ArXiv: astro-ph, Nov 2-6, 2015

от Сильченко О.К.

Astro-ph: 1511.00006

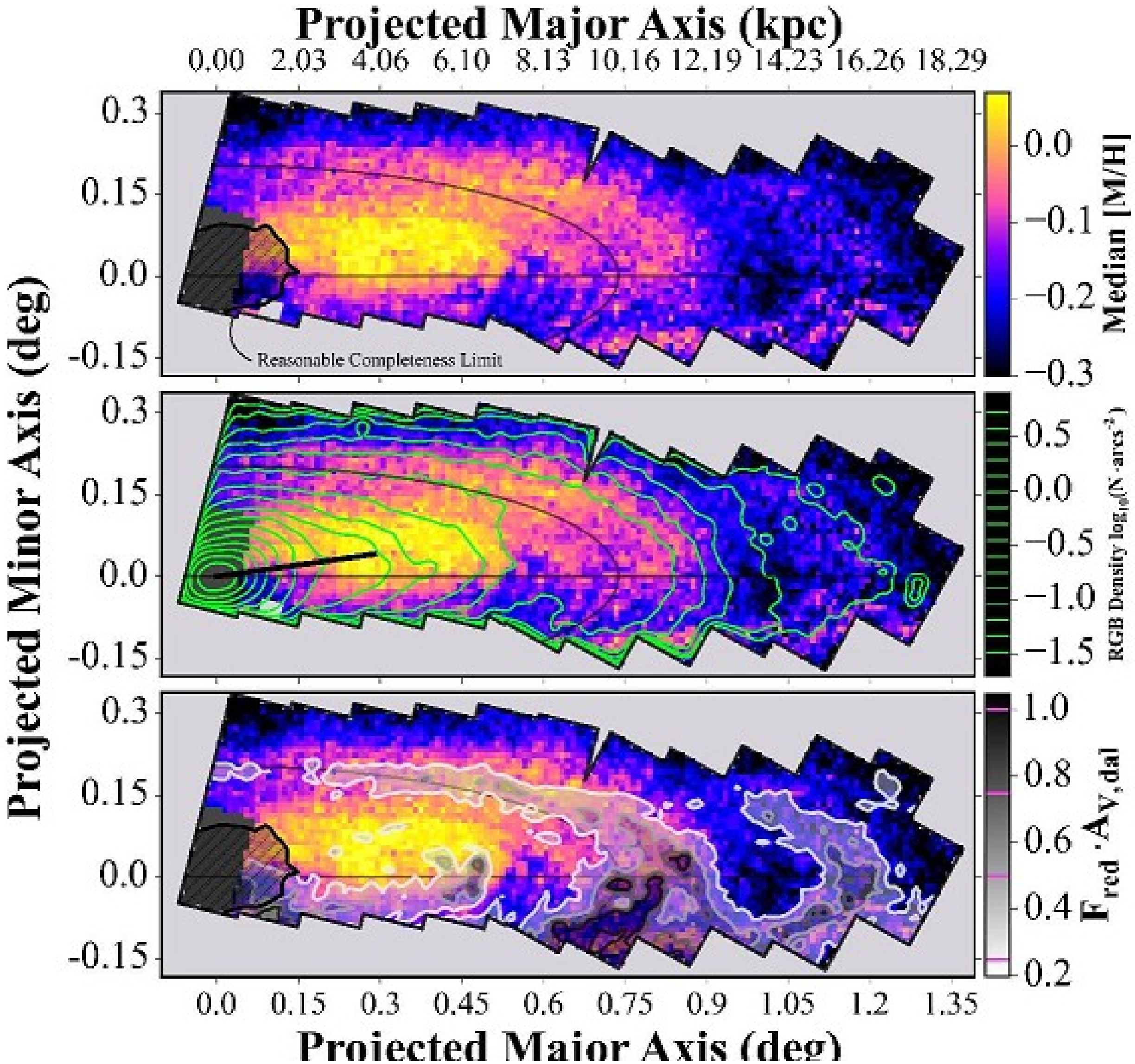
PANCHROMATIC HUBBLE ANDROMEDA TREASURY XII. MAPPING STELLAR METALLICITY DISTRIBUTIONS IN M31

Dylan Gregersen[1], Anil C. Seth[1], Benjamin F. Williams[2], Dustin Lang[3], Julianne J. Dalcanton[2], Leó Girardi[4], Evan D. Skillman[5], Eric Bell[6], Andrew E. Dolphin[7], Morgan Fouesneau[8], Puragra Guhathakurta[9], Katherine M. Hamren[9], L. C. Johnson[2], Jason Kalirai[10,11], Alexia R. Lewis[2], Antonela Monachesi[12], and Knut Olsen[13]

(Dated: November 3, 2015)
Draft version November 3, 2015

ABSTRACT

We present a study of spatial variations in the metallicity of old red giant branch stars in the Andromeda galaxy. Photometric metallicity estimates are derived by interpolating isochrones for over seven million stars in the Panchromatic Hubble Andromeda Treasury (PHAT) survey. This is the first systematic study of stellar metallicities over the inner 20 kpc of Andromeda's galactic disk. We see a clear metallicity gradient of -0.020 ± 0.004 dex/kpc from $\sim 4 - 20$ kpc assuming a constant RGB age. This metallicity gradient is derived after correcting for the effects of photometric bias and completeness and dust extinction and is quite insensitive to these effects. The unknown age gradient in M31's disk creates the dominant systematic uncertainty in our derived metallicity gradient. However, spectroscopic analyses of galaxies similar to M31 show that they typically have small age gradients that make this systematic error comparable to the 1σ error on our metallicity gradient measurement. In addition to the metallicity gradient, we observe an asymmetric local enhancement in metallicity at radii of 3-6 kpc that appears to be associated with Andromeda's elongated bar. This same region also appears to have an enhanced stellar density and velocity dispersion.


Projected Major Axis (kpc)
0.00 2.03 4.06 6.10 8.13 10.16 12.19 14.23 16.26 18.29
Projected Minor Axis (deg)
0.3 0.15 0.0 -0.15
Median [M/H]
0.0 −0.1 −0.2 −0.3
Reasonable Completeness Limit
RGB Density log10(N·arcs-2)
0.5 0.0 −0.5 −1.0 −1.5
Fred ·AV,dal
1.0 0.8 0.6 0.4 0.2
0.0 0.15 0.3 0.45 0.6 0.75 0.9 1.05 1.2 1.35
Projected Major Axis (deg)

Градиент металличности по красным гигантам в М 31

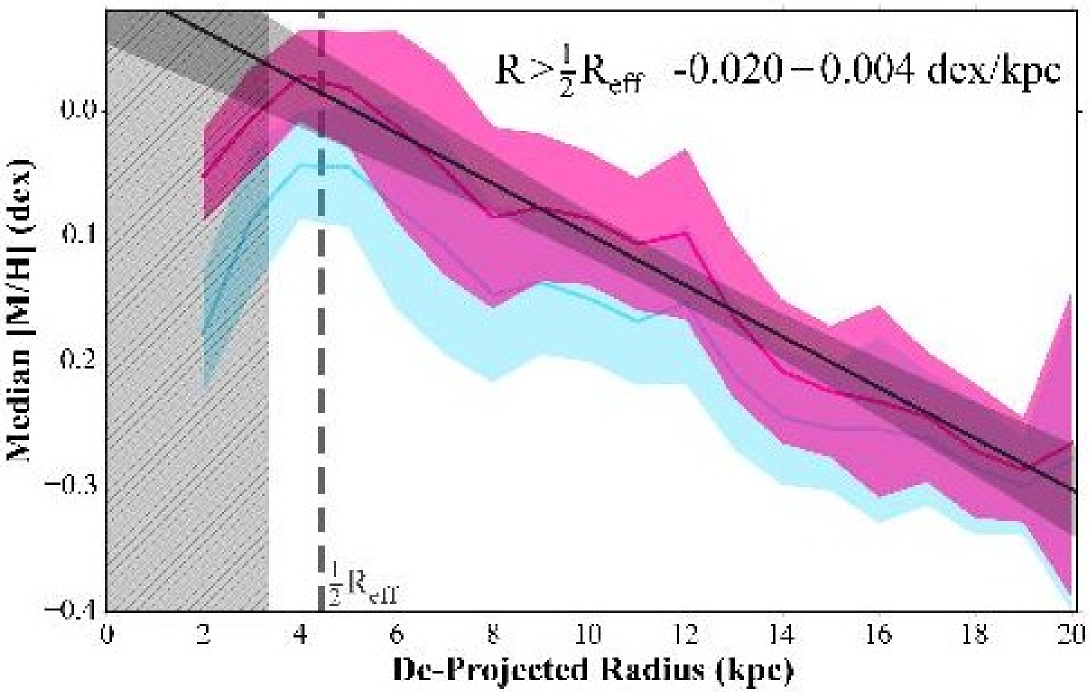


FIG. 9.— The median metallicity gradient in M31. To create this figure, the median metallicity map (Figure 8) was divided into annular bins with $b/a = 0.275$; within these bins the mean of the map is shown as the solid line, while the shaded region shows the standard deviation of the pixels in the bin. High extinction regions ($f_{red} \cdot A_{V,Dal} > 0.25$) were excluded. The red line shows the gradient including corrections for dust extinction and photometric bias and completeness, while in cyan the metallicities have only been corrected for dust extinction. The bias and completeness correc-

Сравнение с выборкой CALIFA

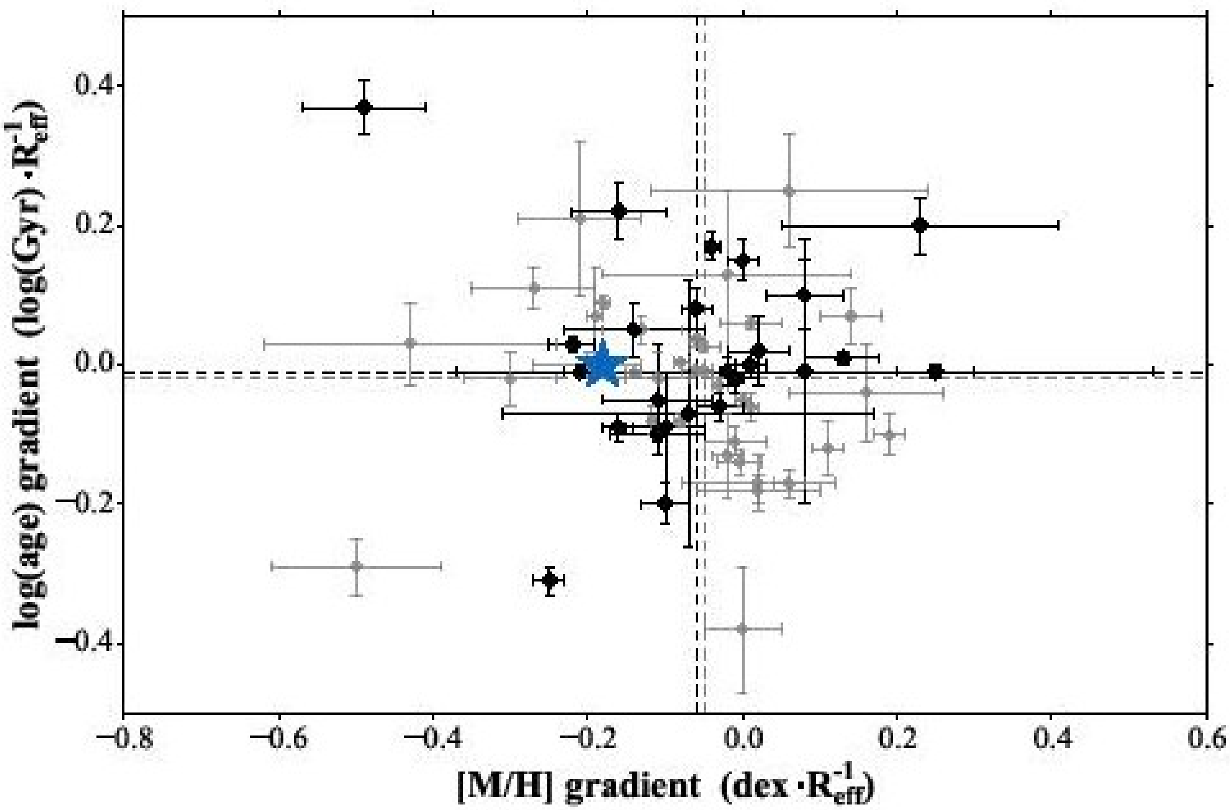


FIG. 12.— Mass-weighted age and metallicity gradients measured for 62 CALIFA galaxies by Sánchez-Blázquez et al. (2014). Gray points indicate the full sample, while the 25 galaxies most similar to M31 (Hubble types Sab to Sbc and $-20.5 > M_r > -22.5$) are highlighted in black. Our M31 metallicity gradient (assuming no age gradient) is shown as the blue star. Dashed lines give the median of the full sample (gray), and the M31-like sample (black) along both axes.

Astro-ph: 1511.01095

Mon. Not. R. Astron. Soc. **000**, 1–11 (2015) Printed 5 November 2015 (MN LaTeX style file v2.2)

The no-spin zone: rotation vs dispersion support in observed and simulated dwarf galaxies

Coral Wheeler[1⋆], Andrew B. Pace[1], James S. Bullock[1], Michael Boylan-Kolchin[2]
Jose Oñorbe[3], Alex Fitts[2], Philip F. Hopkins[4], Dušan Kereš[5]
[1] *Center for Cosmology, Department of Physics and Astronomy, University of California, Irvine, CA 92697, USA*
[2] *Department of Astronomy, The University of Texas at Austin, 2515 Speedway, Stop C1400, Austin, TX 78712*
[3] *Max-Planck-Institut fuer Astronomie, Koenigstuhl 17, 69117 Heidelberg, Germany*
[4] *TAPIR, Mailcode 350-17, California Institute of Technology, Pasadena, CA 91125, USA*
[5] *Department of Physics, Center for Astrophysics and Space Sciences, University of California at San Diego, 9500 Gilman Drive, La Jolla, CA 92093*

Диаграмма Бинни для карликов Местной Группы (звезды!)

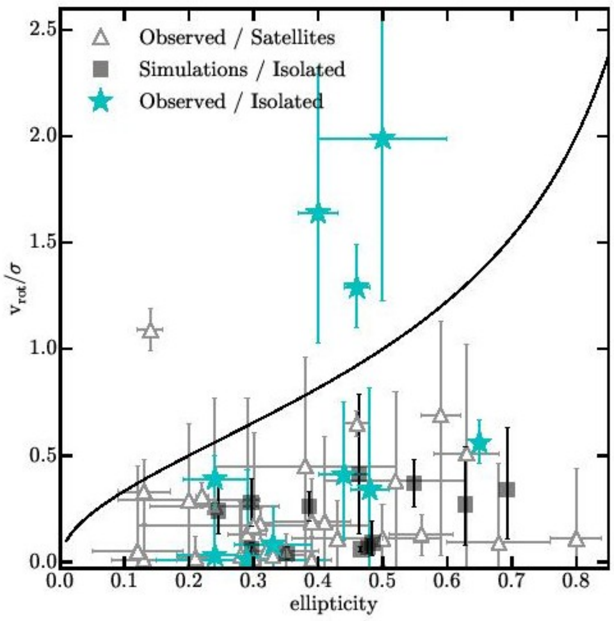


Figure 1. Stellar rotation support $v_{\rm rot}/\sigma$ vs. e (ellipticity) for observed satellites of the Milky Way and M31 (open gray triangles), isolated Local Group Dwarfs (cyan stars), and simulated isolated (dIrr) galaxies (gray squares). The solid line shows the approximate value of $v_{\rm rot}/\sigma$ for self-gravitating objects that are flattened by rotation (Binney 1978). The four galaxies that lie above the curve are Andromeda II (open triangle), Pegasus, Leo A, and Aquarius. The majority of observed isolated dwarfs (7/10) are not rotation-

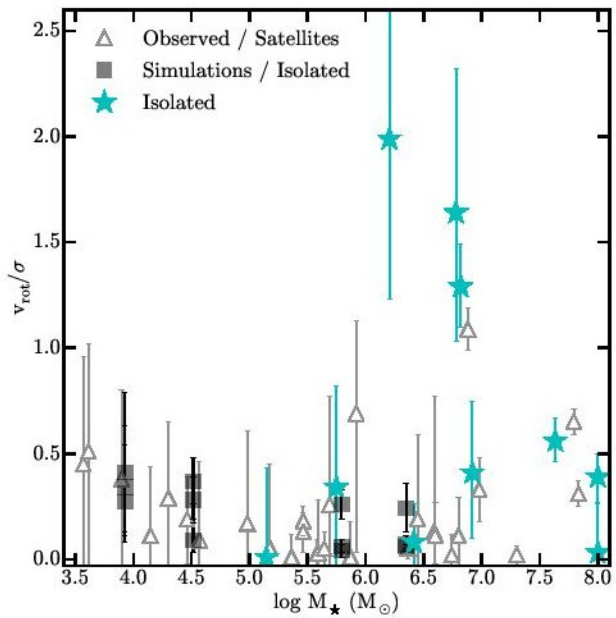


Figure 2. Stellar rotation support ($v_{\rm rot}/\sigma$) vs. stellar mass for observed satellites of the Milky Way and M31 (open gray triangles), isolated Local Group Dwarfs (cyan stars), and our simulations (gray squares). No clear trend with stellar mass is seen in the data.

Нет корреляции с расстоянием до хозяйских галактик?

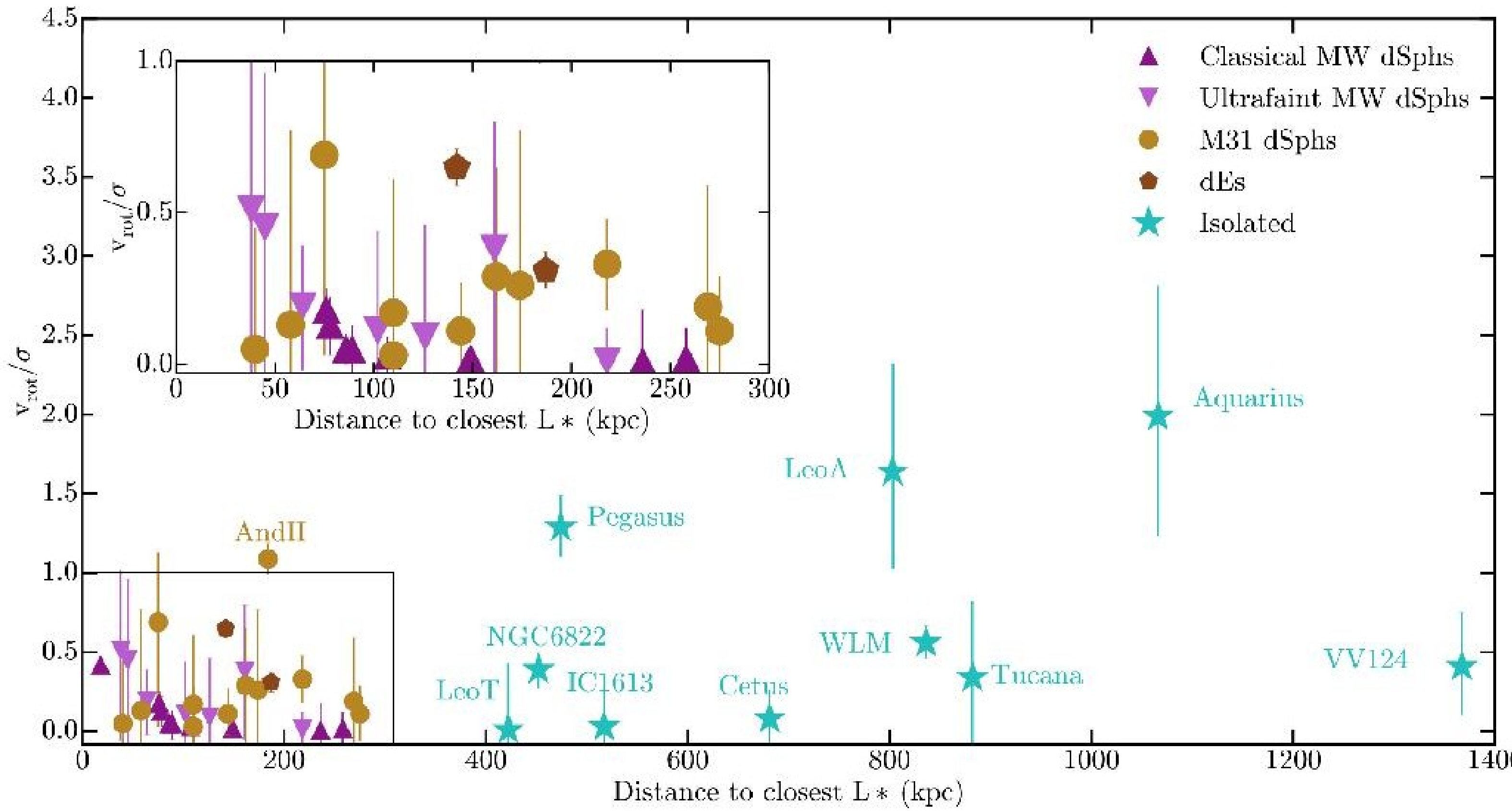


Figure 3. Rotation support $v_{\rm rot}/\sigma$ vs $d_{MW/M31}$, distance from the dwarf to the closest $L_\star$ galaxy (either the Milky Way or M31), for observed classical Milky Way dSphs (up-facing dark magenta triangles), ultra-faint dSphs (down-facing light magenta triangles), M31 dSphs (gold circles), isolated Local Group Dwarfs (cyan stars) and dEs (brown pentagons). *Inset:* Zoomed-in region showing $v_{\rm rot}/\sigma$ vs $d_{MW/M31}$ for select (not including And II) Milky Way and M31 satellites.