

Hubble Space Telescope Pixel Analysis of the Interacting Face-on Spiral Galaxy NGC 5194 (M51A)

Joon Hyeop Lee (1), Sang Chul Kim (1), Hong Soo Park (1,2), Chang Hee Ree (1), Jaemann Kyeong (1), Jiwon Chung (1,3) ((1) Korea Astronomy and Space Science Institute, Korea, (2) Astronomy Program, Department of Physics and Astronomy, Seoul National University, Korea, (3) Department of Astronomy and Space Science, Chungnam National University, Korea)

(Submitted on 25 Jul 2011 (v1), last revised 27 Jul 2011 (this version, v2))

A pixel analysis is carried out on the interacting face-on spiral galaxy NGC 5194 (M51A), using the HST/ACS images in the F435W, F555W and F814W (BVI) bands. After 4x4 binning of the HST/ACS images to secure a sufficient signal-to-noise ratio for each pixel, we derive several quantities describing the pixel color-magnitude diagram (pCMD) of NGC 5194: blue/red color cut, red pixel sequence parameters, blue pixel sequence parameters and blue-to-red pixel ratio. The red sequence pixels are mostly older than 1 Gyr, while the blue sequence pixels are mostly younger than 1 Gyr, in their luminosity-weighted mean stellar ages. The color variation in the red pixel sequence from $V = 20$ mag arcsec⁻² to $V = 17$ mag arcsec⁻² corresponds to a metallicity variation of $\Delta[\text{Fe}/\text{H}] \sim 2$ or an optical depth variation of $\Delta\tau_V \sim 4$ by dust, but the actual sequence is thought to originate from the combination of those two effects. At $V < 20$ mag arcsec⁻², the color variation in the blue pixel sequence corresponds to an age variation from 5 Myr to 300 Myr under the assumption of solar metallicity and $\tau_V = 1$. To investigate the spatial distributions of stellar populations, we divide pixel stellar populations using the pixel color-color diagram and population synthesis models. As a result, we find that the pixel population distributions across the spiral arms agree with a compressing process by spiral density waves: dense dust \rightarrow newly-formed stars. The tidal interaction between NGC 5194 and NGC 5195 appears to enhance the star formation at the tidal bridge connecting the two galaxies. We find that the pixels corresponding to the central active galactic nucleus (AGN) area of NGC 5194 show a tight sequence at the bright-end of the pCMD, which are in the region of $R \sim 100$ pc and may be a photometric indicator of AGN properties.

Comments: 27 pages, 20 figures, accepted for publication in ApJ

Subjects: **Cosmology and Extragalactic Astrophysics (astro-ph.CO)**

Cite as: [arXiv:1107.4827](https://arxiv.org/abs/1107.4827) [astro-ph.CO]

(or [arXiv:1107.4827v2](https://arxiv.org/abs/1107.4827v2) [astro-ph.CO] for this version)

Submission history

From: Joon Hyeop Lee [[view email](#)]

[v1] Mon, 25 Jul 2011 02:43:17 GMT (1532kb)

[v2] Wed, 27 Jul 2011 02:22:15 GMT (1532kb)

Which authors of this paper are endorsers?

Download:

- [PDF](#)
- [PostScript](#)
- [Other formats](#)

Current browse context:

astro-ph.CO

[< prev](#) | [next >](#)

[new](#) | [recent](#) | [1107](#)

Change to browse by:

[astro-ph](#)

References & Citations

- [INSPIRE HEP](#)
([refers to](#) | [cited by](#))
- [NASA ADS](#)

Bookmark([what is this?](#))



