

# The spatially resolved star formation history of the dwarf spiral galaxy NGC 5474

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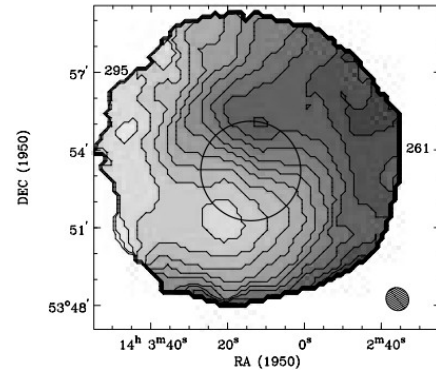
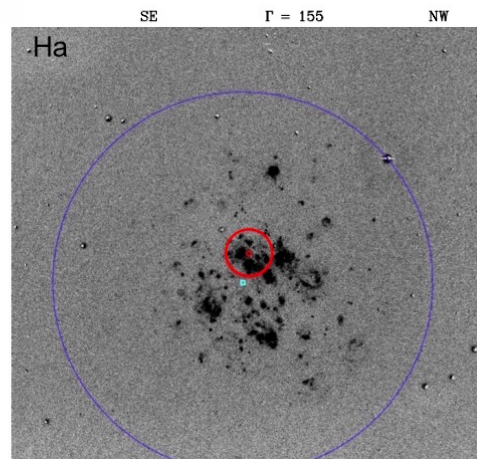
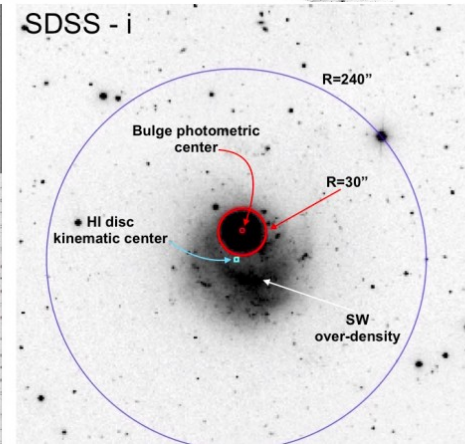
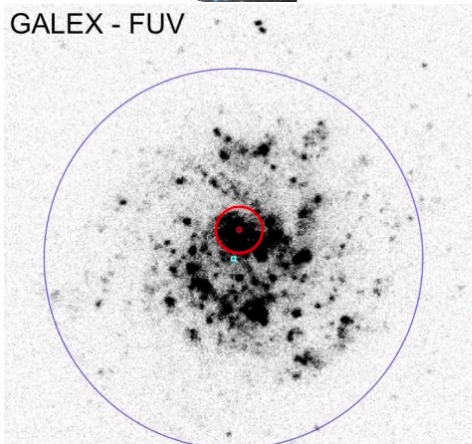
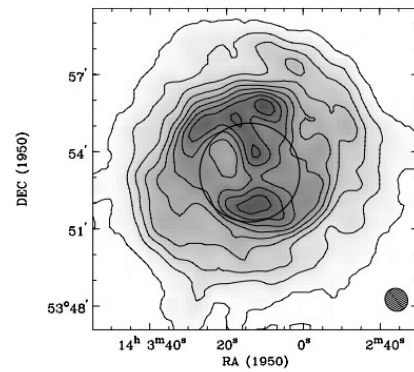
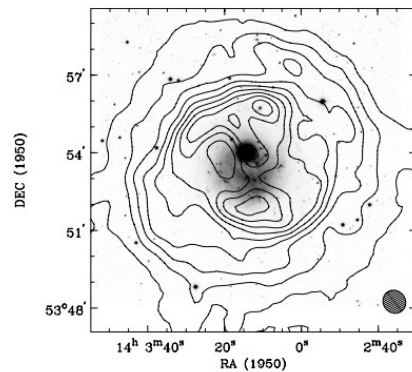
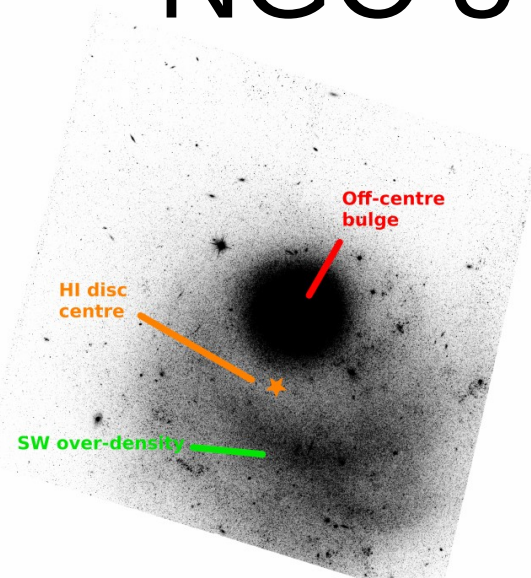
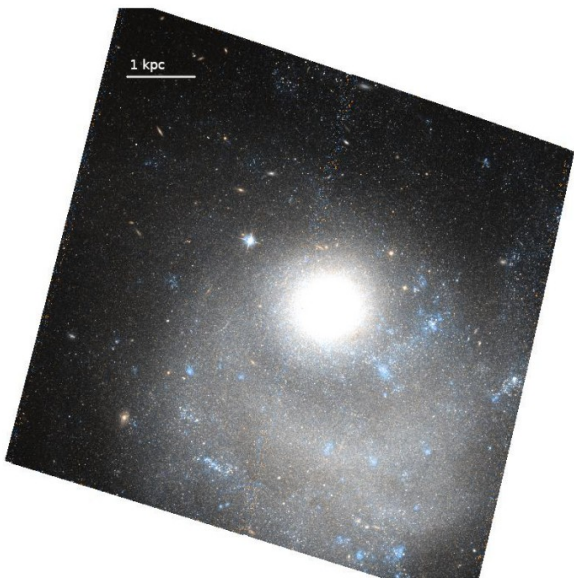
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## ABSTRACT

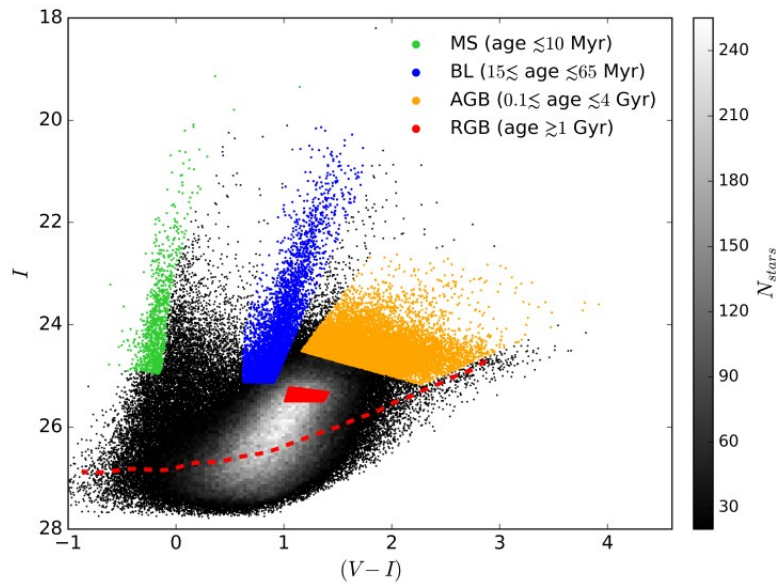
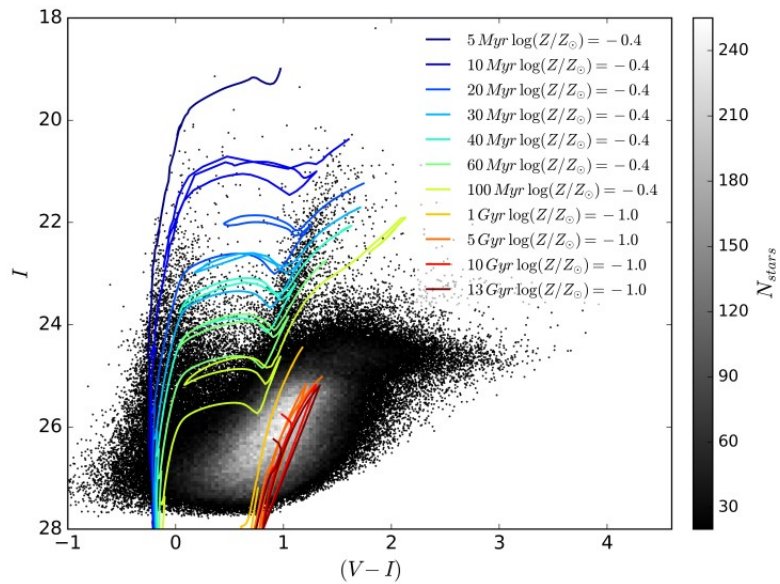
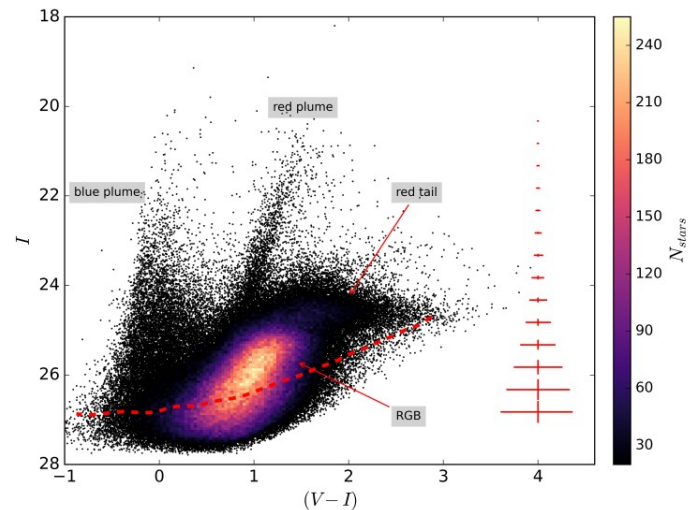
We study the resolved stellar populations and derive the star formation history of NGC 5474, a peculiar star-forming dwarf galaxy at a distance of  $\sim 7$  Mpc, using Hubble Space Telescope Advanced Camera for Surveys data from the Legacy Extragalactic UV Survey (LEGUS) program. We apply an improved colour-magnitude diagram fitting technique based on the code SFERA and use the latest PARSEC-COLIBRI stellar models. Our results are the following. The off-centre bulge-like structure, suggested to constitute the bulge of the galaxy, is dominated by star formation (SF) activity initiated 14 Gyr ago and lasted at least up to 1 Gyr ago. Nevertheless, this component shows clear evidence of prolonged SF activity (lasting until  $\sim 10$  Myr ago). We estimate the total stellar mass of the bulge-like structure to be  $(5.0 \pm 0.3) \times 10^8 M_{\odot}$ . Such a mass is consistent with published suggestions that this structure is in fact an independent system orbiting around and not within NGC 5474's disc. The stellar over-density located to the South-West of the bulge-like structure shows a significant SF event older than 1 Gyr, while it is characterised by two recent peaks of SF, around  $\sim 10$  and  $\sim 100$  Myr ago. In the last Gyr, the behavior of the stellar disc is consistent with what is known in the literature as 'gasping'. The synchronised burst at 10 – 35 Myr in all components might hint to the recent gravitational interaction between the stellar bulge-like structure and the disc of NGC 5474.

**Key words:** galaxies: dwarf – galaxies: formation – galaxies: interactions – galaxies: irregular – galaxies: stellar content.

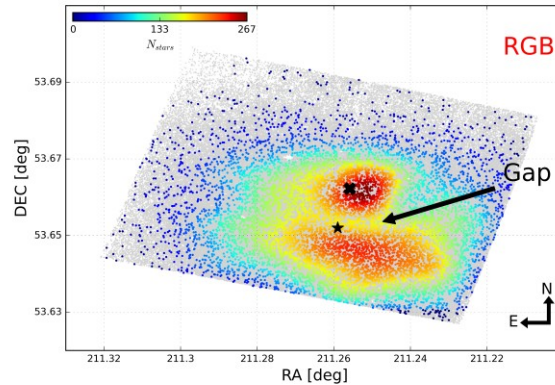
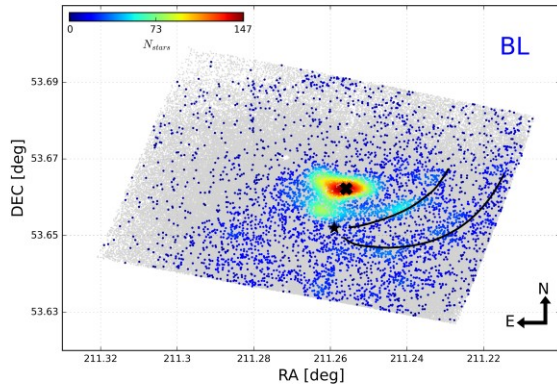
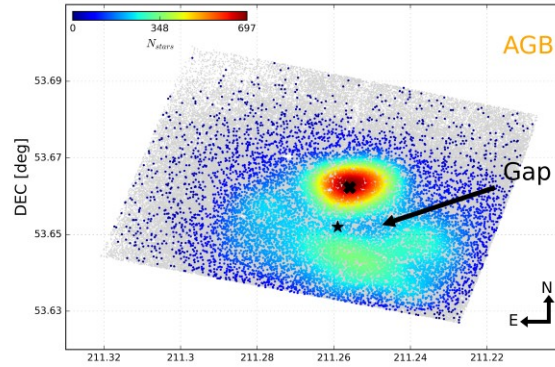
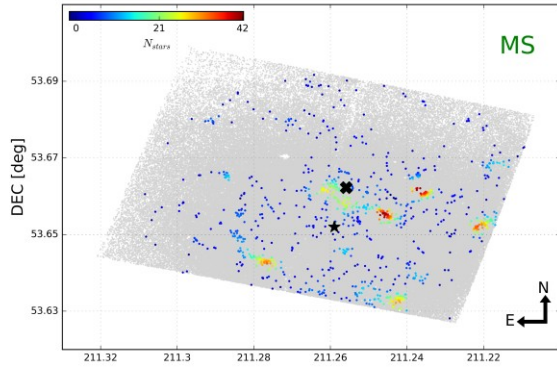
# NGC 5474



# Основные индикаторы возраста на CMD

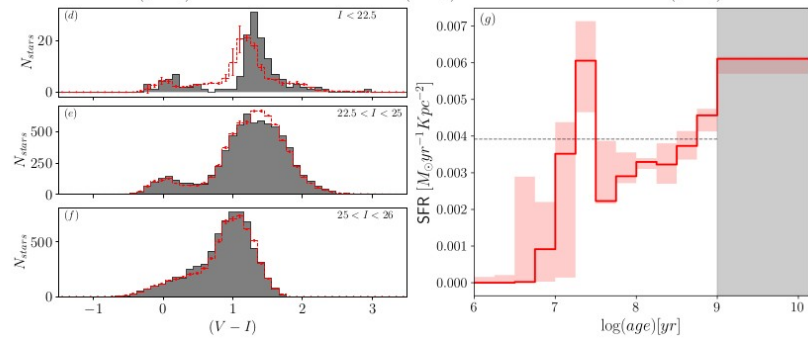
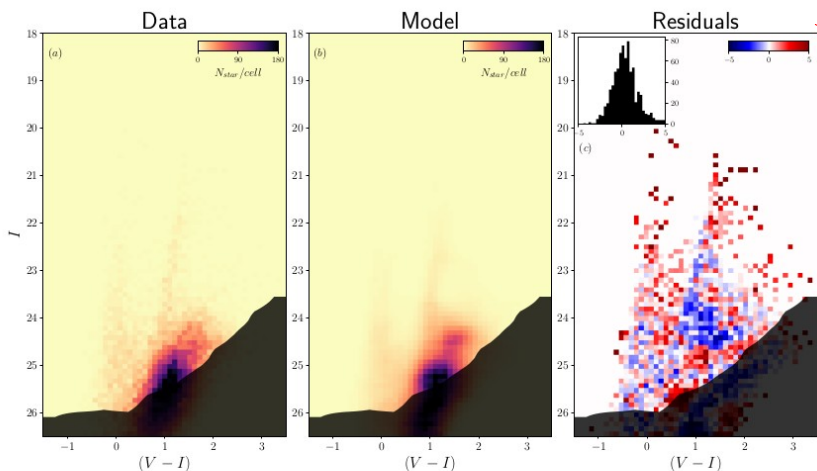


# Пространственное распределение звезд разного возраста

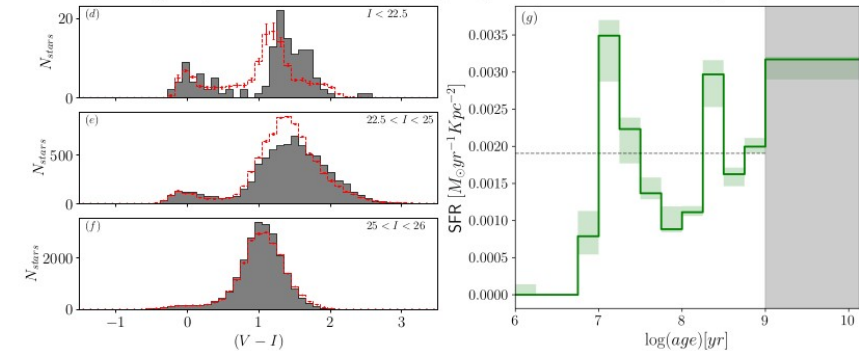
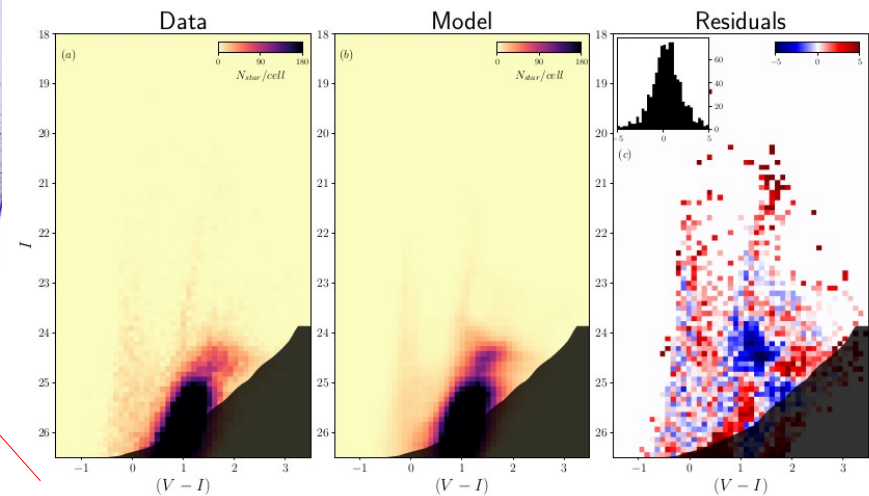
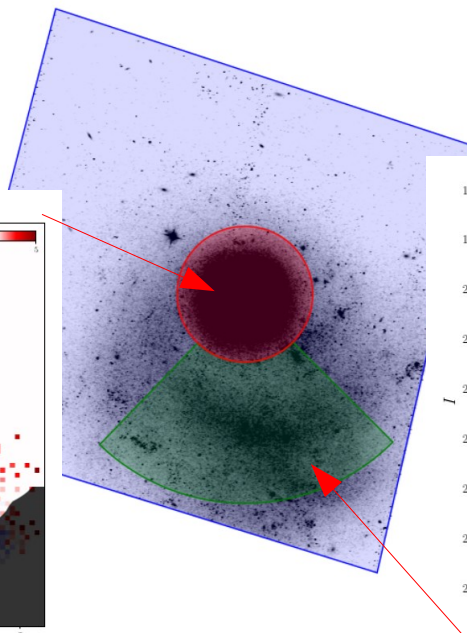


# История звездообразования

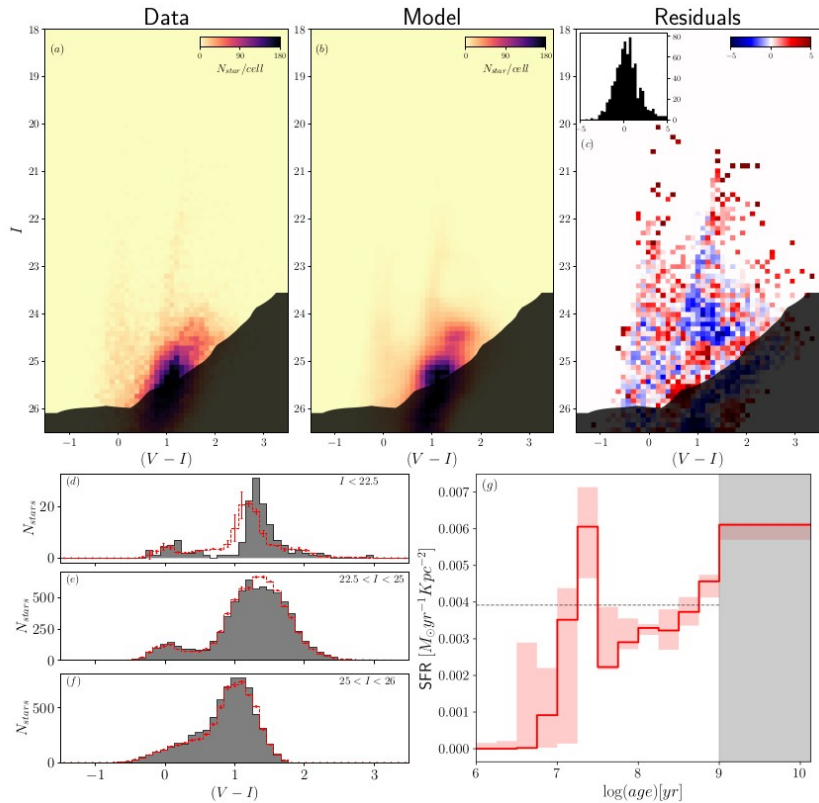
Балдж (?)



SW over-density



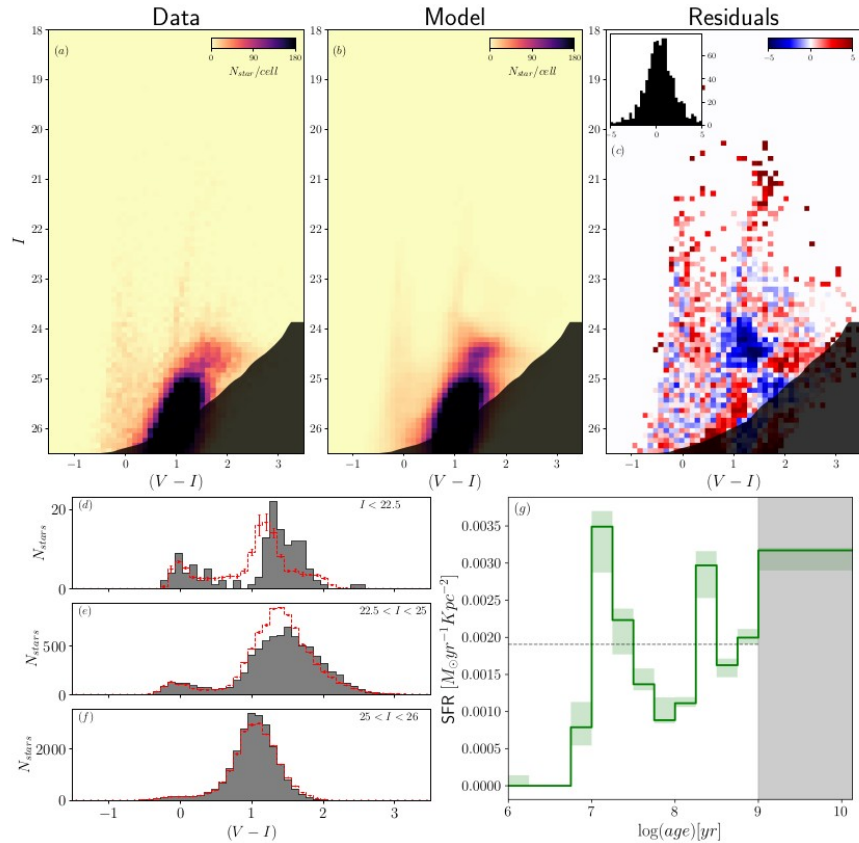
# История звездообразования (балдж)



- an overall decreasing trend in the last 1 Gyr;
- a very recent peak around 20-35 Myr ago (although characterized by rather large uncertainties, namely  $\sim 30\%$ );
- an average SFR in the last 1 Gyr  $\sim 1.5$  times lower than at older epochs.
- total stellar mass value of  $(5.0 \pm 0.3) \times 10^8 M_{\odot} \Rightarrow$  putative bulge is not a real bulge orbiting within the plane of the disc, but rather an independent system moving on a polar orbit around NGC 5474.

# История звездообразования (SW over-density)

- a total stellar mass of  $(5.2 \pm 0.1) \times 10^8 M_{\odot}$



# Summary

- clear evidence of prolonged SF activity up to at least 10 Myr ago, with a very uncertain peak around  $\sim 20 - 35$  Myr, a rather unusual feature in “classical” bulges. Moreover, we provided a lower limit to the total bulge’s mass of  $(5.0 \pm 1.0) \times 10^8 M_{\odot}$ . This value is significantly higher than the limit found by Pascale et al. (2021)
- The SW over-density’s SFH shows three prominent peaks of SF, one at epochs earlier than 1 Gyr ago,  $\sim 1.5$  times higher than the average SF activity in the last Gyr, validating the ancient nature of this population, and two younger peaks at  $\sim 10$  and  $\sim 100$  Myr, respectively. The peak around  $\sim 100$  Myr is broadly consistent with a possible interaction between NGC 5474 and M101.



# Summary

- In the last Gyr, the disc of NGC 5474 shows a rather similar SFHs in terms of overall shape and trend with respect to the SW over-density, but not in overall rate. Indeed, the disc average activity is consistently lower, and more 'flat' than in the SW over-density. Moreover, the disc shows a significantly lower rate of SF at age  $> 1$  Gyr with respect to the putative bulge and SW over-density. Its behavior is consistent to what in the literature is called a 'gasping' regime.
- For NGC 5474, we found a total stellar mass of  $(1.55 \pm 0.03) \times 10^9 M_{\odot}$ , within a radius of  $\sim 3$  kpc. This value falls near the dynamical mass range reported by Rownd et al. (1994) for the galaxy within a radius of  $\sim 5$  kpc ( $2.0 - 6.5 \times 10^9 M_{\odot}$ ). This result may suggest that NGC 5474 is not a dark matter dominated system (Moreno et al. 2022).