Comparing the Star Formation Histories of the M31 and Milky Way Satellites

(Weisz et al. 2014, *ApJ*, 789, 24)

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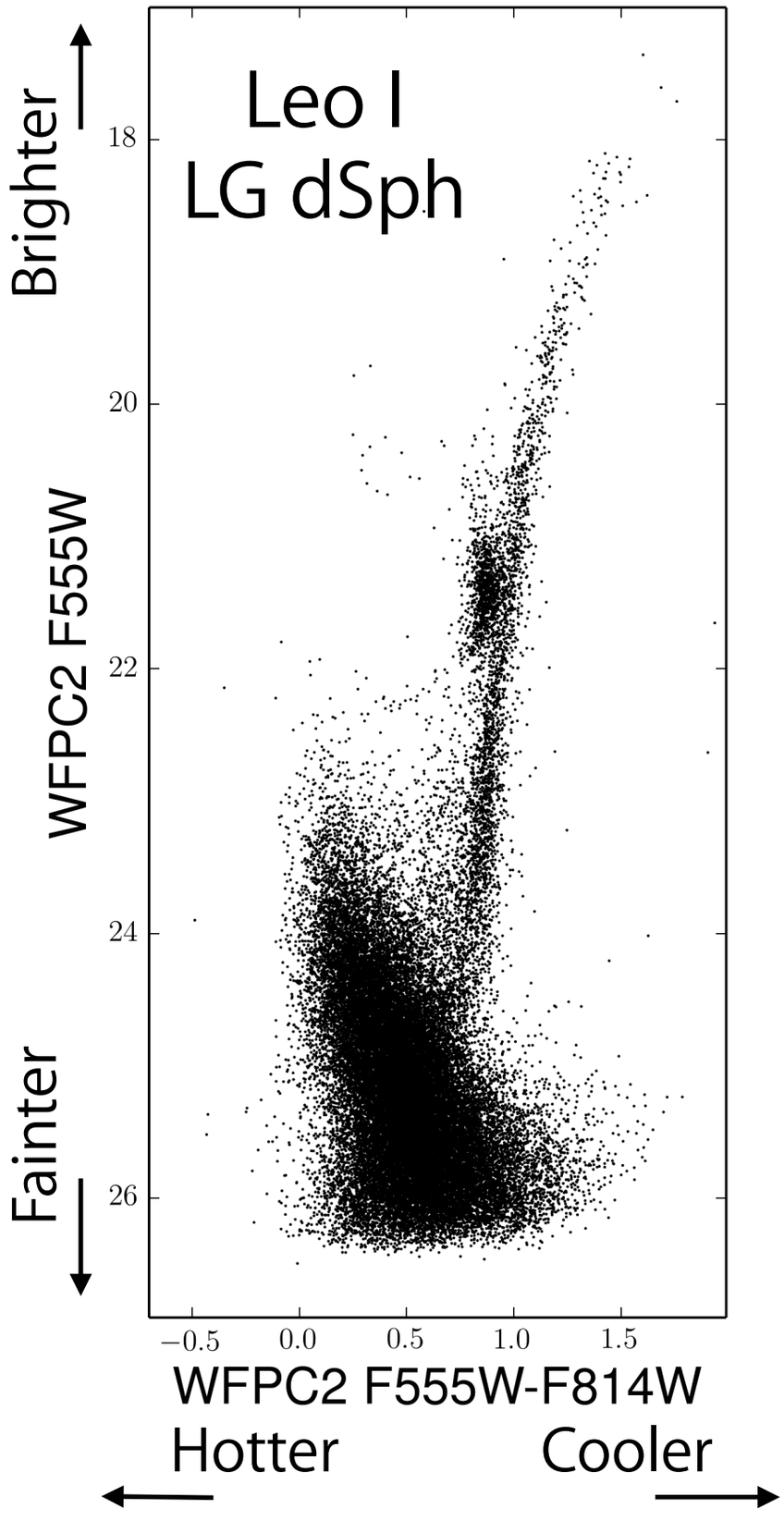
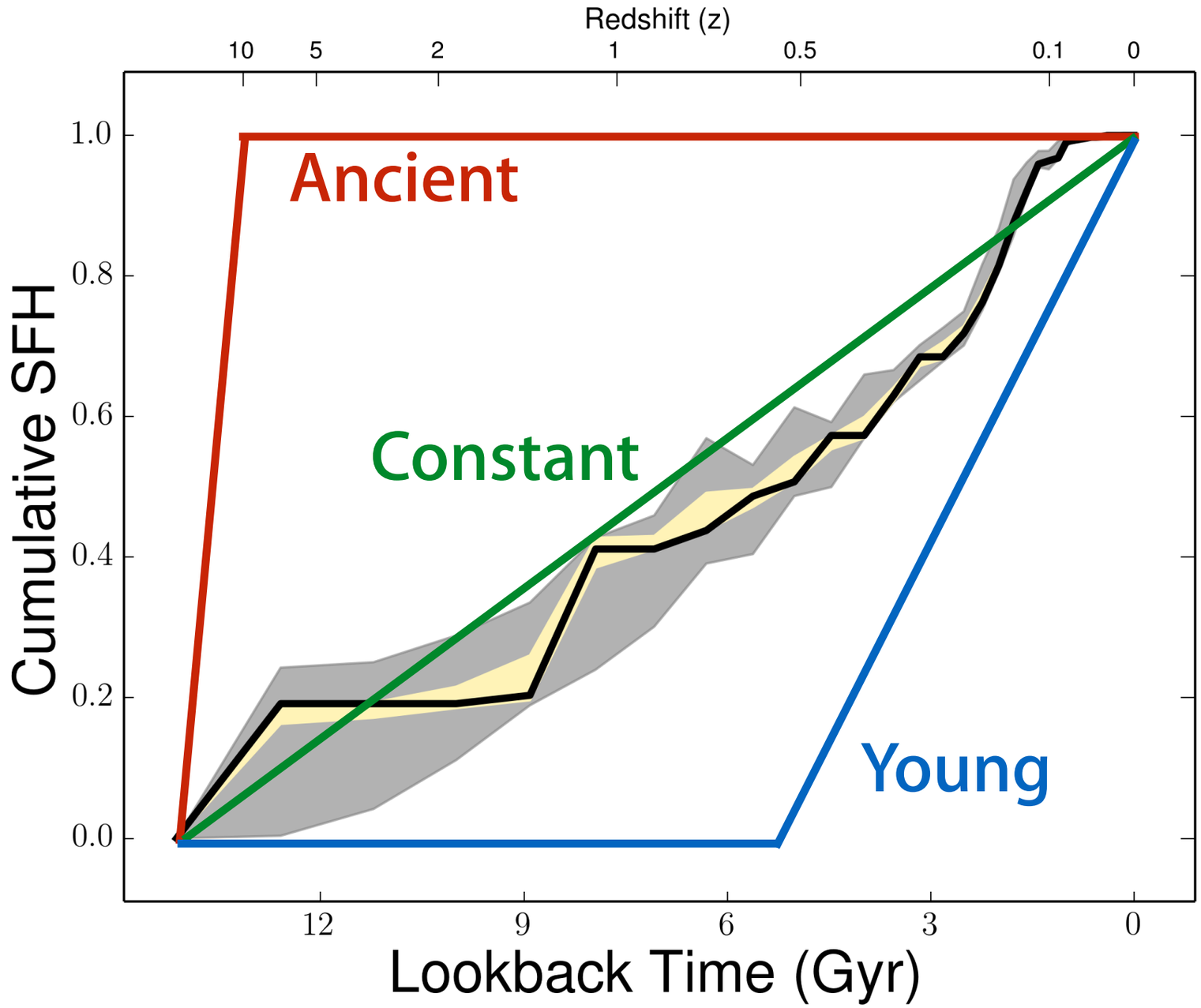
Potsdam Dwarfs

8.25.2014

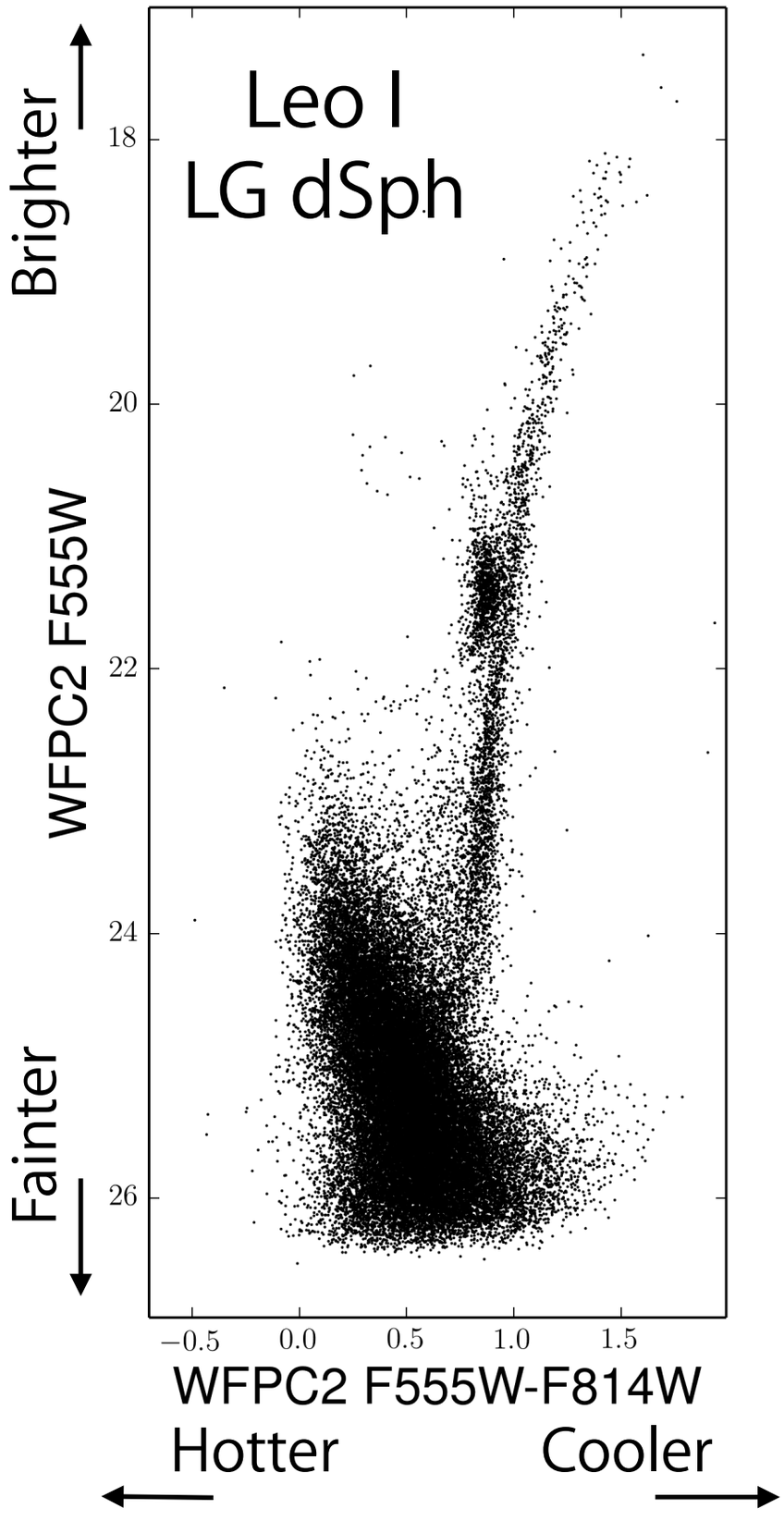
Star Formation History of Leo I

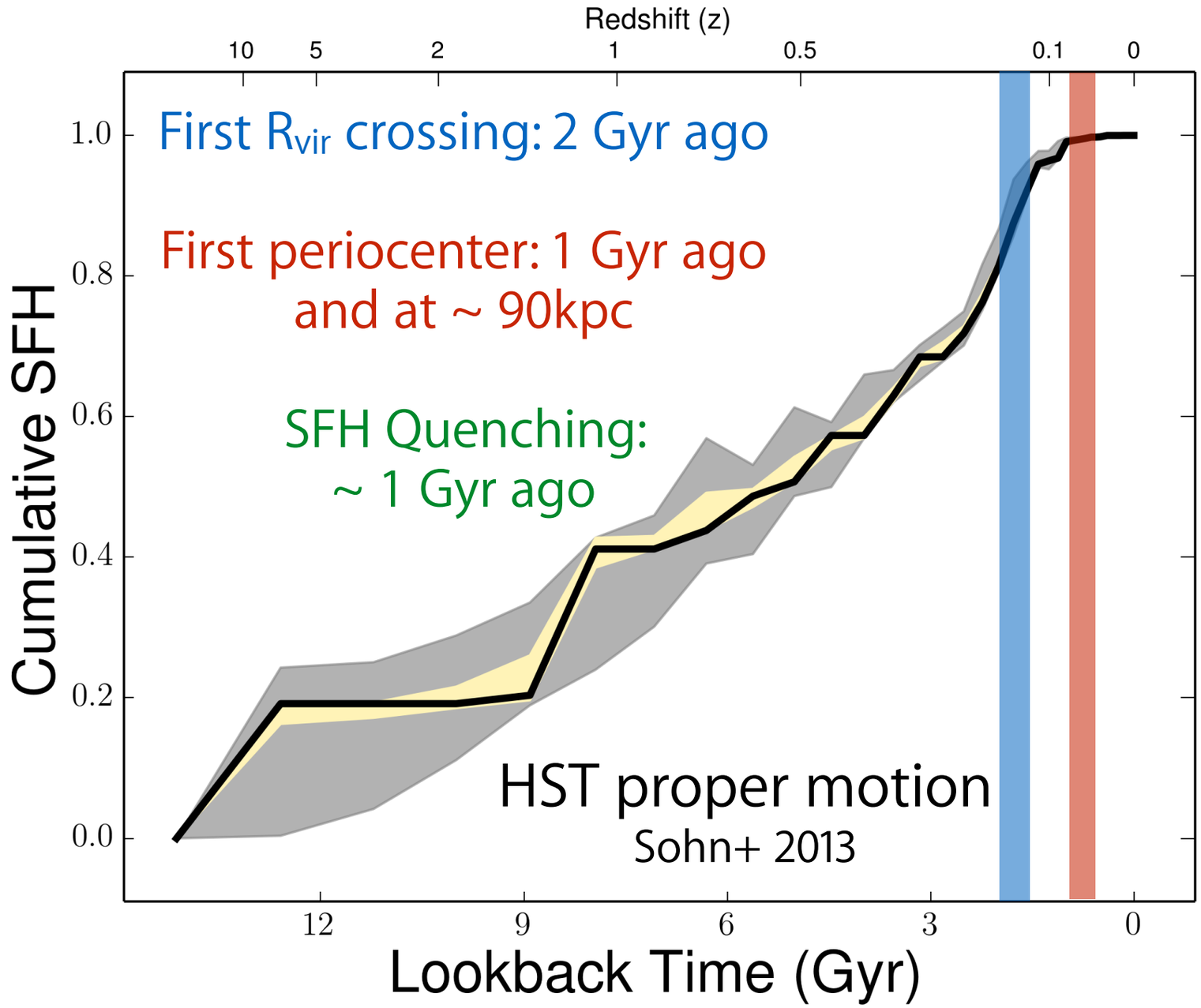




Weisz+ 2014a

Star Formation History of Leo I





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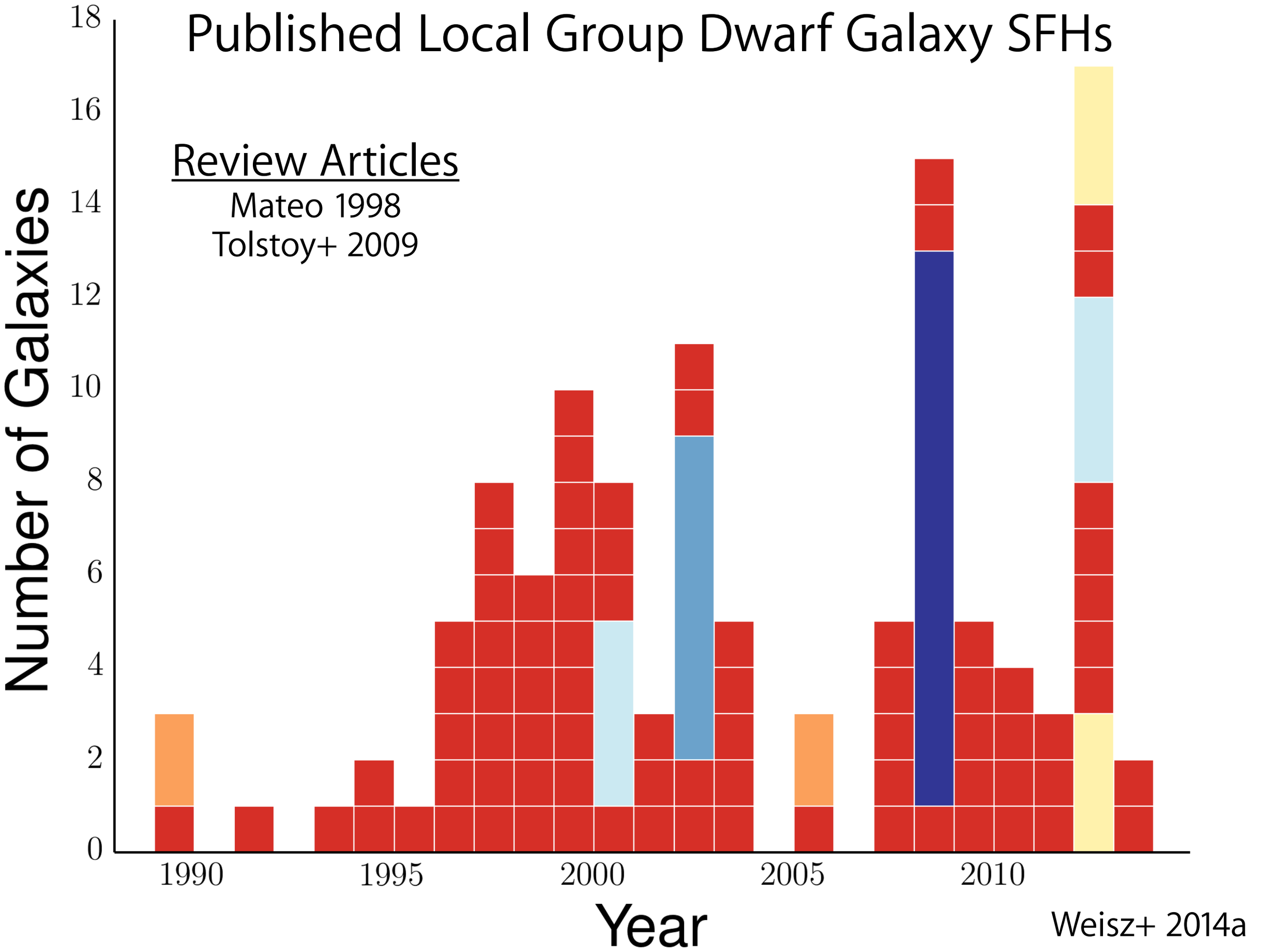
Published Local Group Dwarf Galaxy SFHs



Weisz+ 2014a

Why HST?

Ground

HST

Uniformly Measured SFHs of 40 LG Dwarfs from archival HST / WFPC2 imaging

Dan Weisz, Andy Dolphin, Evan Skillman,
Karrie Gilbert, Julianne Dalcanton, Ben Williams

Paper I. Data and Characterizing SFHs *(Weisz+ 2014a)*

Paper II. Signatures of Reionization *(Weisz+ 2014b)*

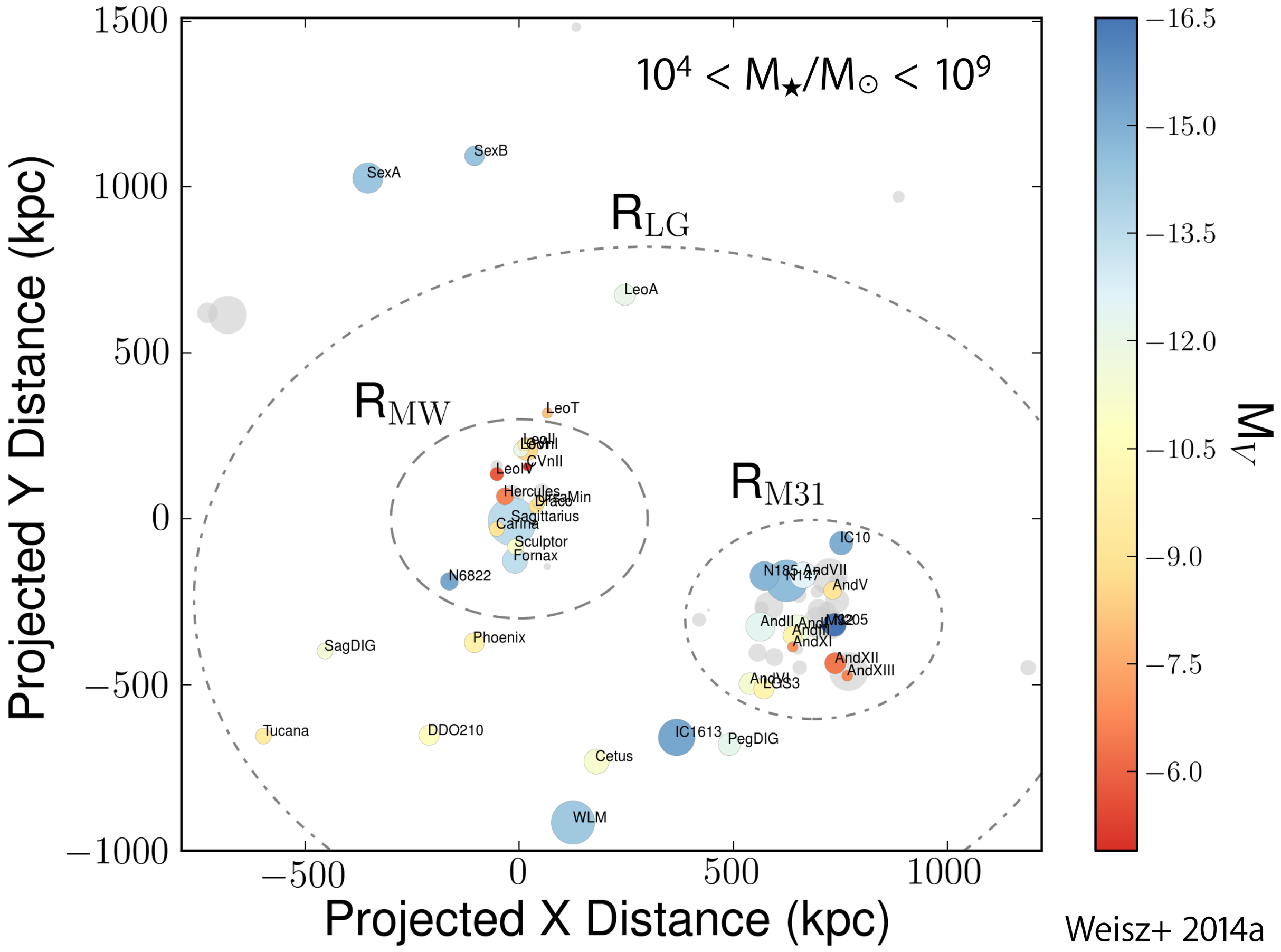
Paper III. Quenching Timescales *(Weisz+ 2014 submitted)*

The Very Faint End of the UV Luminosity Function over Cosmic Time: Constraints from the Local Group Fossil Record

(Weisz, Johnson, & Conroy 2014 submitted)

Photometry from the HST LG Stellar Photometry Archive:
http://astronomy.nmsu.edu/logphot

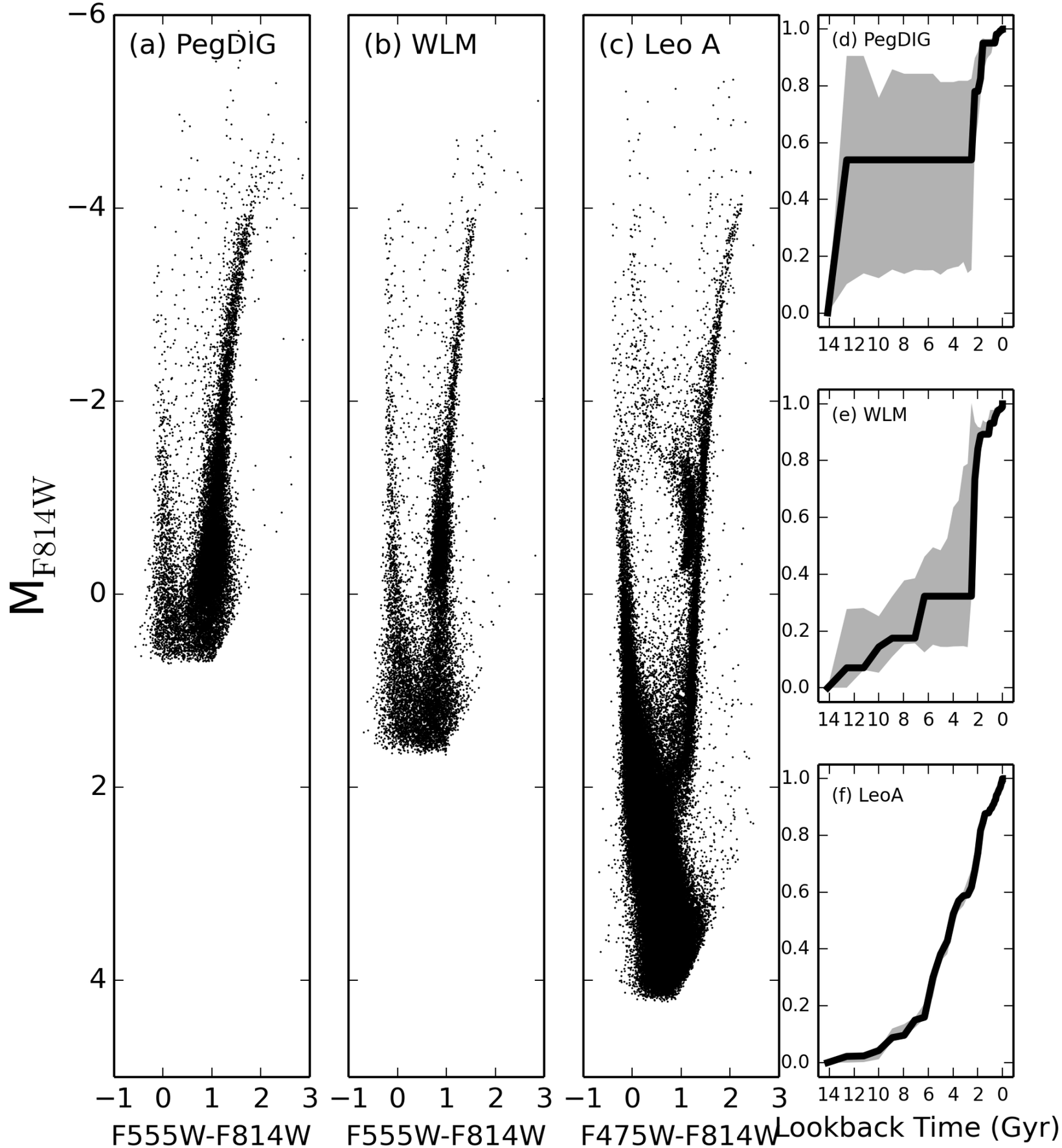
Star Formation Histories:
http://people.ucsc.edu/~drweisz


$10^4 < M_\star/M_\odot < 10^9$
R_{LG}
R_{MW}
R_{M31}
SexA
SexB
LeoA
LeoT
LeoII
CVnII
LeoIV
Hercules
UrsaMin
Draco
Sagittarius
Carina
Sculptor
Fornax
N6822
Phoenix
SagDIG
Tucana
DDO210
Cetus
WLM
IC1613
PegDIG
IC10
N185
AndVII
N147
AndV
AndII
M32
M205
AndI
AndXI
AndXII
AndXIII
AndVI
LGS3
1500
1000
500
0
−500
−1000
−500
0
500
1000
Projected Y Distance (kpc)
Projected X Distance (kpc)
−16.5
−15.0
−13.5
−12.0
−10.5
−9.0
−7.5
−6.0
M_V
Weisz+ 2014a

Homogenous reduction and analysis

but….

Heterogenous observations



Fraction of dwarfs imaged below oMSTO

MW: 100% M31: ~15% Field: ~50%

R_{LG}

R_{MW}

R_{M31}

AndXVI

AndII

Projected Y Distance (kpc)

Projected X Distance (kpc)

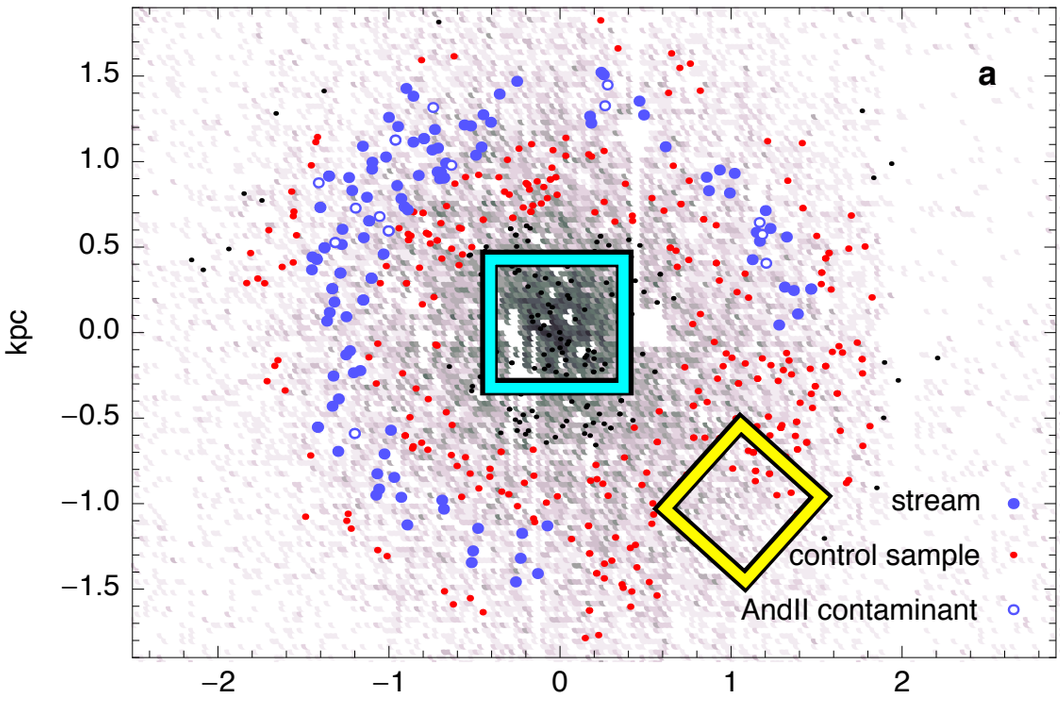
oldest MSTO (Gyr ago)

Weisz+ 2014c

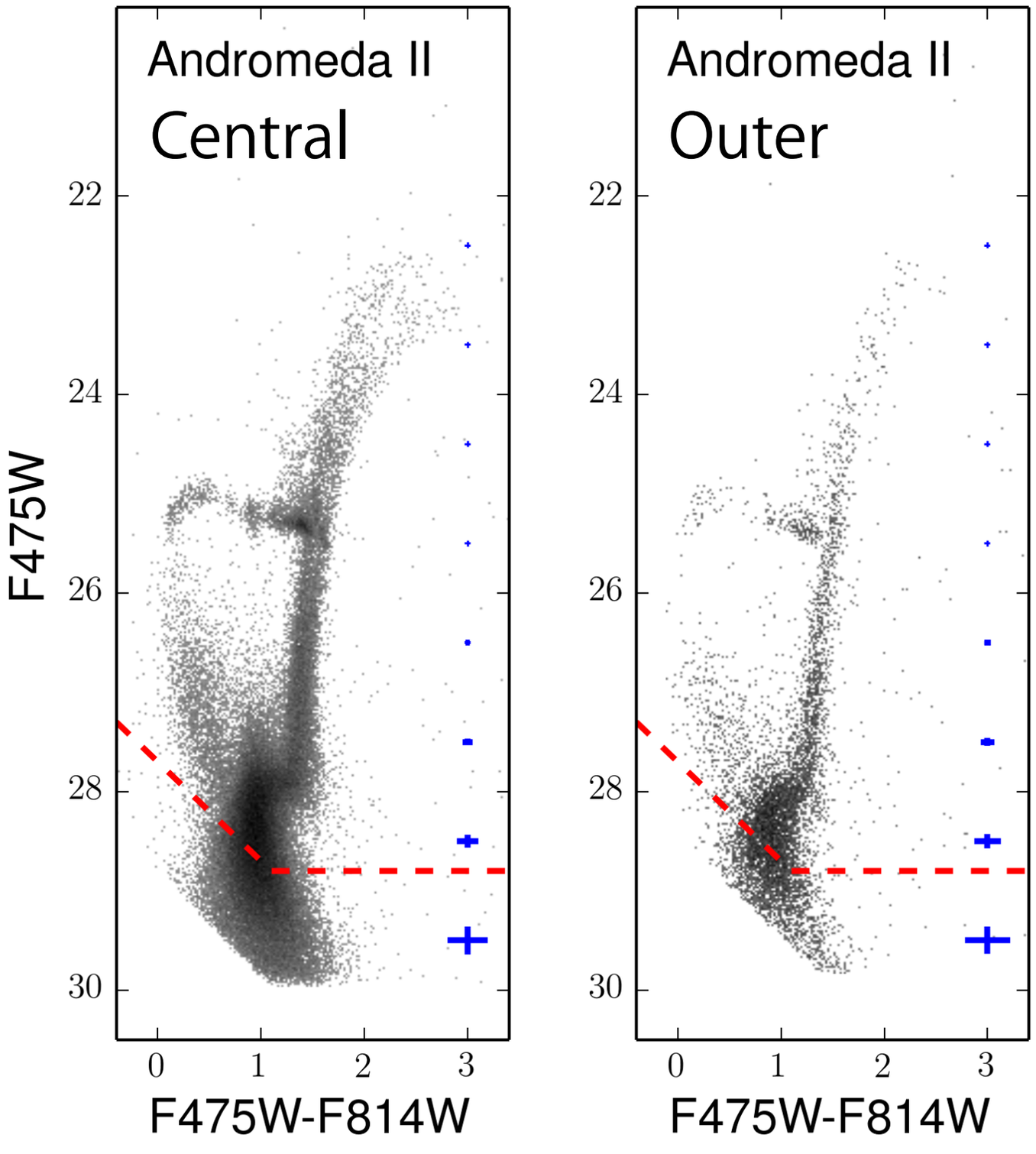
AndII

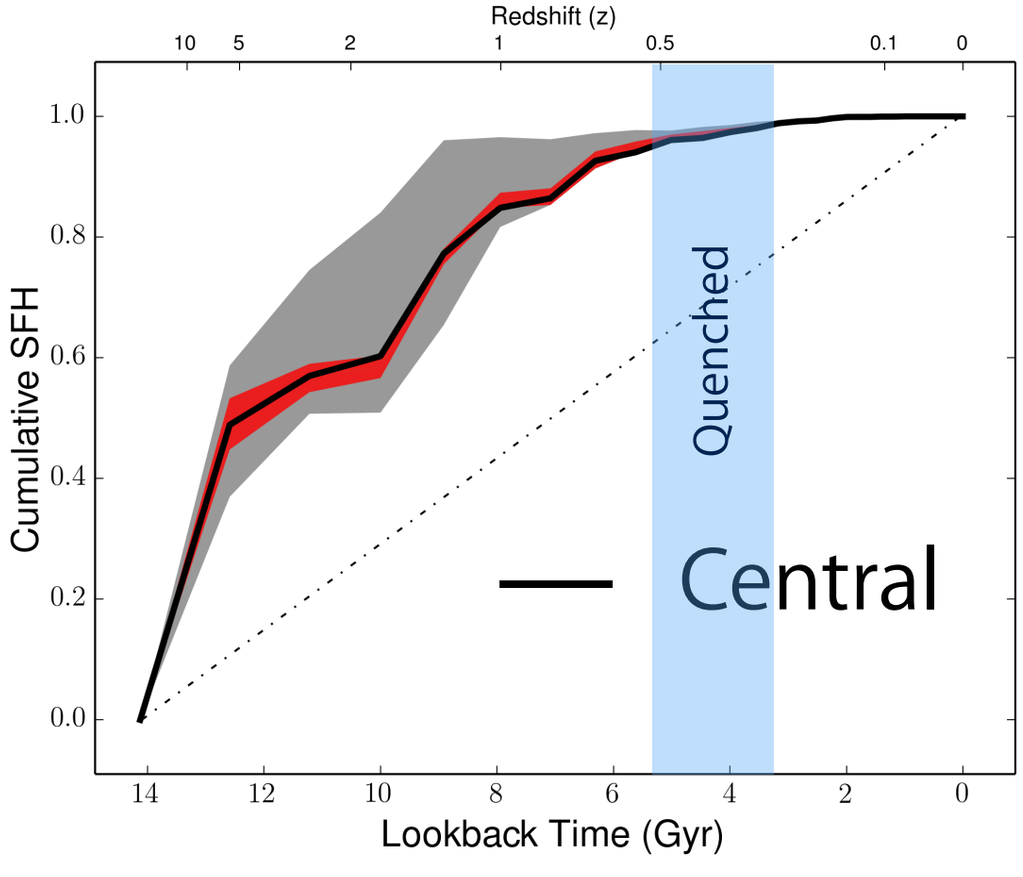
$M_V = -12,\ \log(M_\star/M_\odot) \sim 7$

$D_{M31} \sim 195$ kpc



Amorisco+ 2014





Weisz+ 2014c

AndII

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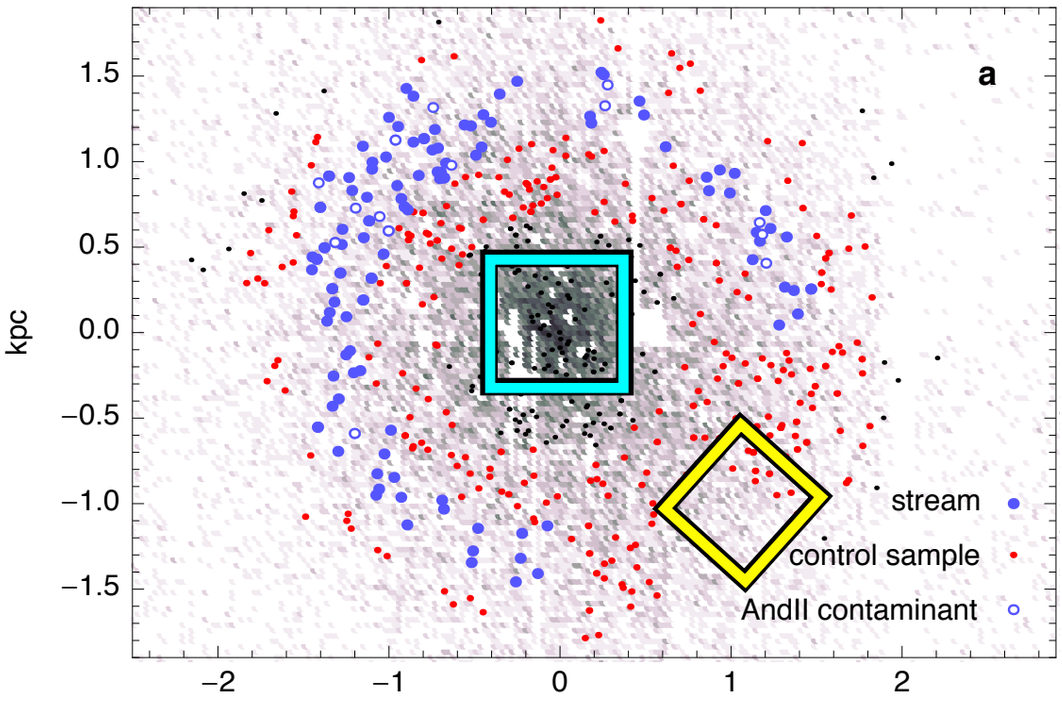
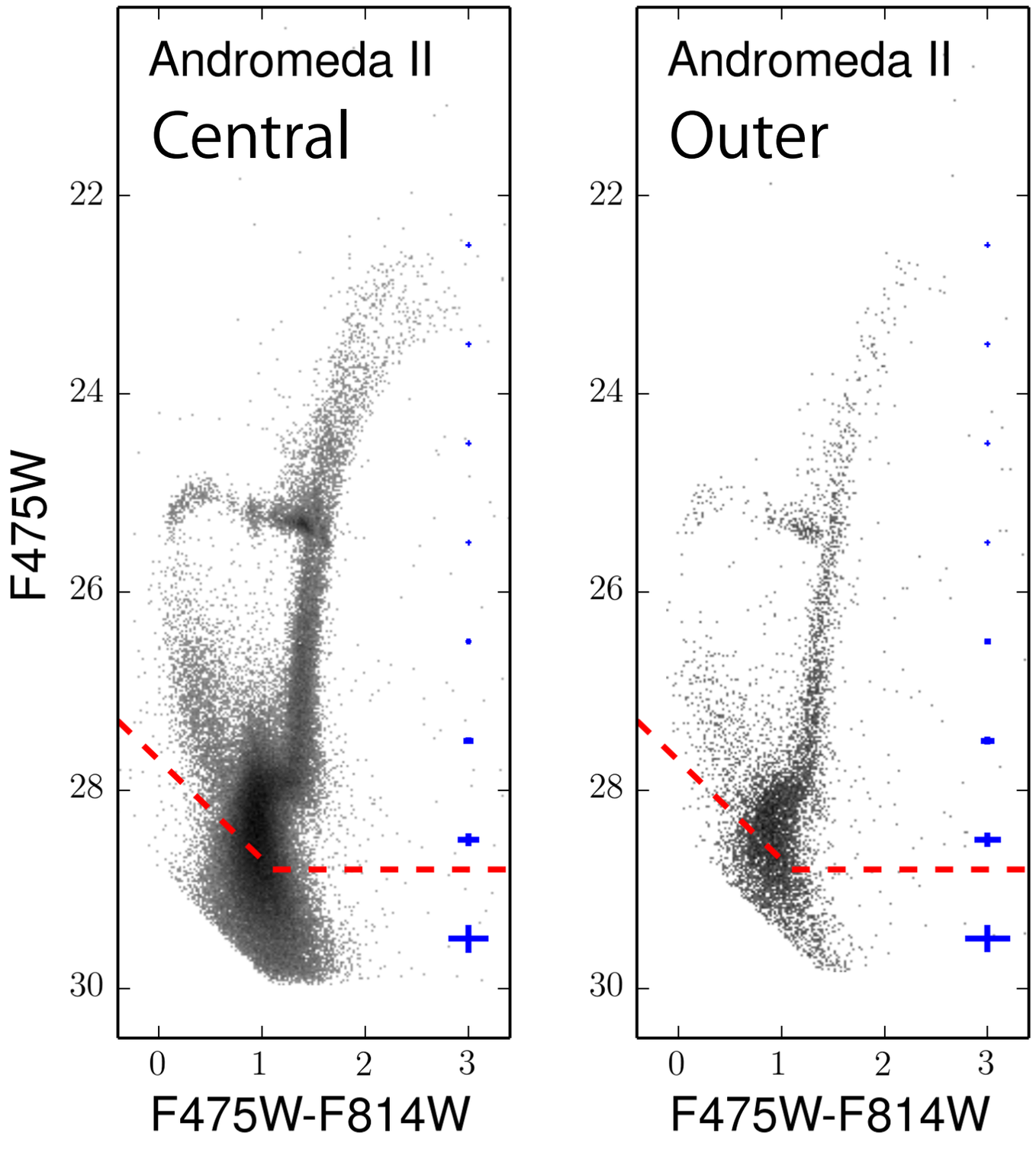
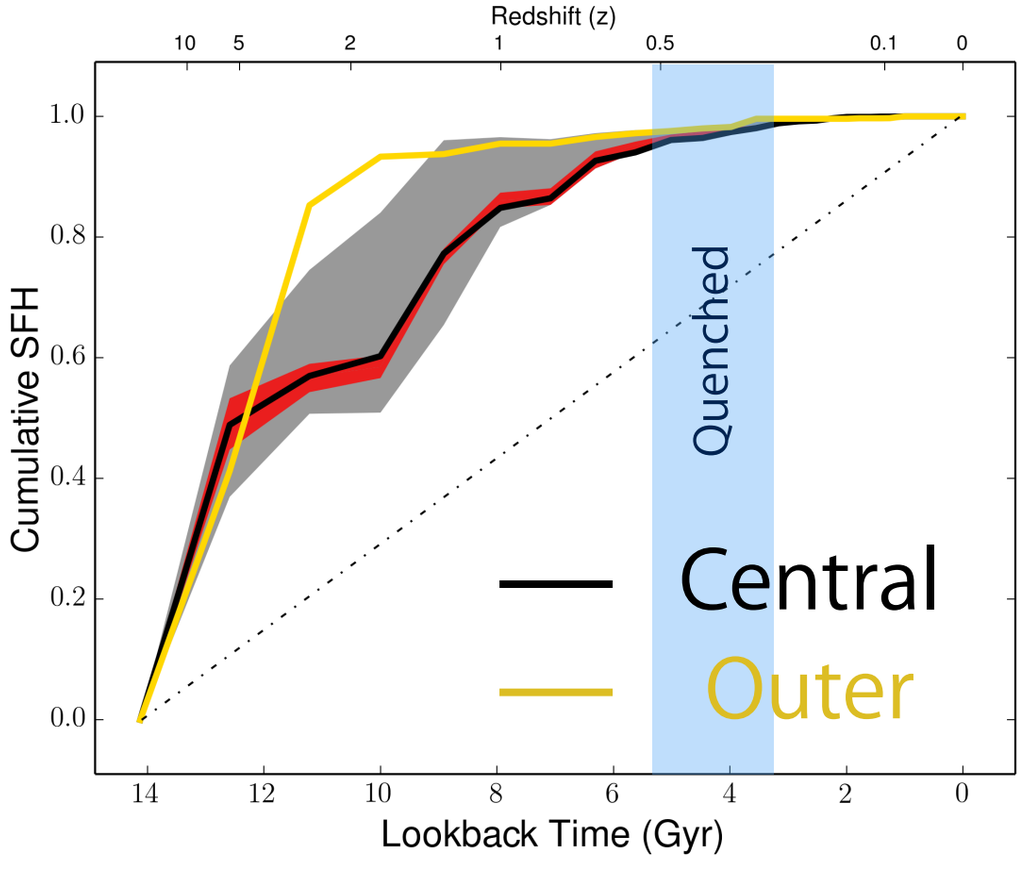


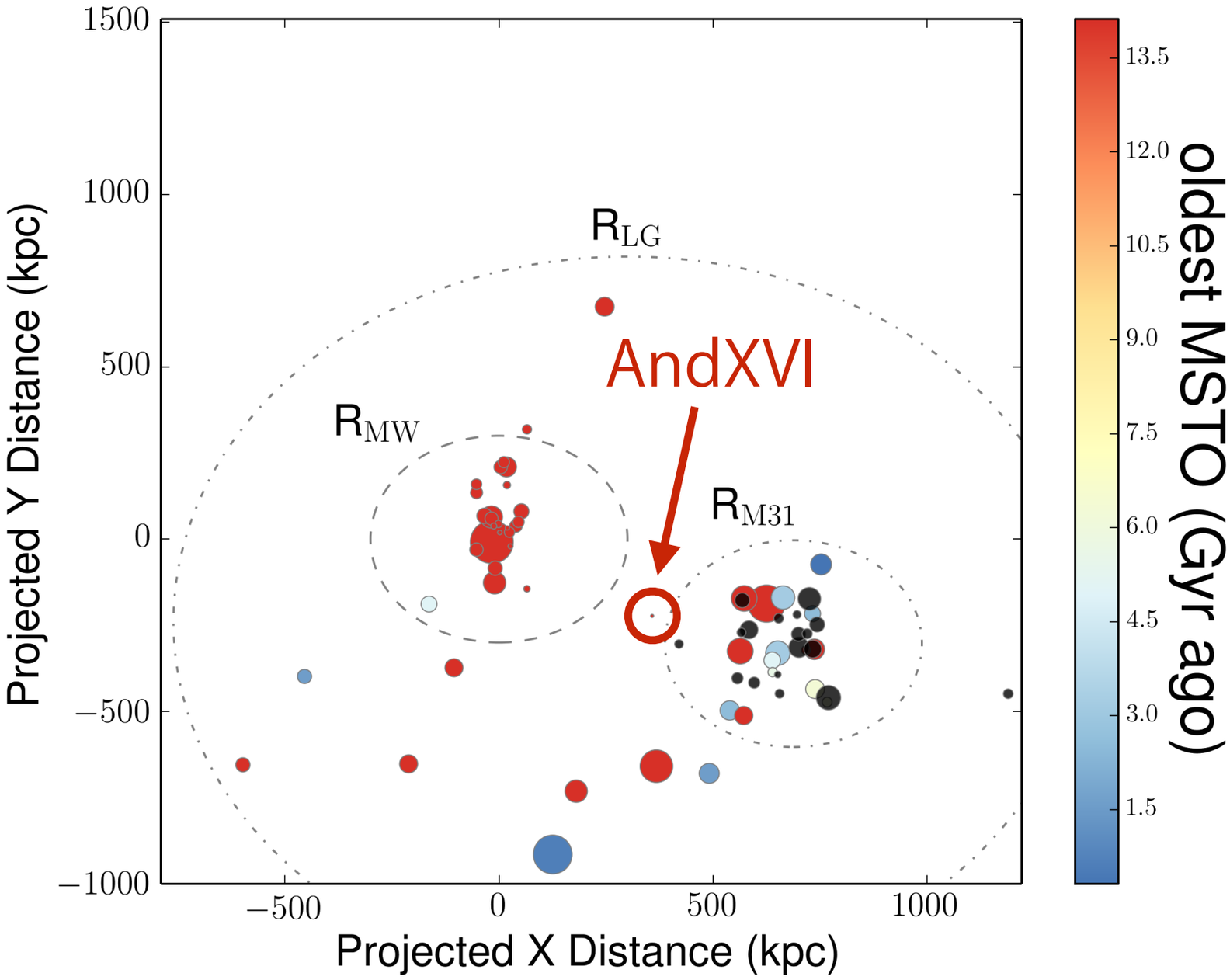
Amorisco+ 2014

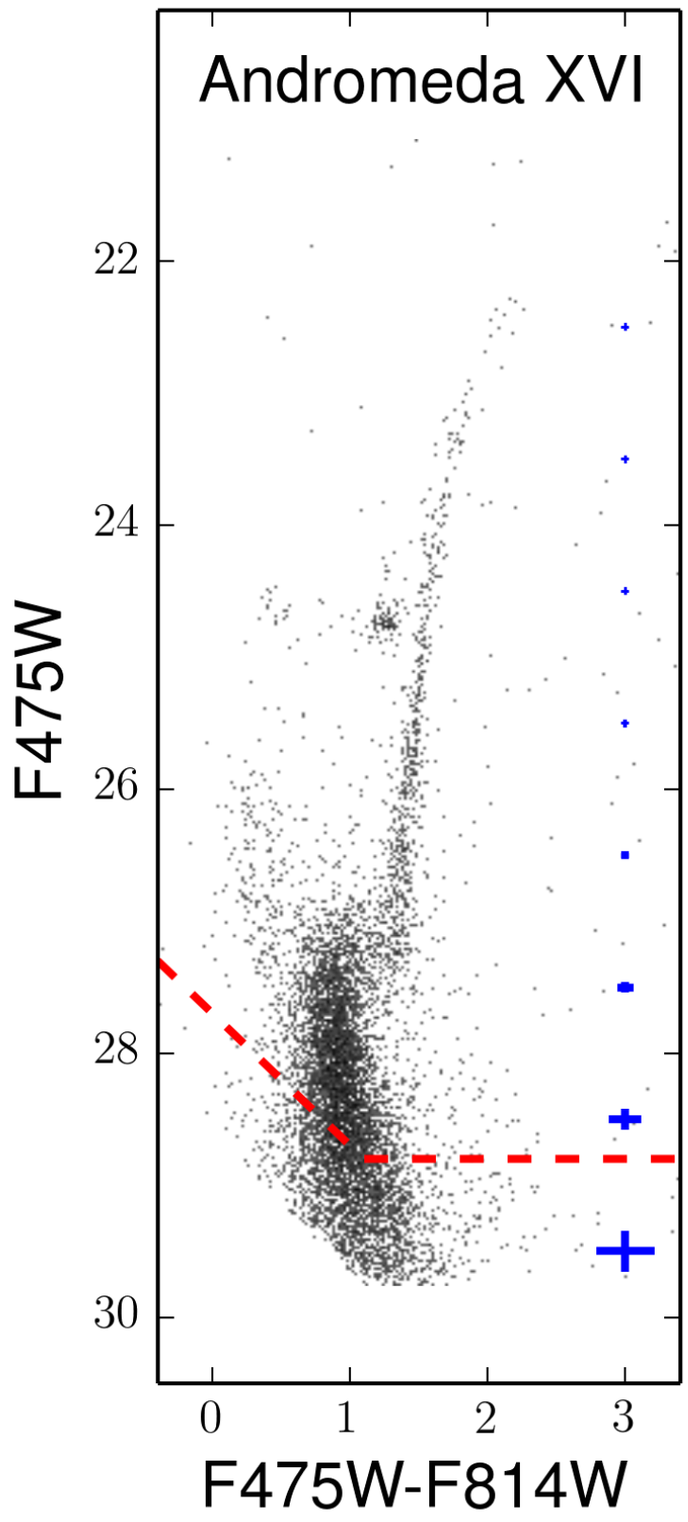




Weisz+ 2014c

AndXVI



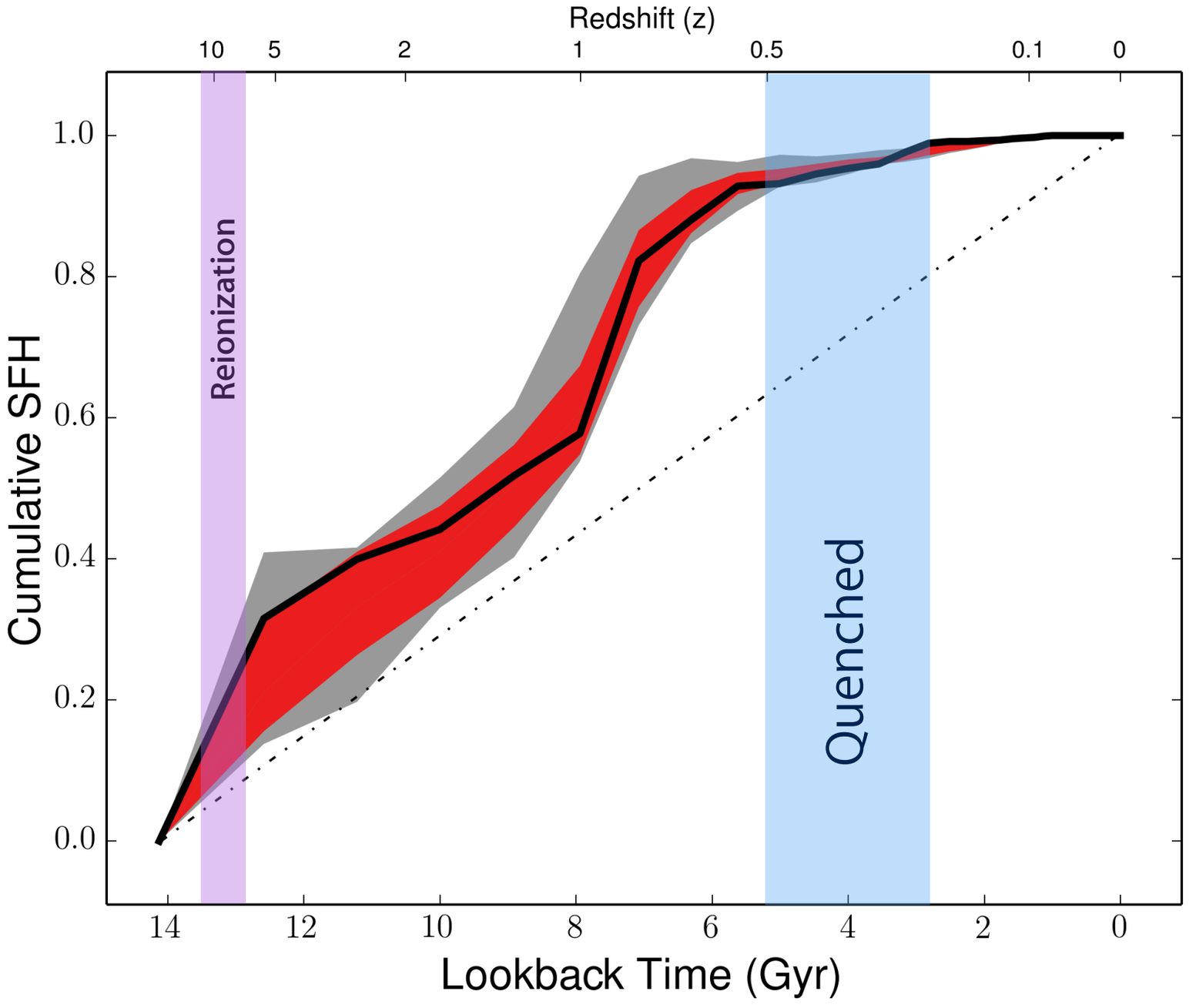


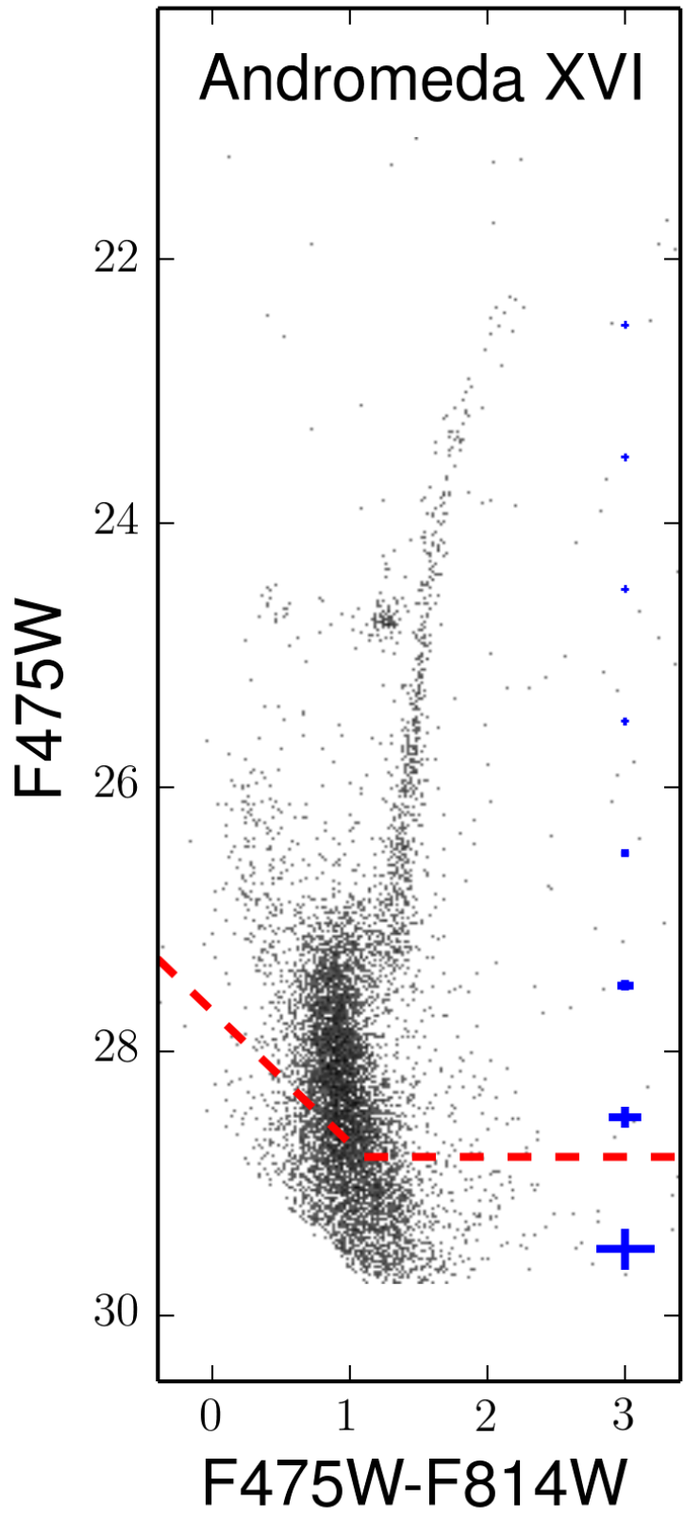
$M_V = -7.5,\ \log(M_\star/M_\odot) \sim 5$

$D_{M31} \sim 320$ kpc

Weisz+ 2014c

AndXVI





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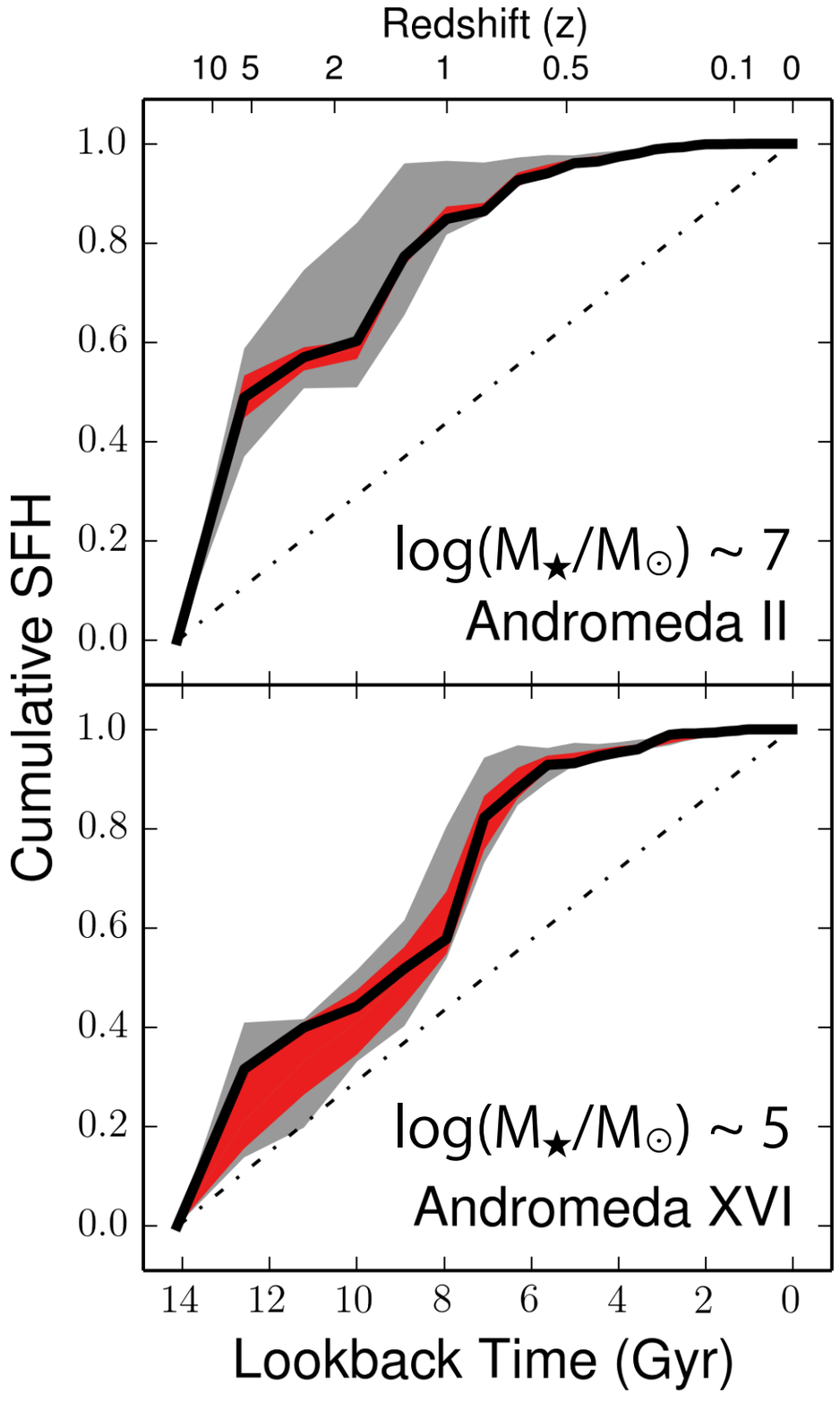
$D_{M31} \sim 320$ kpc

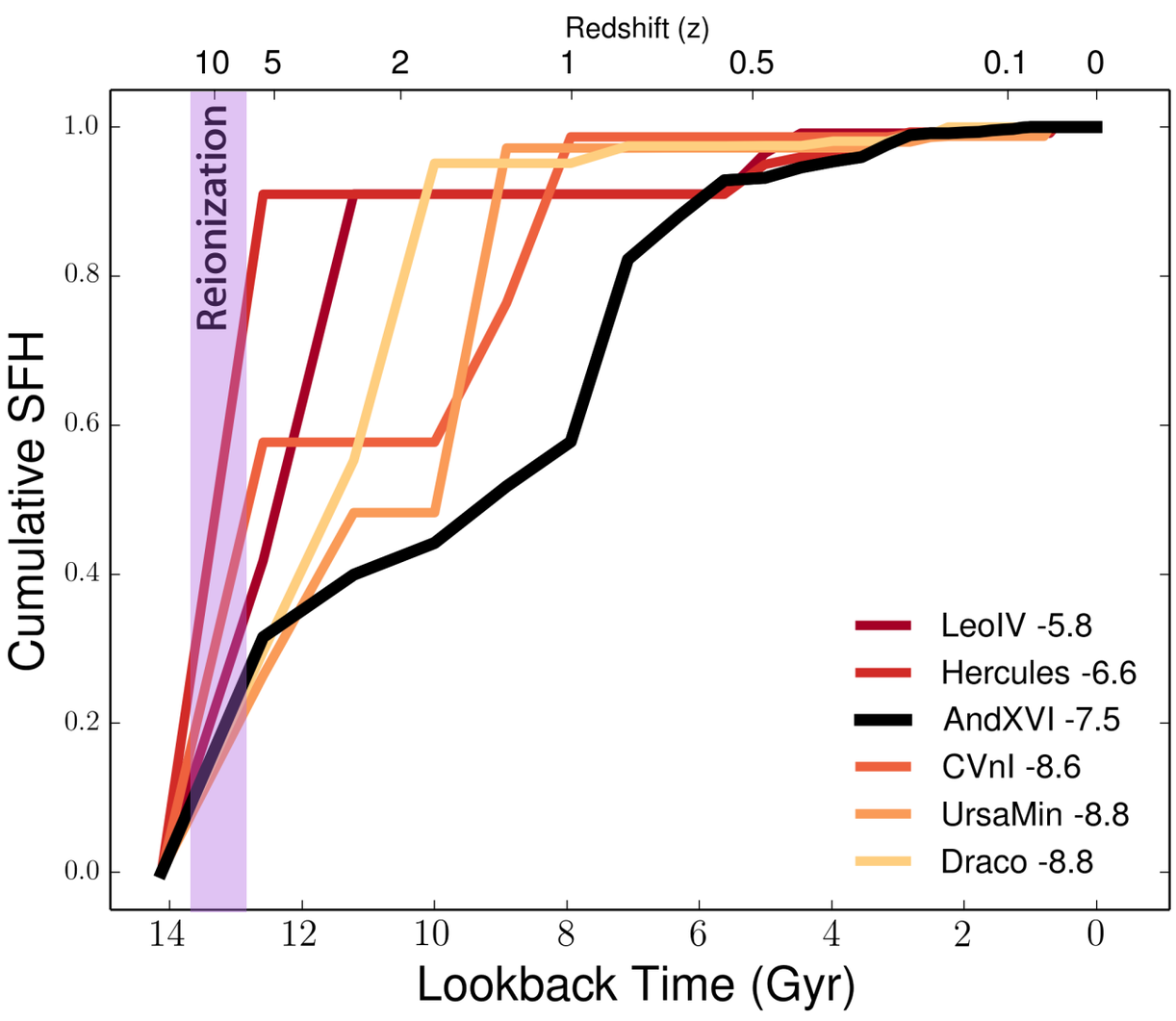
Weisz+ 2014c

Extended SFHs of And II & And XVI

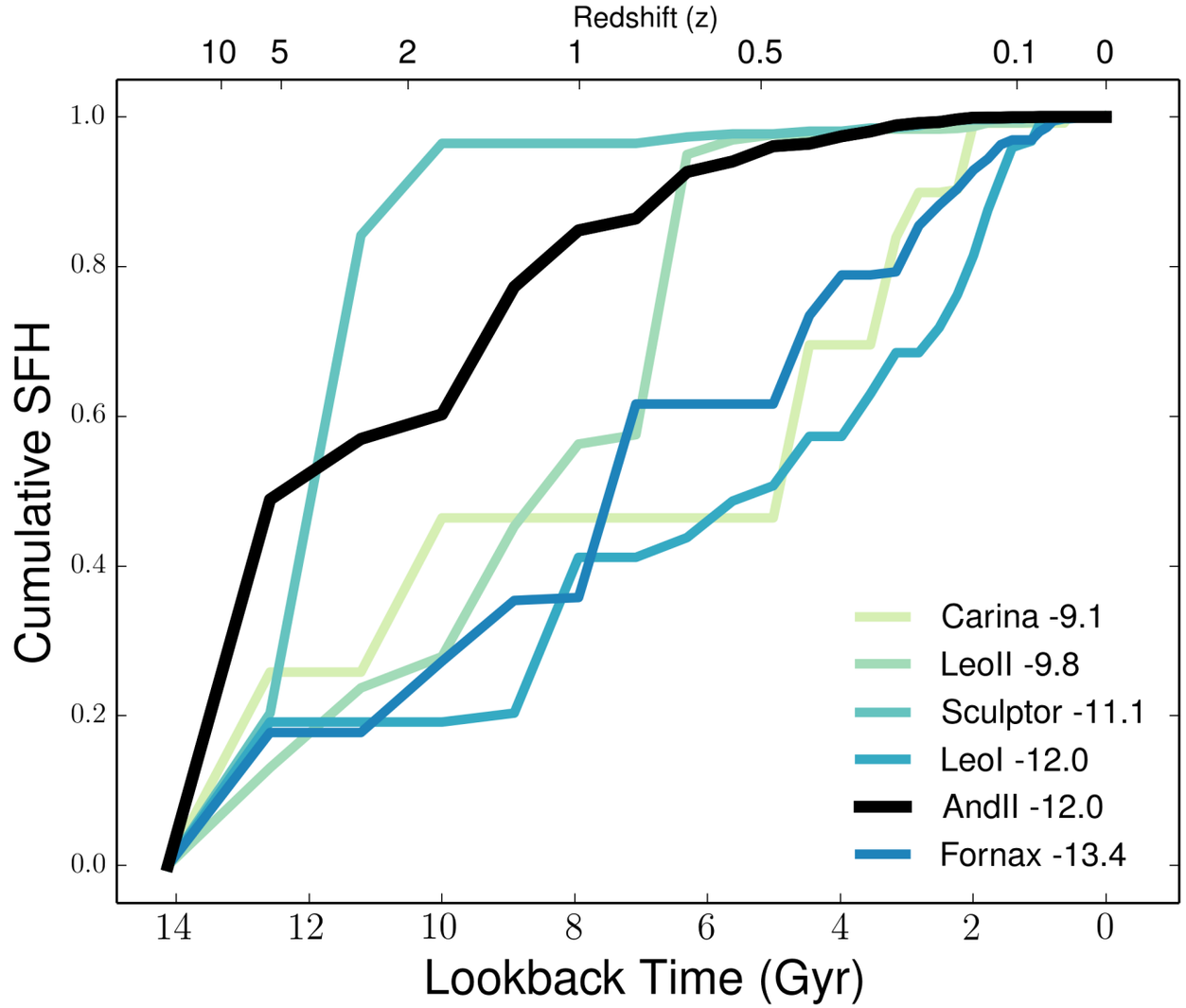


Weisz+ 2014c

AndXVI & Faint MW Satellites



AndII & Luminous MW Satellites



Fraction of dwarfs imaged below oMSTO

MW: 100% M31: ~15% Field: ~50%

R_{LG}

R_{MW}

R_{M31}

Projected Y Distance (kpc)

Projected X Distance (kpc)

oldest MSTO (Gyr ago)

HST Cycle 22

PI: E. Skillman
4 M31 satellites
to oMSTO

PI: N. Martin
17 M31 satellites
to sub-HB/oMSTO

PI: D. Weisz
PegDIG & WLM
to oMSTO

R_{MW}

R_{M31}

Projected Y Distance (kpc)

Projected X Distance (kpc)

oldest MSTO (Gyr ago)

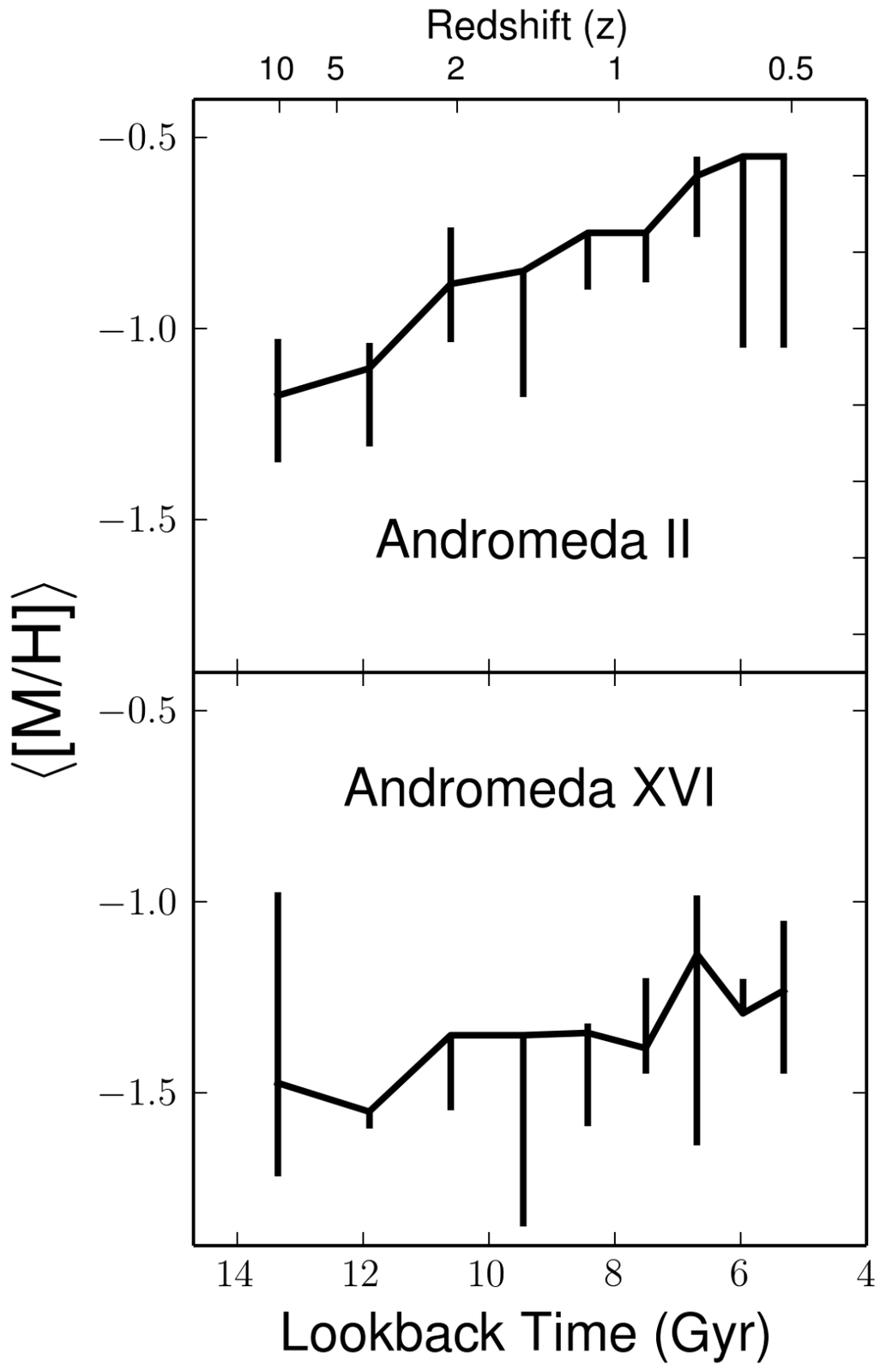
Summary

Deep HST imaging captures oMSTO
of AndII and AndXVI

Both have extended SFHs to z~0.5,
despite being 2 dex in mass apart

Both SFHs different than MW satellites
of similar luminosity

Cycle 22 HST programs (Skillman, Martin, Weisz)
will nearly complete imaging
of M31 & `Field' dwarfs to > 8-9 Gyr MSTO


Redshift (z)
10
5
2
1
0.5
−0.5
−1.0
−1.5
Andromeda II
Andromeda XVI
⟨[M/H]⟩
14
12
10
8
6
4
Lookback Time (Gyr)