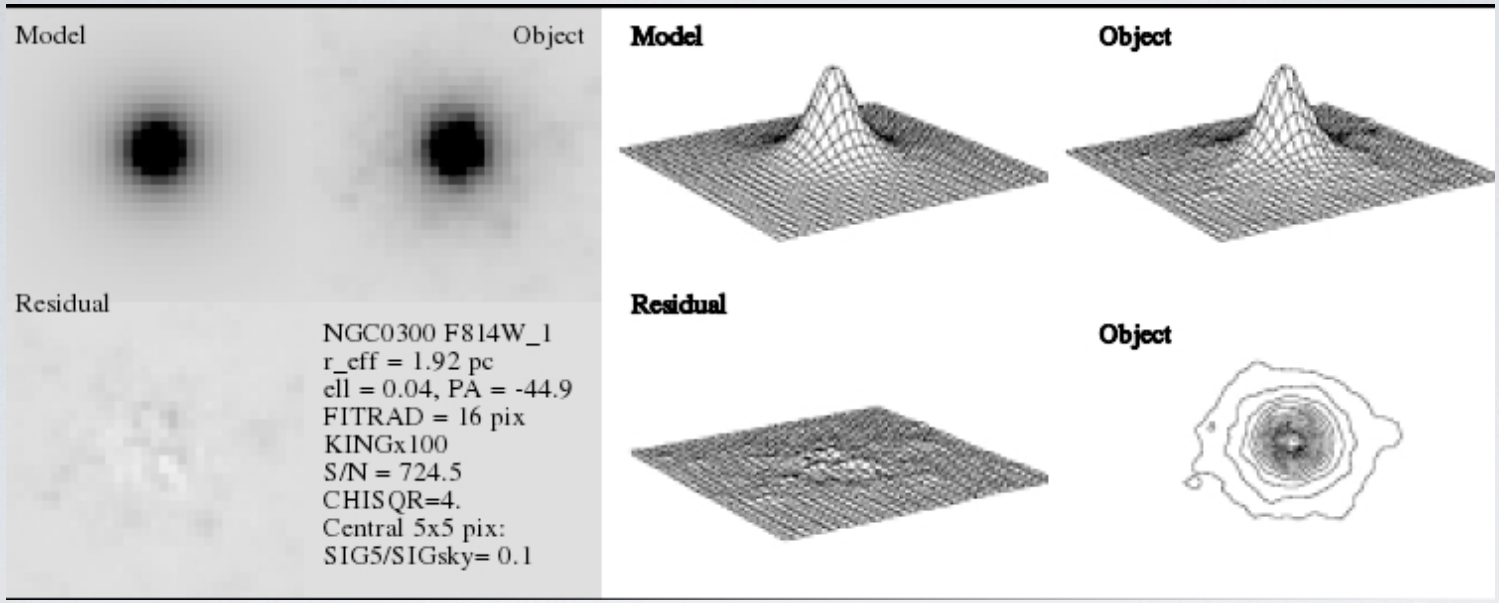

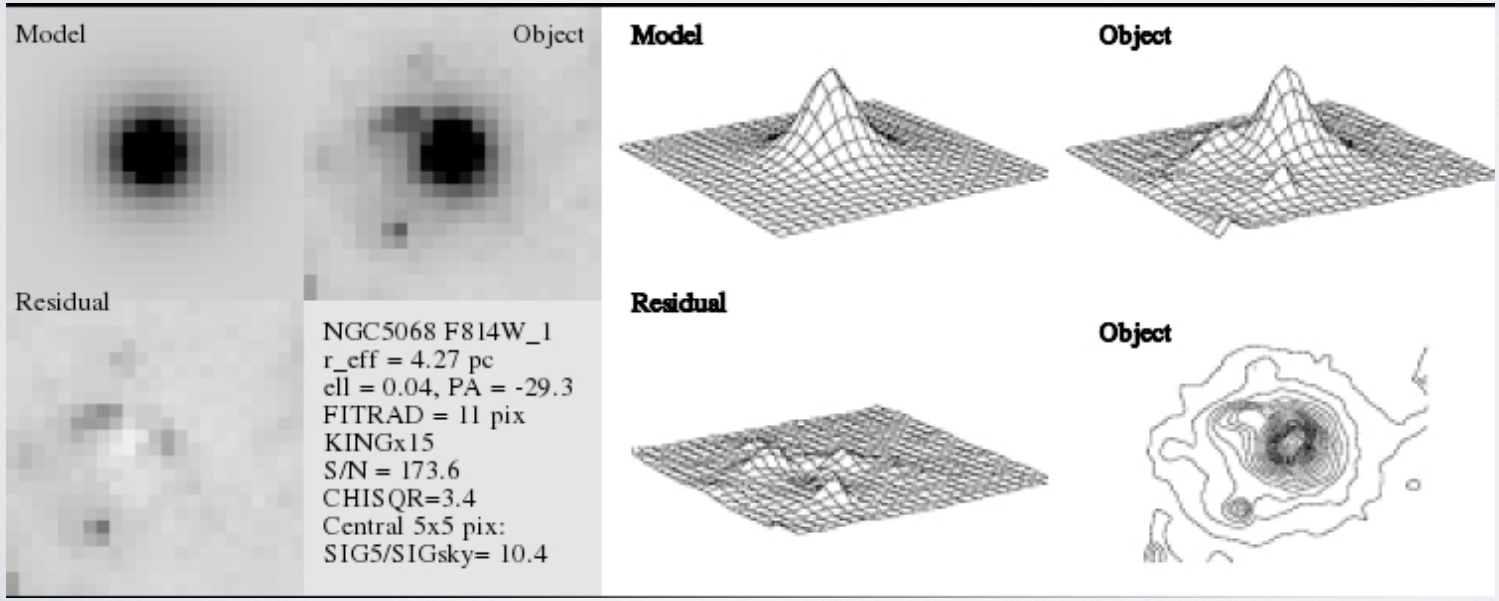

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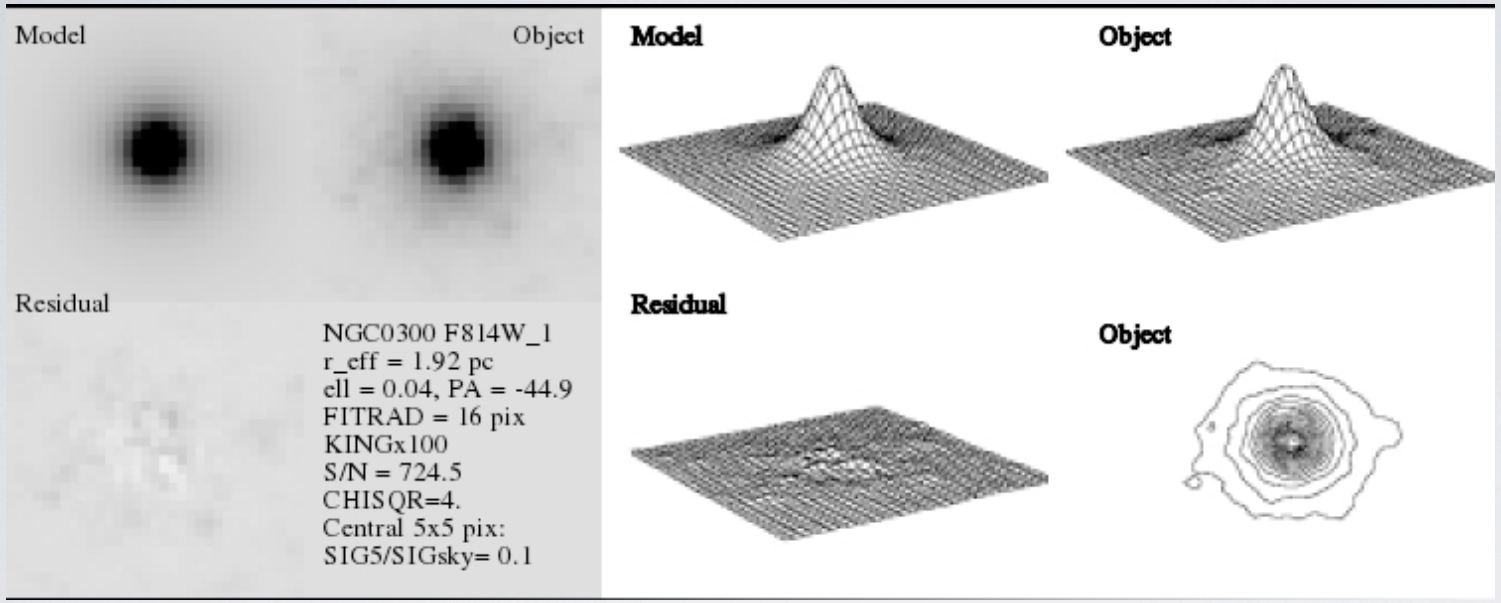

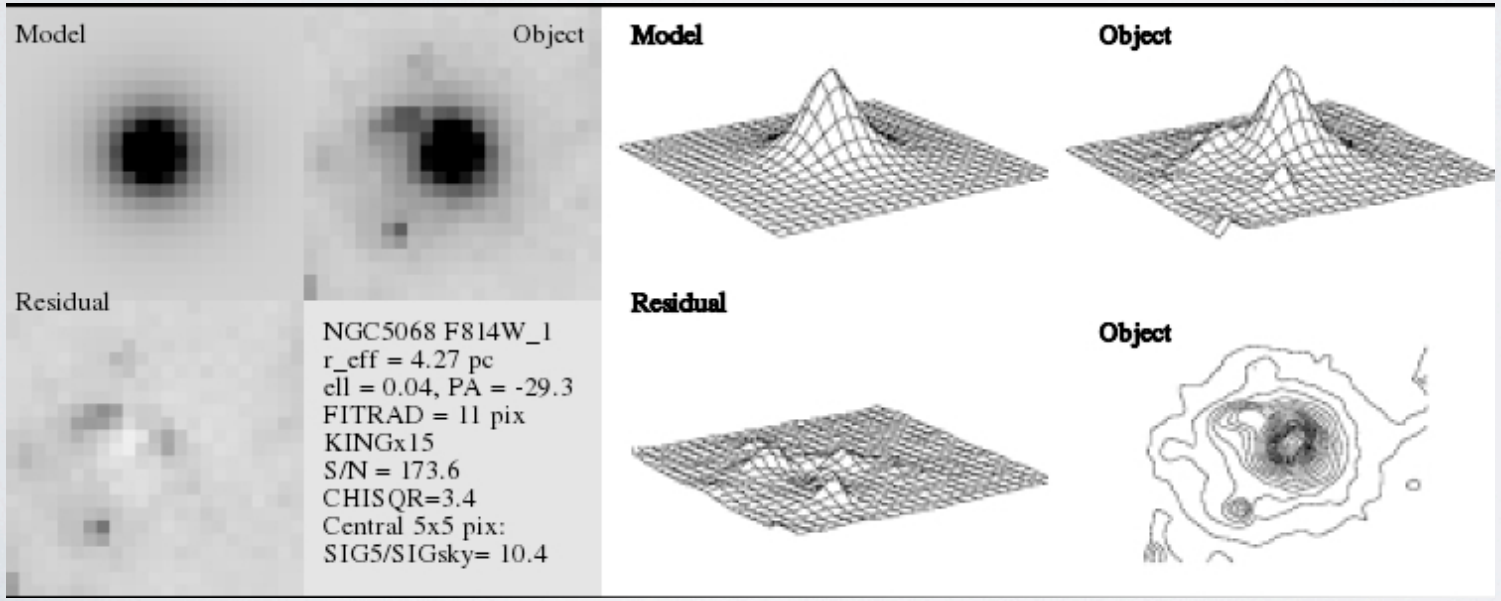

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Larsen (1999)

Output

- Model magnitude
- structural parameters:

R_{EFF}, effective radius

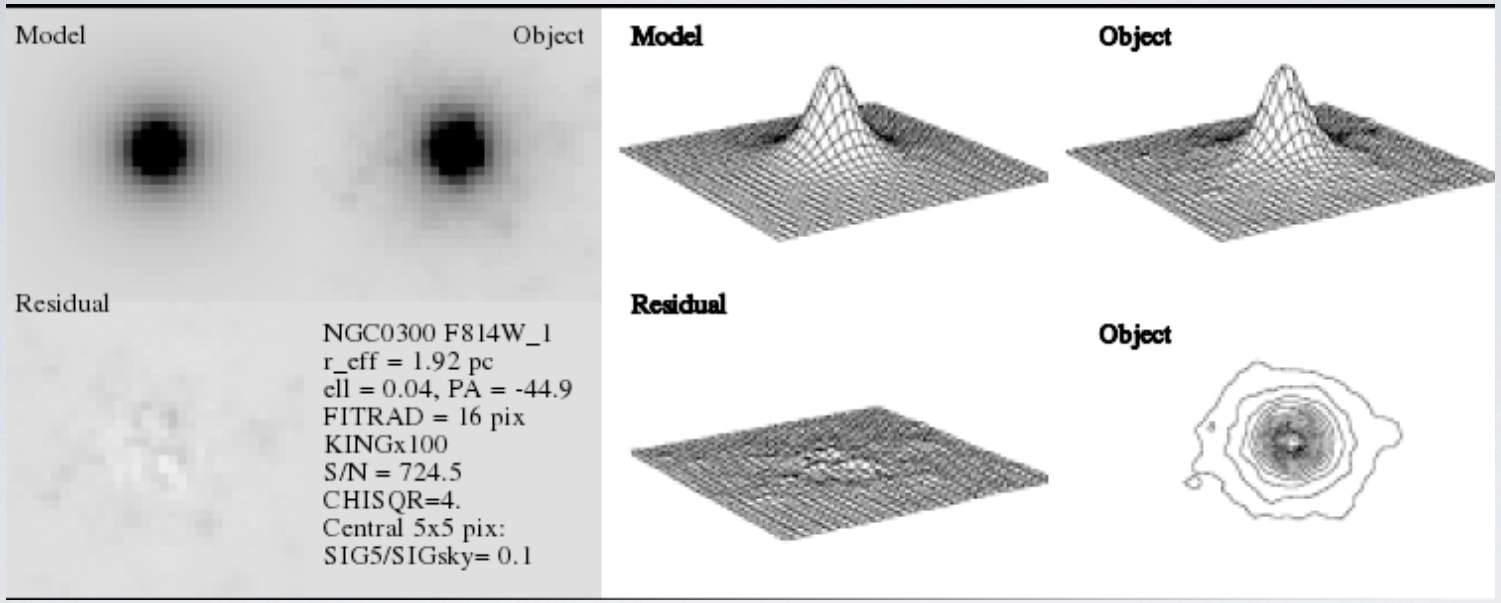
ϵ, ellipticity,

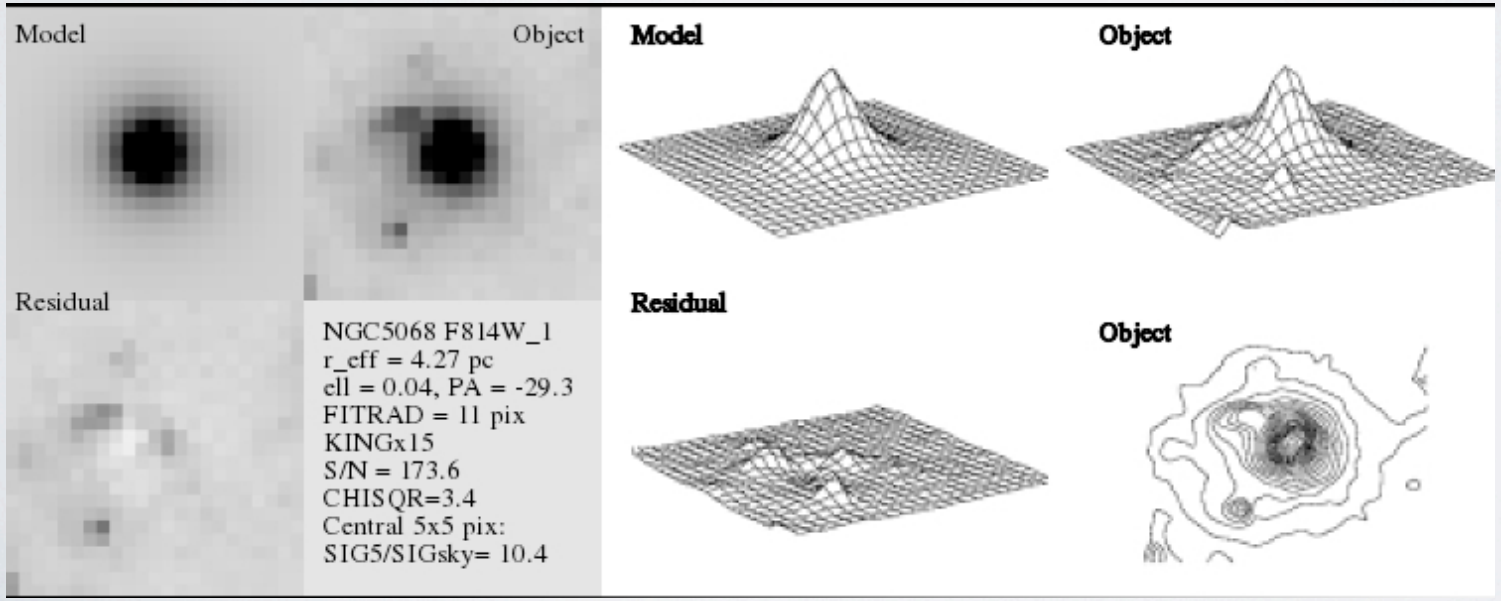
PA, position angle,

Georgiev & Böker (in prep.)

Measuring Nuclear Star Cluster properties

With the Hubble Space Telescope - Wide Field and Planetary Camera 2 (WFPC2)





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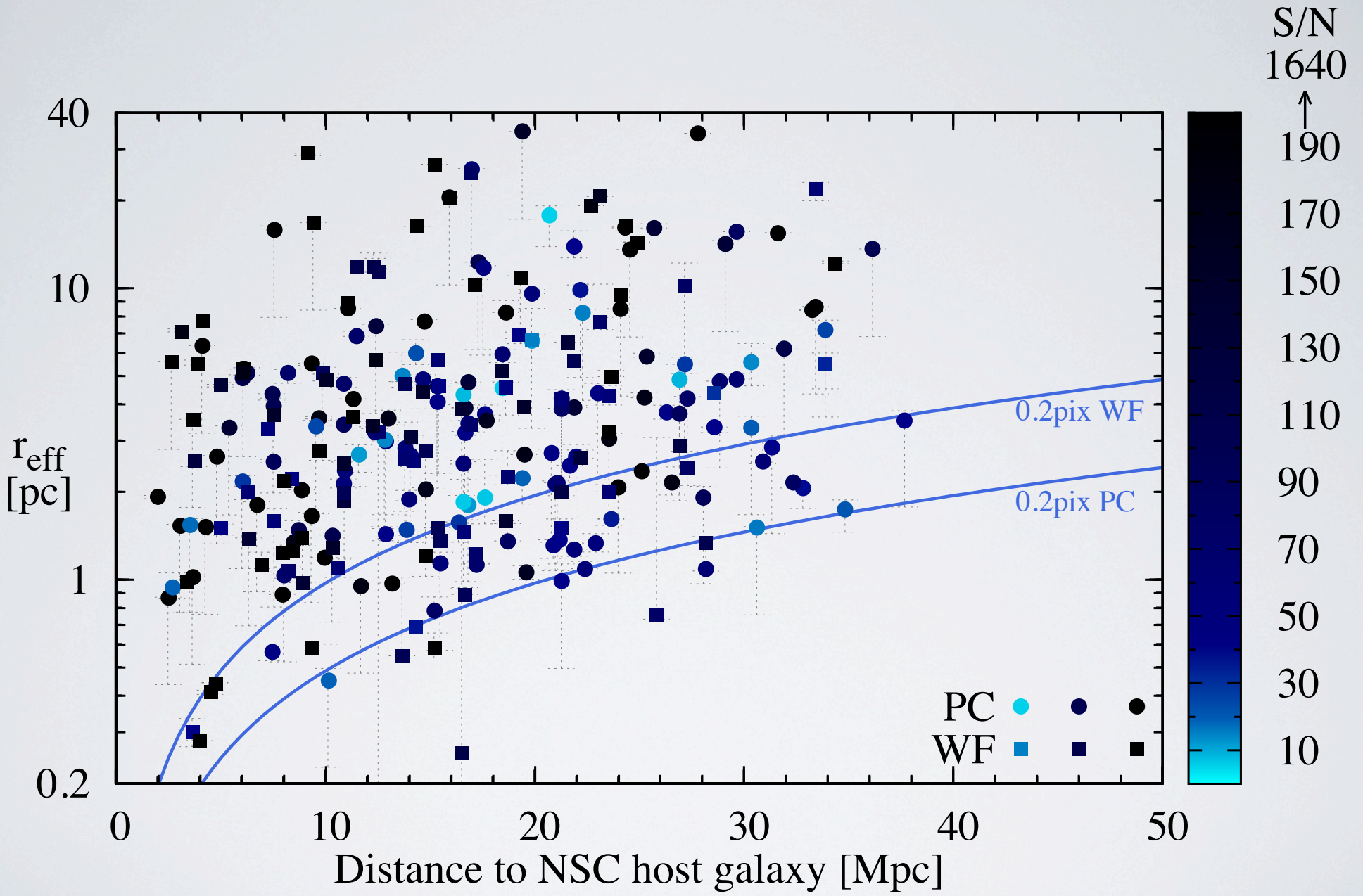
As free of contaminating flux as possible flux and size measurement of 228 NCSs

Georgiev & Böker (in prep.)

Distance and S/N dependent resolution limits



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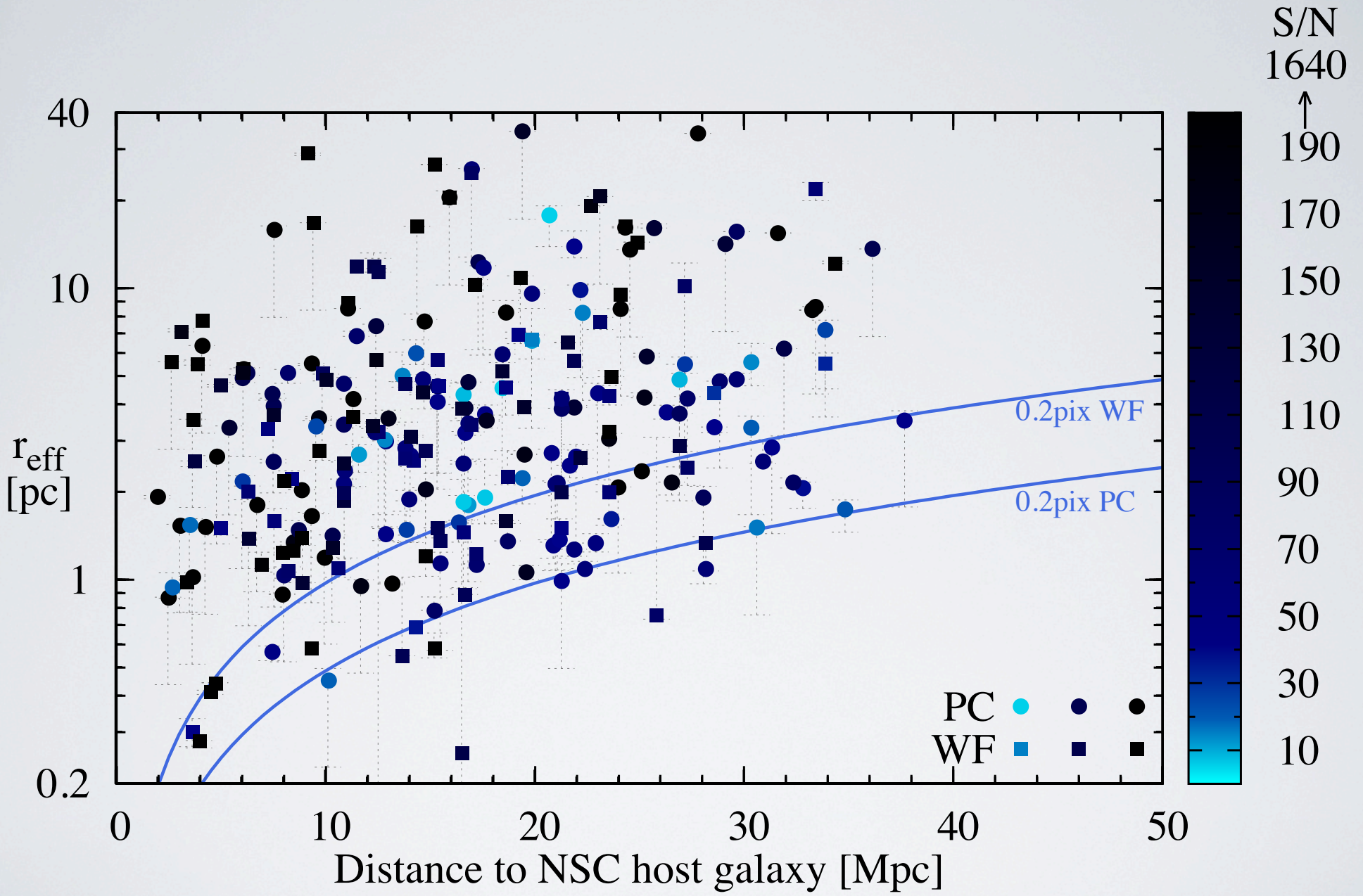
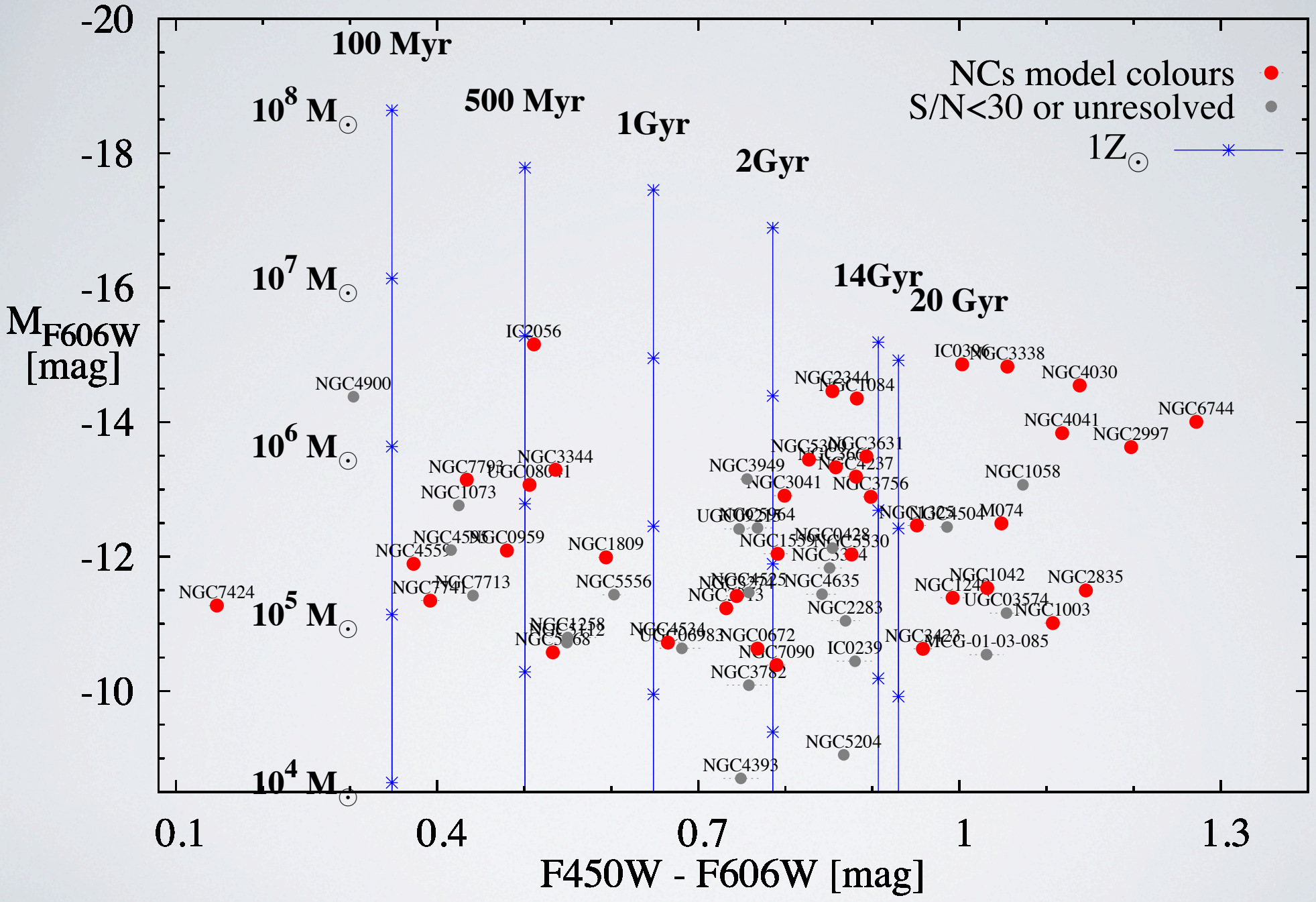


More than 90% of the NSCs (S/N>30) with robust R_{EFF} measurement

Georgiev & Böker (in prep.)

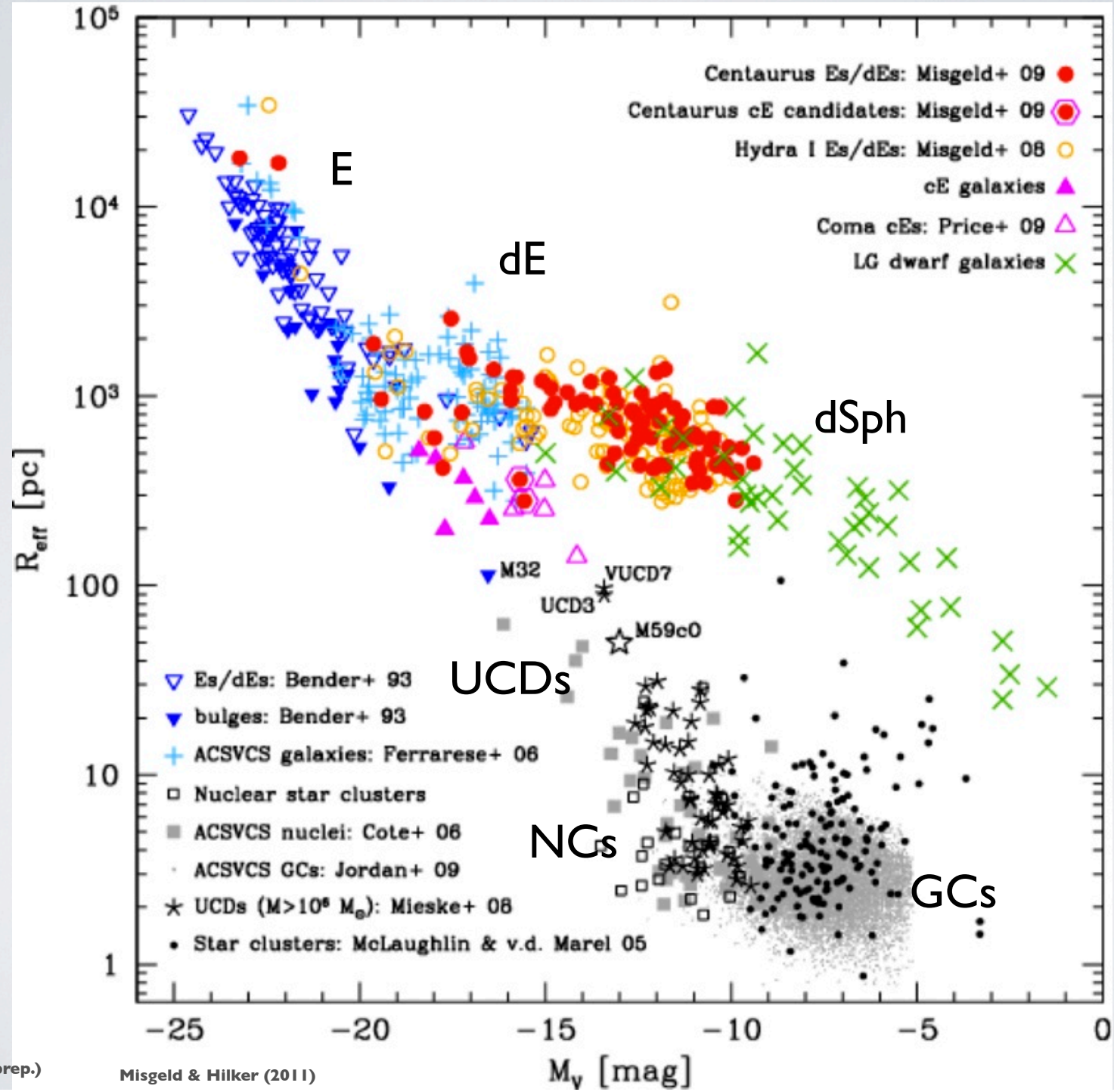
Stellar populations in Nuclear Star Clusters



NSCs span a wide range in metalicity, age and mass

Georgiev & Böker (in prep.)

Luminosity vs. effective radius of Nuclear Clusters



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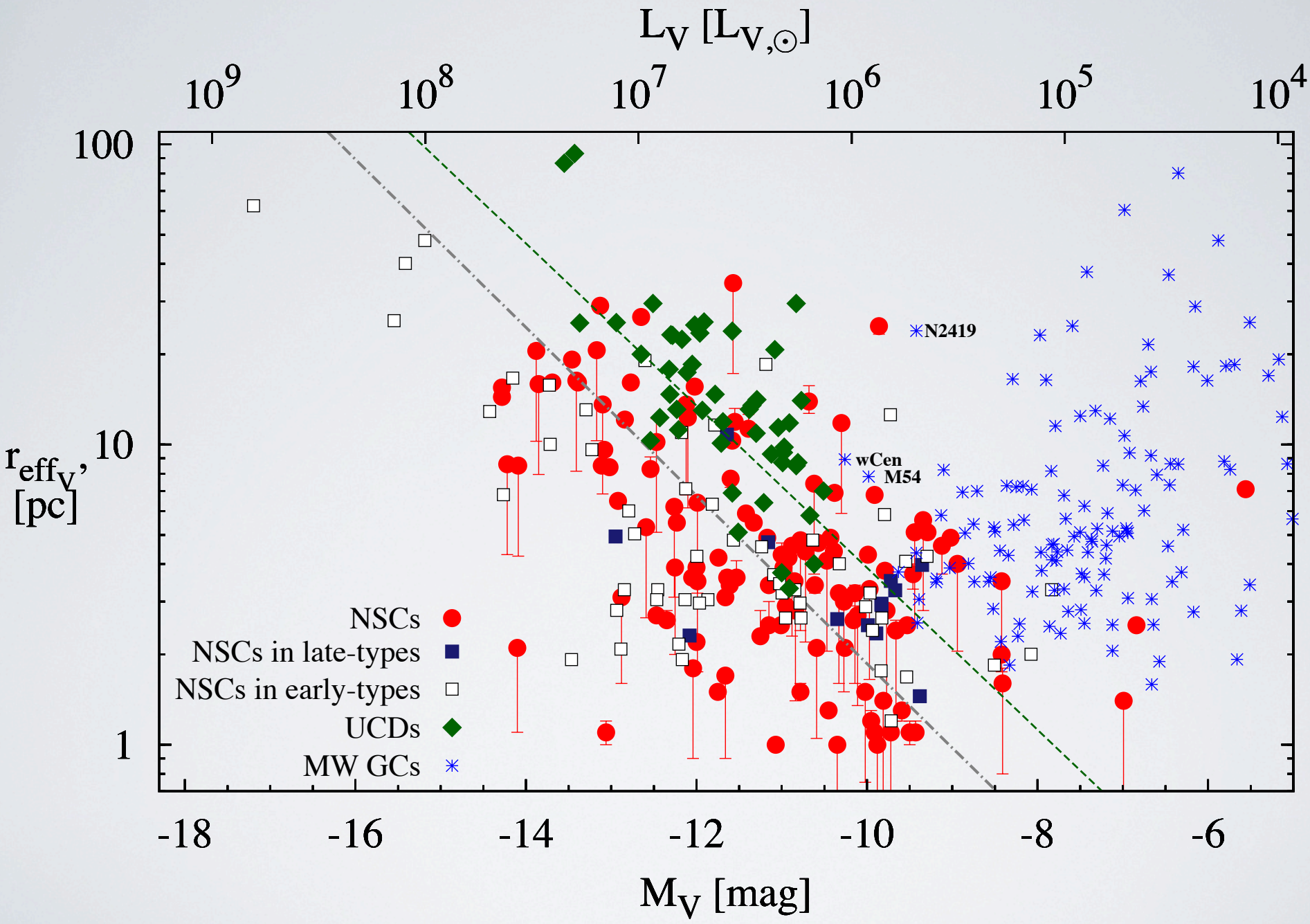

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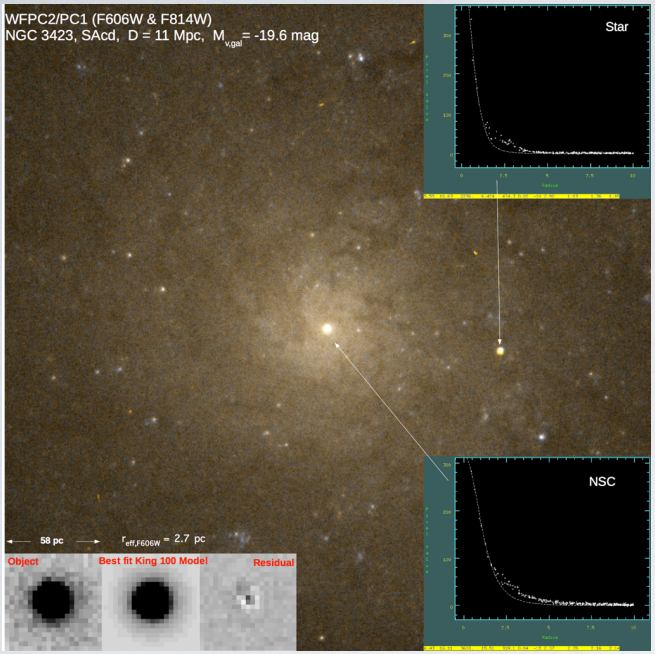
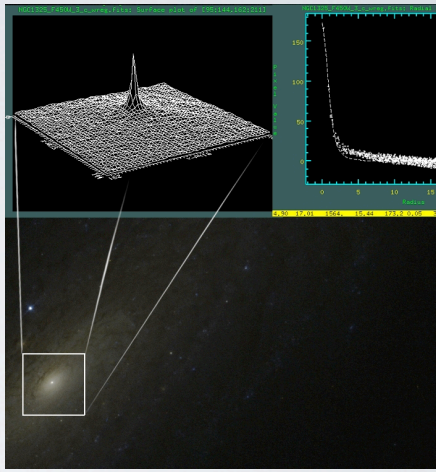
Summary



- Largest homogeneous analysis of NSCs in late-type spiral galaxies

- NSCs span a wide range in age and mass

- **NSCs** can be the progeny of massive GCs and UCDs



Outlook

- NSCs in Spiral galaxies - release of a database of structure and photometry of 228 NSCs

- Studying the formation and co-evolution of nuclear objects - nuclear clusters and BHs

- Stellar pops of NSCs in the NIR: HST/WFC3 (JWST)