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От Сильченко О.К.

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The Fornax3D project: discovery of ancient massive merger events in the Fornax cluster galaxies NGC 1380 and NGC 1427

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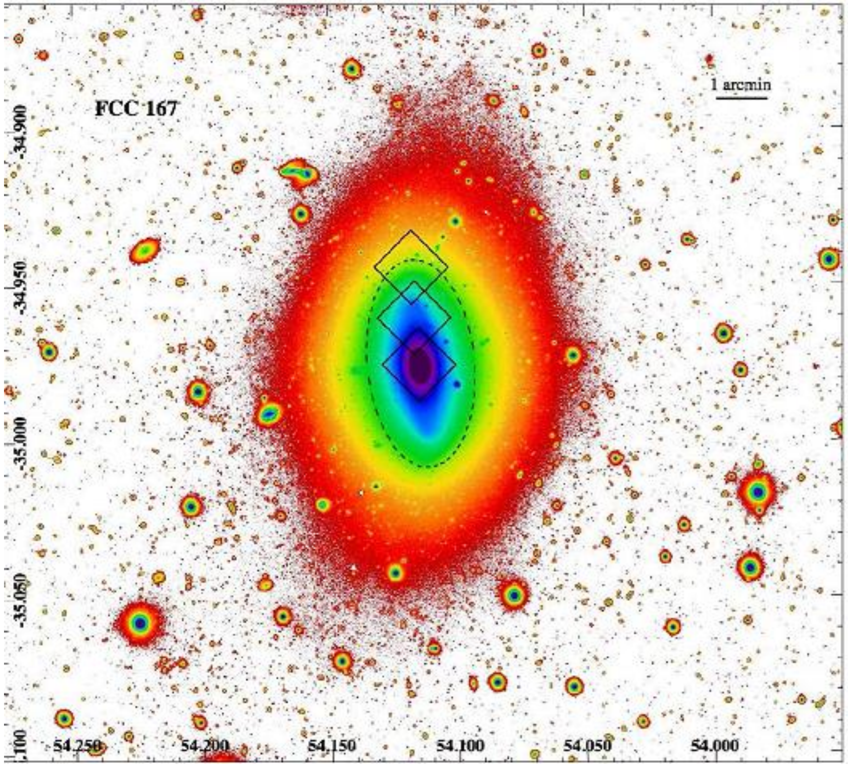
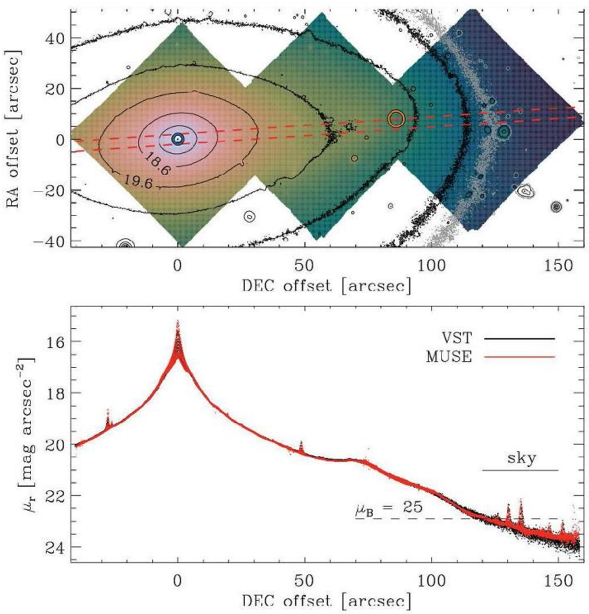
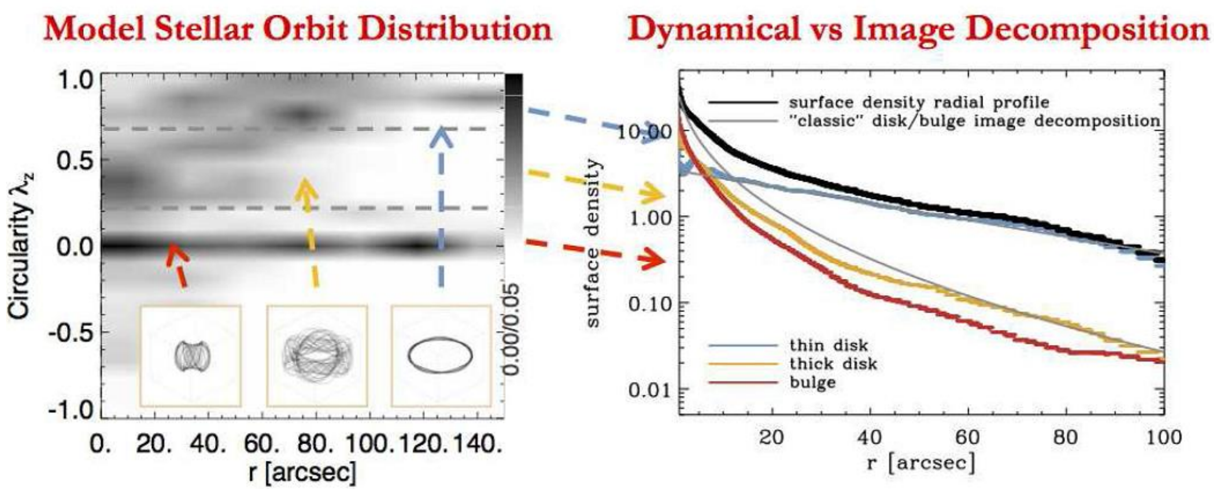
Fornax-3D: MUSE
S0-галактика NGC 1380



Sarzi+ 2018

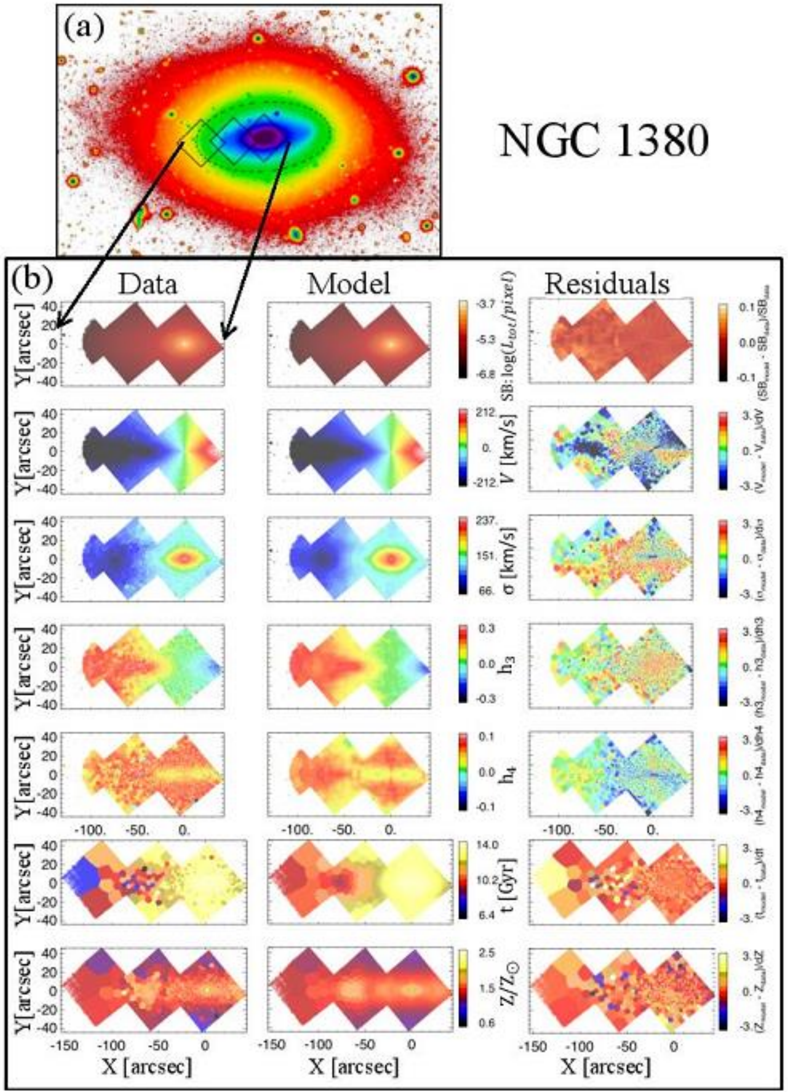
Первый заход на орбитальную декомпозицию NGC 1380

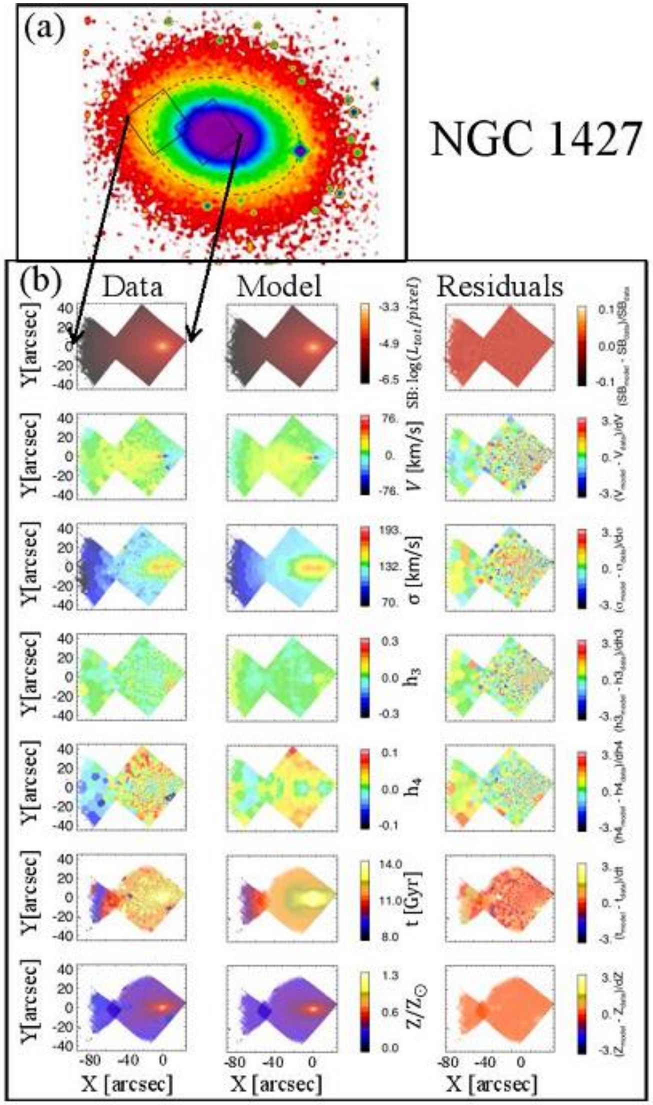




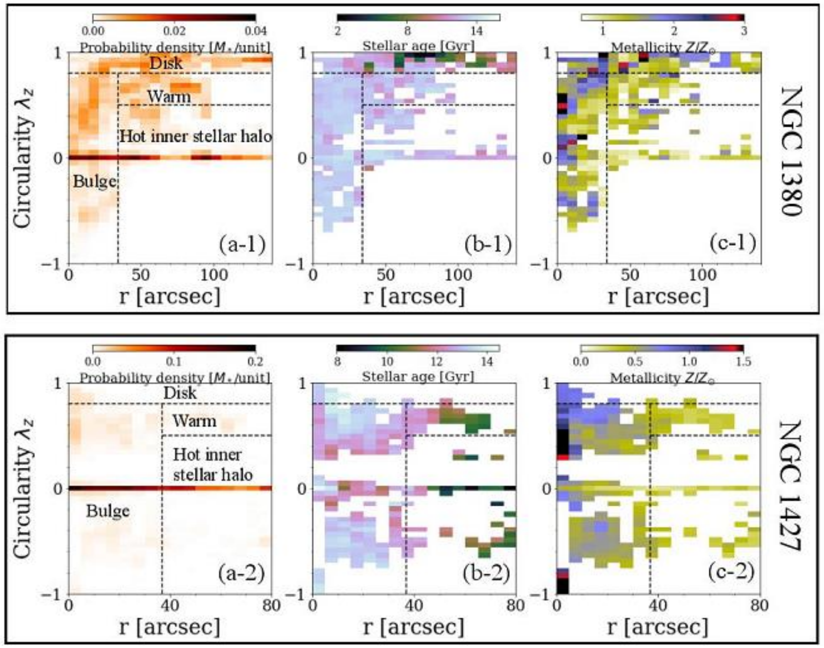
Sarzi+ 2018

Второй заход: S/N=100/200





Динамическая декомпозиция



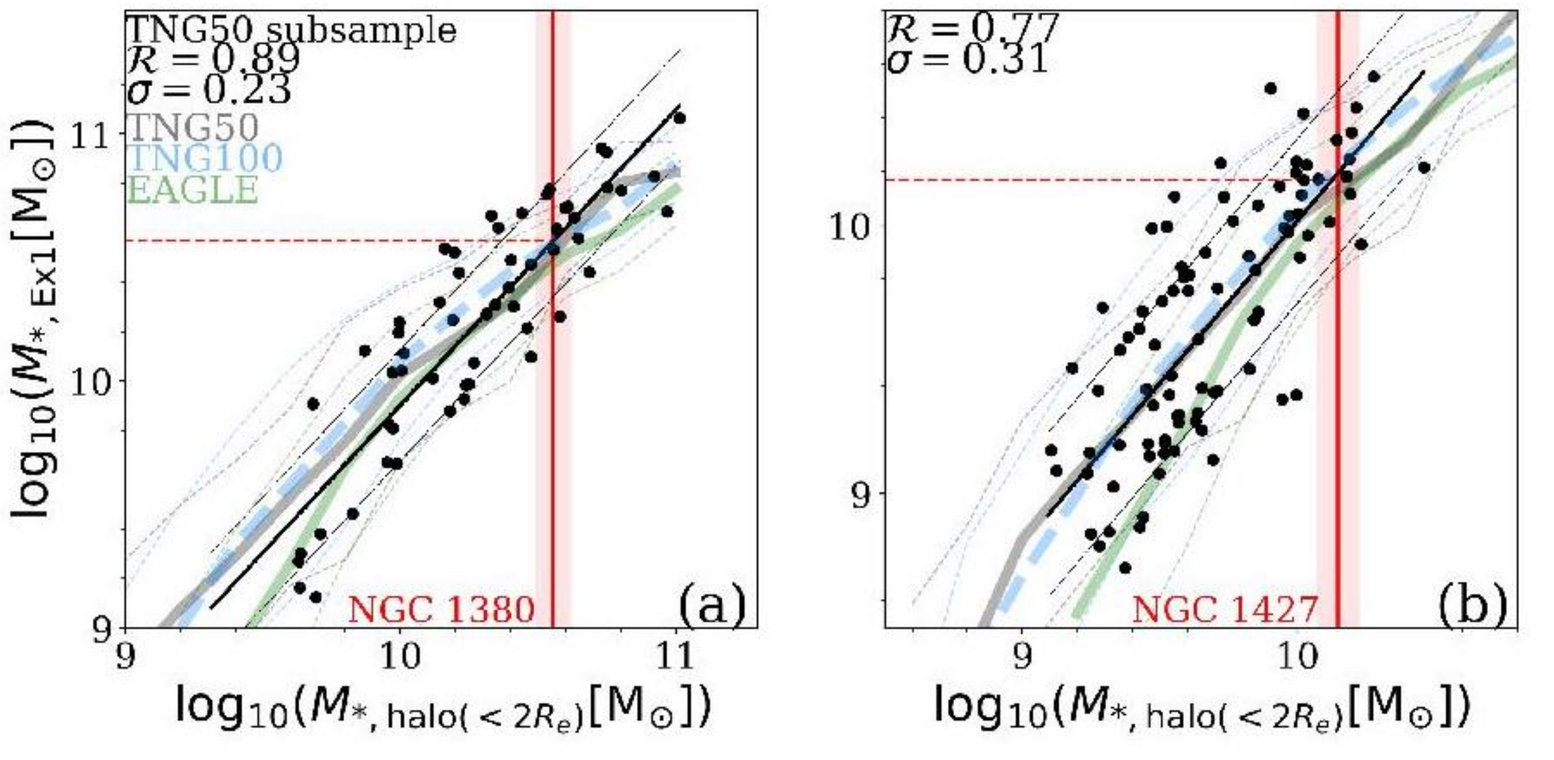
Considering the sub-structures in the stellar-orbit probability density and in the age and metallicity distributions in the phase space of r versus λ_z, we separate each galaxy into four stellar components:

- disk ($\lambda_z > 0.8$),
- bulge ($\lambda_z < 0.8$, $r < r_{\rm cut}$),
- warm ($0.5 < \lambda_z < 0.8$, $r_{\rm cut} < r < 2\,R_e$),
- hot inner stellar halo ($\lambda_z < 0.5$, $r_{\rm cut} < r < 2\,R_e$).

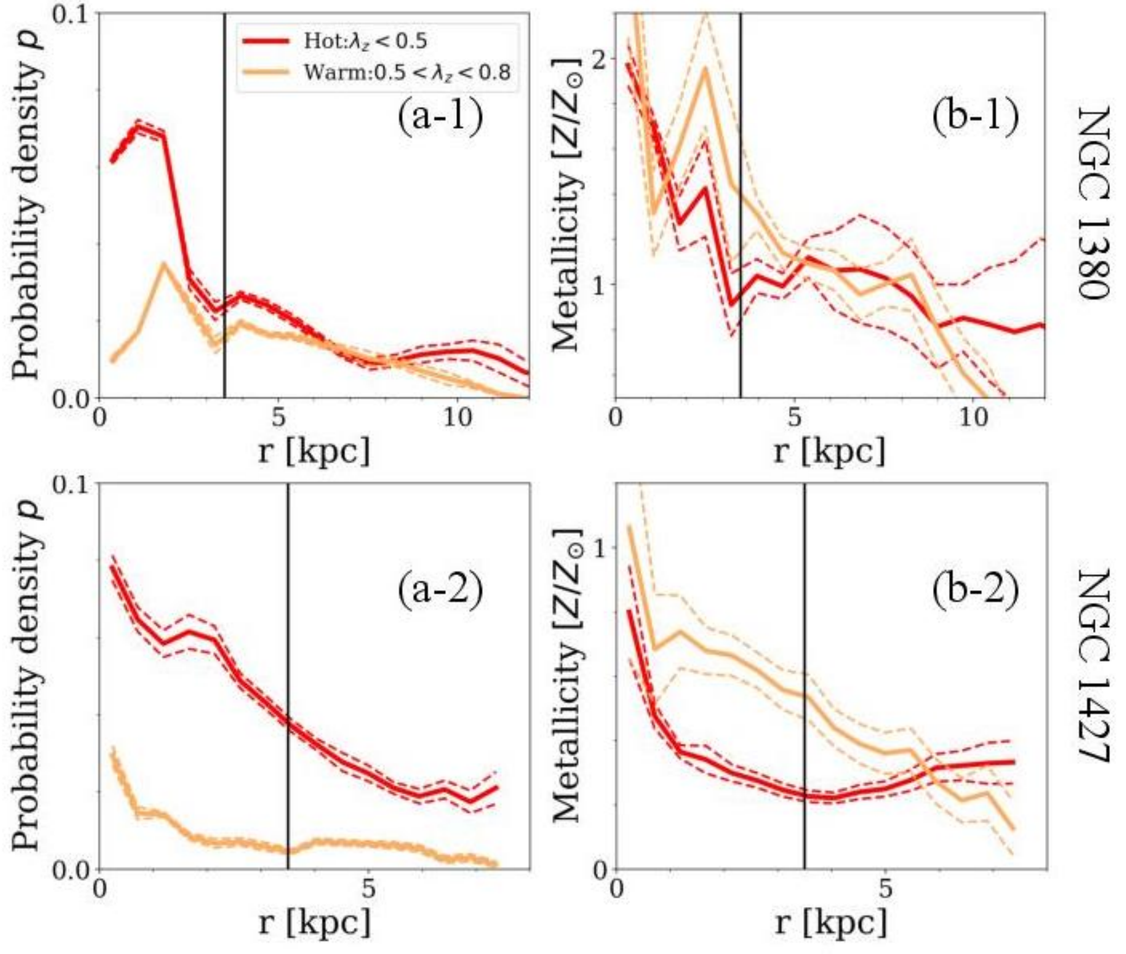
The latter is in fact a dynamically-hot component, separated from the bulge by $r_{\rm cut} = 3.5$ kpc, which is generally associated with a transition in density and metallicity distributions of the dynamically-hot orbits.

ner stellar halo mass is $M_{*,{\rm halo}(r<2R_e)} = (3.6 \pm 0.5) \times 10^{10}\,{\rm M}_\odot$ and $M_{*,{\rm halo}(r<2R_e)} = (1.4 \pm 0.2) \times 10^{10}\,{\rm M}_\odot$ for NGC 1380 and NGC 1427, respectively. The uncertainty includes contribution

Связь массы горячего гало с аккрецируемой массой – через TNG50



И свойства аккрецированных звезд…



И свойства аккрецированных звезд (возраст→ момент аккреции)

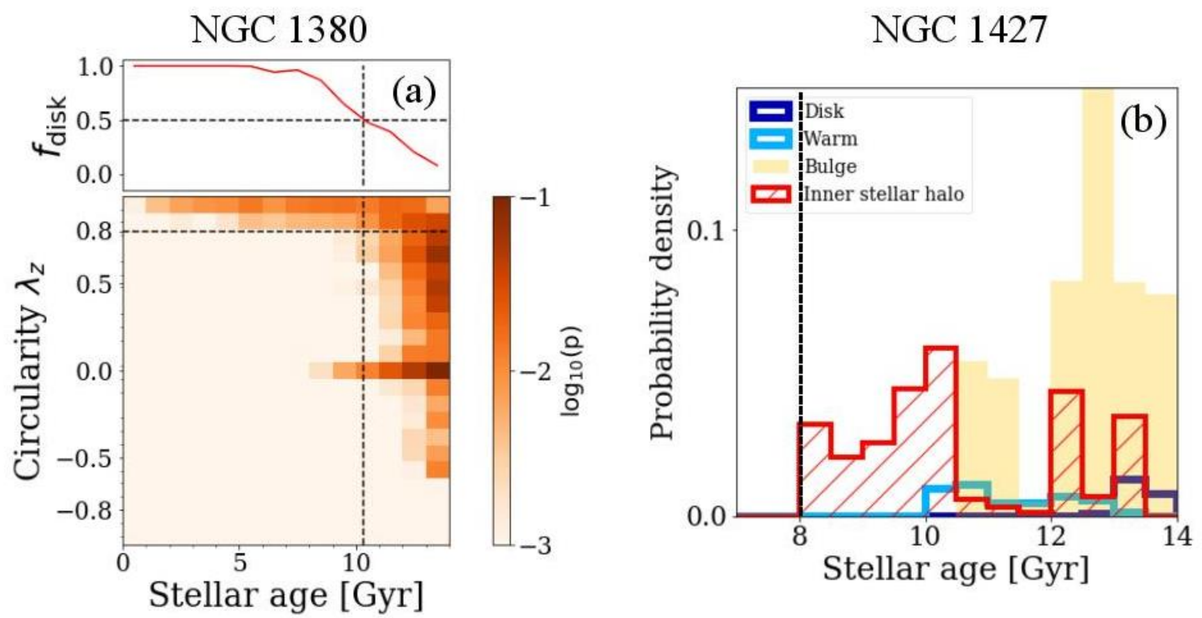


Fig. 7. Timing of the last massive mergers for NGC 1380 and NGC 1427. Panel (a): The probability distribution of stellar orbits $p(\lambda_z, t)$ in the plane of circularity λ_z versus stellar age t from our best-fitting models of NGC 1380. The fraction of disk orbits $f_{\rm disk}$ is plotted in the top subpanel as function of t and shows a sharp transition at $t \simeq 10$ Gyr indicated by the vertical dashed line. We thus infer that the massive merger responsible for the build up of NGC 1380's hot inner stellar halo ended about ~ 10 Gyr ago. Panel (b): The stellar age distribution of disk, warm, bulge, and hot inner stellar halo component from our best-fitting models of NGC 1427. Since the hot inner stellar halo has younger stellar populations than most of the bulge, with youngest stellar population of ~ 8 Gyr, we infer that the last massive merger responsible for the build-up of hot inner stellar halo could not have ended before that.

Почти всегда это – очень давно

Table 1. NGC 1380's and NGC 1427's discovered major merger events in comparison with past mergers in the Milky Way and the Andromeda galaxy.

Galaxy name	M_*	$M_{*,\mathrm{Ex1}}$	Time of Merger	Redshift	$M_{*,\mathrm{ExSitu}}$
Milky Way	$5 \times 10^{10}\ \mathrm{M}_\odot$	$3-6 \times 10^{8}\ \mathrm{M}_\odot$	10 Gyr ago	$z \sim 1.8$	-
Andromeda	$1.3 \times 10^{11}\ \mathrm{M}_\odot$	$2 \times 10^{10}\ \mathrm{M}_\odot$	2 Gyr ago	$z \sim 0.15$	-
NGC 1380	$(1.8 \pm 0.2) \times 10^{11}\ \mathrm{M}_\odot$	$3.7^{+2.7}_{-1.5} \times 10^{10}\ \mathrm{M}_\odot$	10 Gyr ago	$z \sim 1.8$	$7.1^{+3.0}_{-2.0} \times 10^{10}\ \mathrm{M}_\odot$
NGC 1427	$(5.6 \pm 0.6) \times 10^{10}\ \mathrm{M}_\odot$	$1.5^{+1.6}_{-0.7} \times 10^{10}\ \mathrm{M}_\odot$	$t \lesssim 8$ Gyr ago	$z \lesssim 1$	$2.6^{+1.7}_{-1.0} \times 10^{10}\ \mathrm{M}_\odot$

Notes. The six columns from left to right are: galaxy name, galaxy's current total stellar mass M_*, stellar mass of the most massive merger $M_{*,\mathrm{Ex1}}$, time of the last massive merger, redshift of the last massive merger, total ex-situ stellar mass $M_{*,\mathrm{ExSitu}}$. The total stellar mass of the Milky Way is adopted from Bland-Hawthorn & Gerhard (2016), while its merger mass and time are from Helmi et al. (2018) and Belokurov et al. (2020). The total stellar mass of Andromeda is adopted from Corbelli et al. (2010), while its merger mass and merger time are from D'Souza & Bell (2018b). The errors on NGC 1380 and NGC 1427 indicate the 1σ uncertainties of our results.

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Worry No More, The Hubble Tension is Relieved:
A Truly Direct Measurement of the Hubble Constant from Mooniversal Expansion

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(Dated: 1 April 2022)

ABSTRACT

Using sedimentary and eclipse-based measurements of the lunar recession velocity, we derive a new local-Universe measurement of the Hubble constant (H_0) from the recession rate of Earth's Moon. Taking into account the effects of tides, we find a value of $H_0 = 63.01 \pm 1.79$ km s^{-1} Mpc^{-1}, which is in approximate agreement with the *Planck* space mission's measurement using the cosmic microwave background (CMB) and base ΛCDM. Our new measurement represents the first ever model-independent, single-step measurement of the Universe's current expansion rate. This is also the first major local Universe measurement of H_0 which is *below* the measurement from *Planck*. Importantly, it is robust to the systematic errors that may be present in other H_0 measurements using other cosmological probes such as type Ia supernovae, baryon acoustic oscillations, or lensed quasars. Our work provides key evidence towards the notion that the existing Hubble tension may indeed be a result of systematic uncertainties in the local distance ladder.

Но сводка, между прочим, весьма полезная

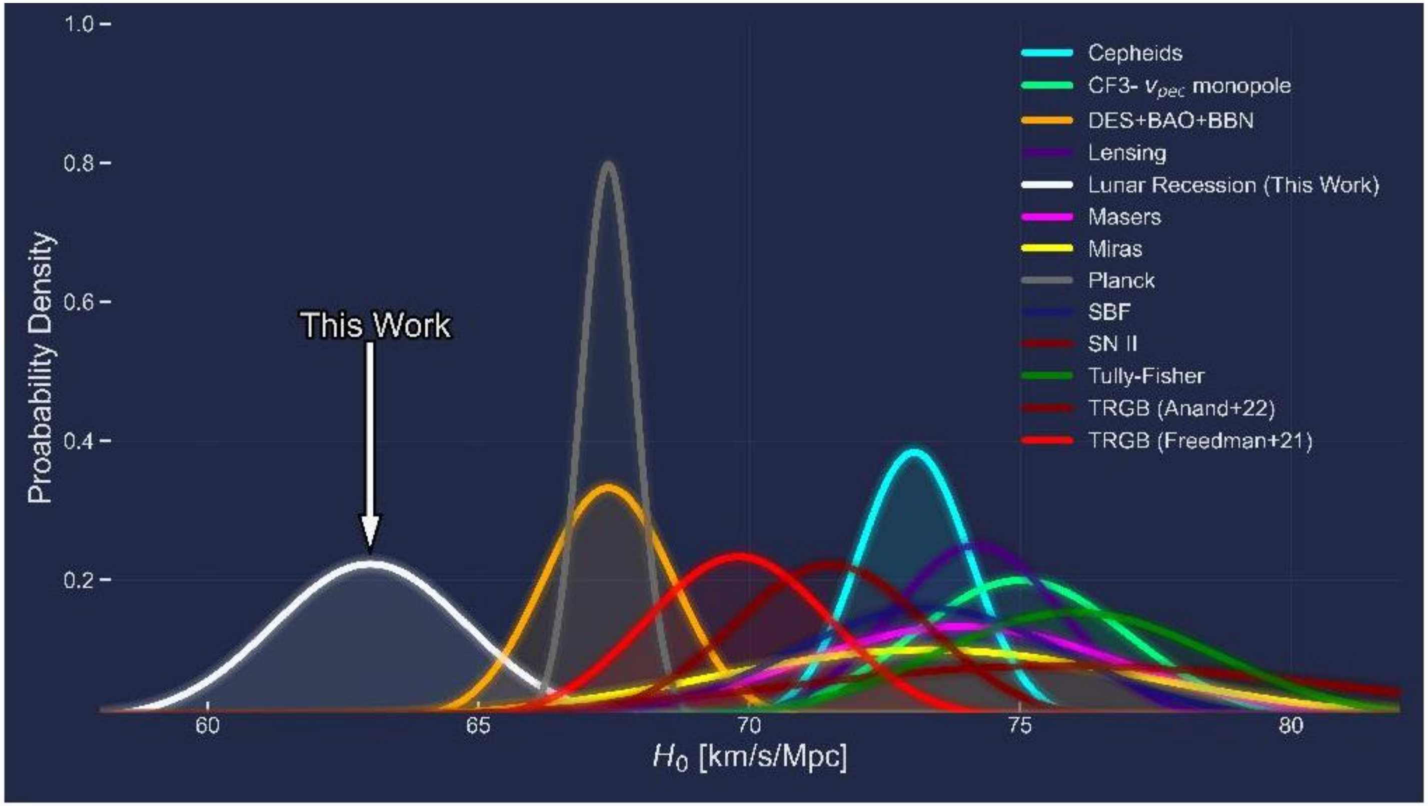

Figure 1. A comparison of numerous recent H_0 results, including the one we derive in this paper, which we stress is the *only* measurement which is both model-independent and performed in a single step. Methods plotted include Cepheid variables (Riess et al. 2021), a restriction on the peculiar velocity monopole from Cosmicflows-3 (Tully et al. 2016), the Dark Energy Survey + Baryon Acoustic Oscillations + Big Bang Nucelosynthesis (Abbott et al. 2018), time delay cosmography of lensed quasars from TDCOSMO (Millon et al. 2020), megamasers from the Megamaser Cosmology Project (Pesce et al. 2020), Mira variables (Huang et al. 2020), Planck measurements of the CMB (Planck Collaboration et al. 2020), surface brightness fluctuations (Blakeslee et al. 2021), type II supernovae (de Jaeger et al. 2020), the Tully-Fisher relation (Kourkchi et al. 2020), and the Tip of the Red