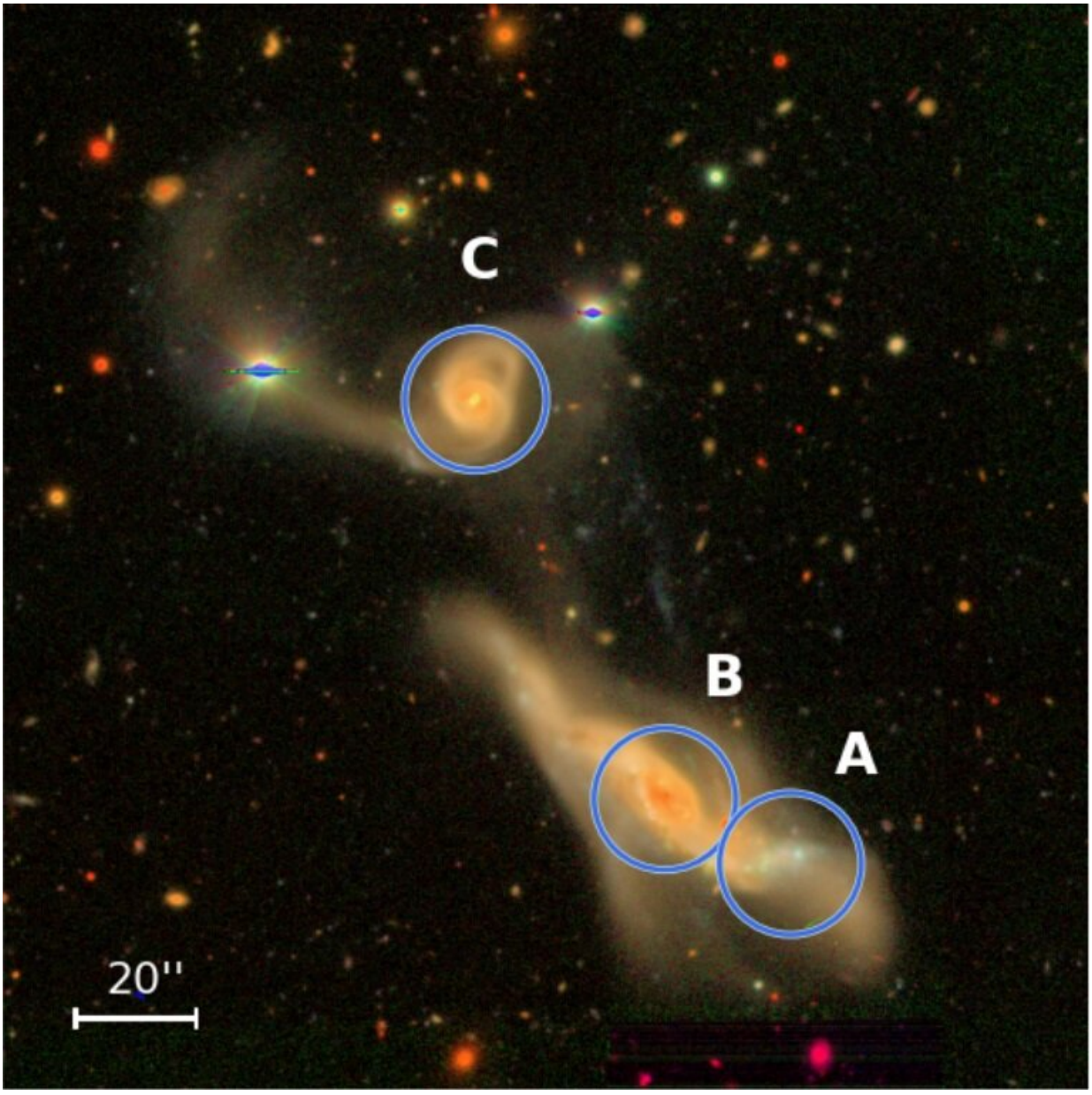
Galaxy triplet SIT 45 inspected in detail

October 5 2022, by Tomasz Nowakowski



Hyper Suprime-Cam (HSC) g-r-i band color image of the isolated triplet SIT 45.

Credit: Aihara et al., 2022.

An international team of astronomers has performed multiwavelength photometric observations of a galaxy triplet known as SIT 45. Results of the study, published September 26 on arXiv.org, provide important information regarding the properties and dynamics of this object.

Galaxy triplets are generally perceived as interesting laboratories enabling studies of the formation and the evolution of small and large systems of galaxies. However, given that they are not common in the local universe, detecting new ones and investigating them in detail is of high importance for astronomers.

Located some 473 million light years away, SIT 45 (also known as UGC 12589) is an unusual isolated galaxy triplet consisting of three merging late-type galaxies. Taking into account that SIT 45 contains three interacting galaxies, it is expected to exhibit complex dynamics and star formation history.

Therefore, a team of researchers led by Diana Grajales-Medina of the Valencian International University in Spain studied the evolution of SIT 45 through its dynamic properties and configuration, as well as its local environment and large-scale structure. For this purpose, they analyzed data from various surveys including the Galaxy Evolution Explorer (GALEX) satellite All Sky Survey and the Two Micron All Sky Survey (2MASS).

"In this work we have studied the dynamical parameters and SFH [star formation history] of the isolated merging galaxy triplet SIT 45. The interacting system SIT 45 (UGC 12589) is an unusual isolated triplet of galaxies, consisting of three interacting late-type galaxies. It is therefore

an ideal candidate for investigating processes such as the triggering of star formation due to interaction," the authors of the paper wrote.

The study found that SIT 45 is a highly isolated system with respect to its large-scale environment and is one of the most compact triplets in the SIT (SDSS-based catalog of Isolated Triplets) database. The value of its tidal force parameter due to triplet members is one of the highest in the SIT catalog.

By investigating the star formation history of SIT 45, the team found that the system has an ongoing star-formation, with one of the galaxies, designated SIT 45C, presenting starburst activity. In general, the three galaxies present a recent (about 200 million years old) star formation increase, which suggests that it may have been triggered by the merging process.

According to the astronomers, the results indicate that SIT 45 is highly evolved taking into account its harmonic radius and crossing time values that are much smaller than in the rest of the known SIT triplets. It was also found that SIT 45 is composed of blue spirals with high star formation rate that might be embedded in a common dark matter halo.

The researchers propose the two most plausible hypotheses that could explain the properties of SIT 45.

"We consider two scenarios for the present configuration of the triplet, one where one of the members is a tidal galaxy, and another where this galaxy arrives to the system after the interaction. Both scenarios need further exploration," the authors of the study concluded.

More information: SIT 45: An interacting, compact, and star-forming isolated galaxy triplet, arXiv:2209.12850 [astro-ph.GA] arxiv.org/abs/2209.12850