The influence of galaxy mergers on the star formation history of luminous AGN

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Abstract

We study the connection between star formation and black hole growth in luminous AGN involved in galaxy mergers. Galaxy mergers constitute a potential candidate for providing cold dense gas to the central region of a galaxy, triggering both circumnuclear star formation and AGN activity. To this end, we investigate the stellar population properties of AGN host galaxies ($z \sim 0.3$) that show neighbouring galaxies using SDSS DR7 data. We present spectroscopic analysis results on the comparison of star formation histories as a function of projected distance. We witness younger stellar populations with decreasing distance for the case of neighbours, confirming the mergers-starburst correlation, while the AGN host galaxies do not reveal a similar trend. Although the activity of the central AGN does not show to be directly driven by the merger, our results support the starburst-AGN activity connection.

Sample Selection

We select AGN showing neighbours at distances and velocity seperations up to 1 Mpc and 2,000 km/s respectively

- 931,208 spectra of galaxies and AGN from SDSS DR7 [1]
- 5,571 AGN of redshift $0.2 \leq z \leq 0.4$ [2]

Search for neighbours around central AGN

Final: 477 spectroscopic pairs of central AGN-neighbour with different projected separations

Methods

Extract host galaxy spectrum of AGN and compare it to corresponding Neighbour galaxy spectrum

- **Decompose each spectrum** by performing **MCMC fitting** [3] and using **19** spectrum components-templates for AGN, **7** galaxy components for case of neighbours
- Arrange AGN-neighbour pairs **as a function of projected separation**
- **Stack AGN and neighbours spectra** belonging to each separation range

Results

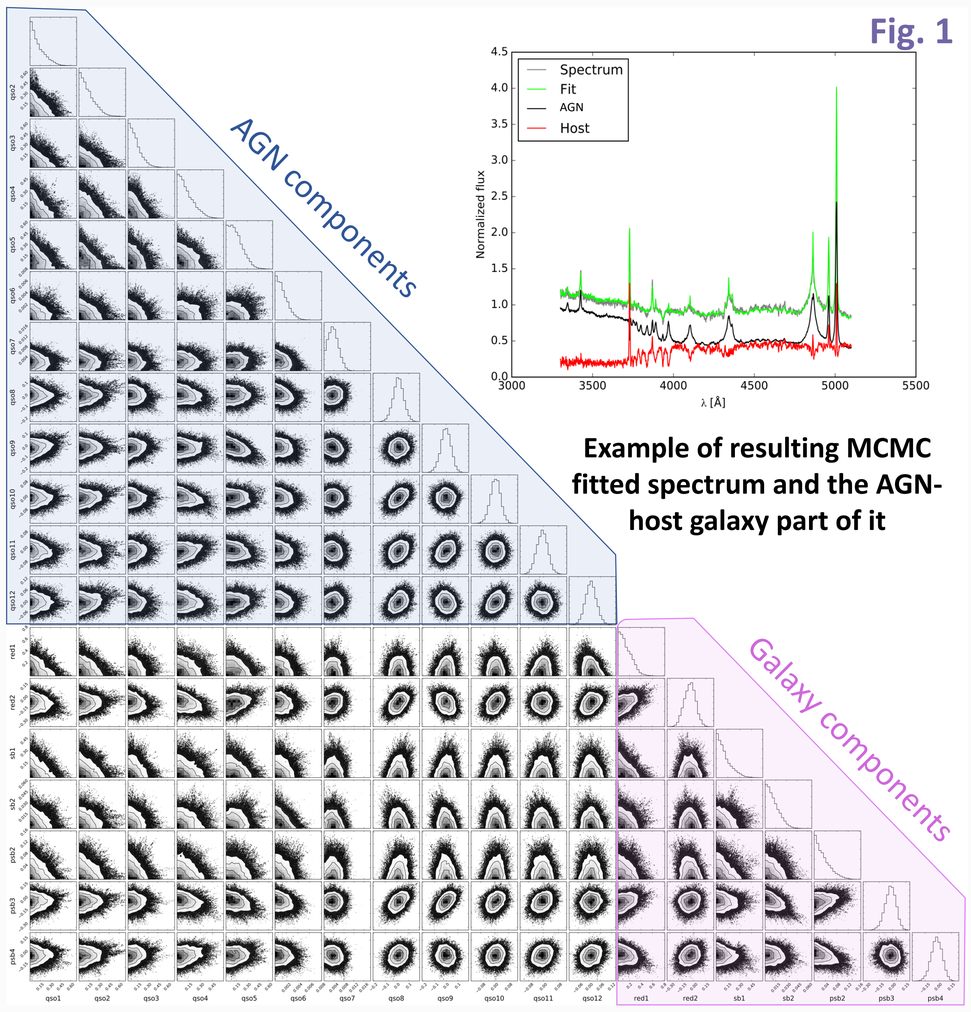

Fig. 1

Example of resulting MCMC fitted spectrum and the AGN-host galaxy part of it

Spectral decomposition of initial AGN spectrum. MCMC fitting successfully recovers the host galaxy.

The host galaxies spectra are star-forming at all separations confirming the starburst-AGN activity connection. There is no strong evolution with merger stage. Therefore, they do not seem to be directly driven by the merger [4].

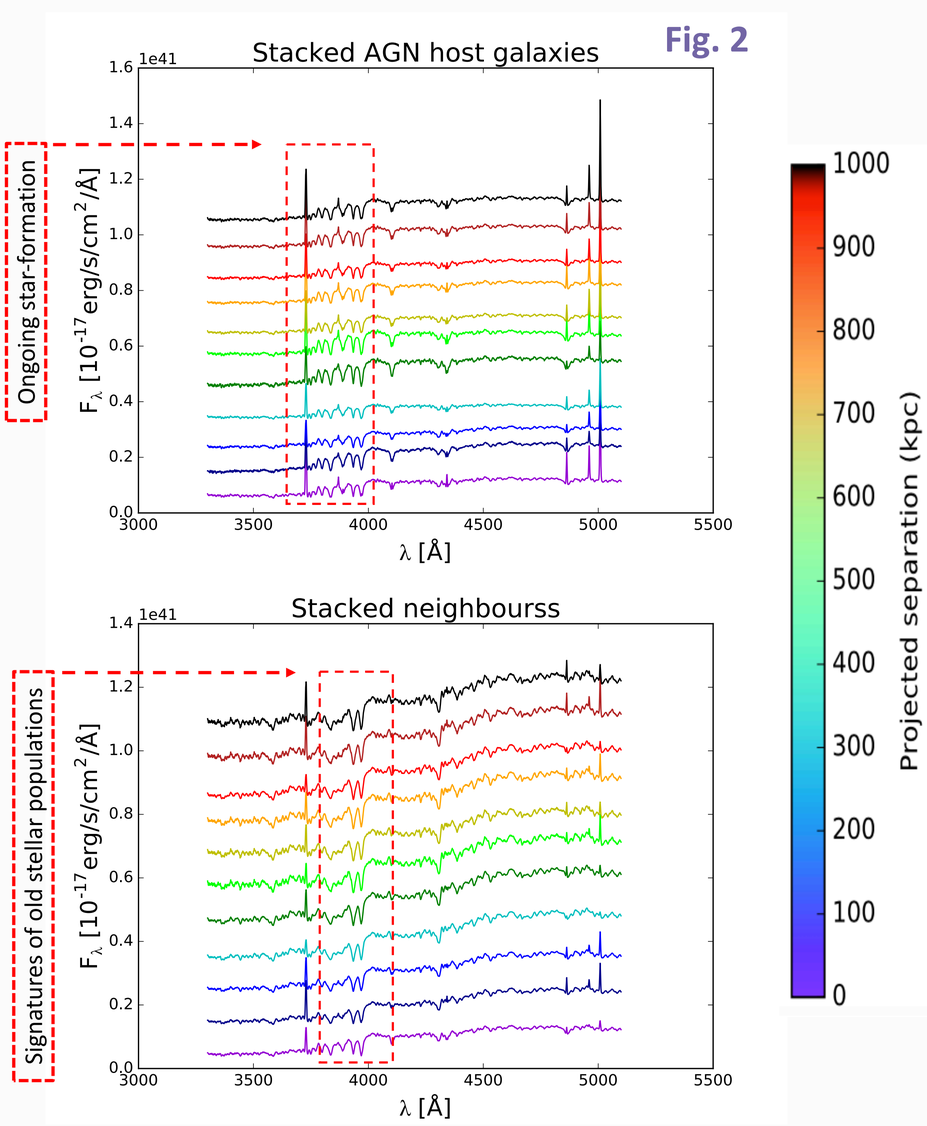

Fig. 2

The neighbours show younger stellar populations with decreasing separation supporting the mergers-starburst correlation [5]**. (see also Fig. 3 & 4)**

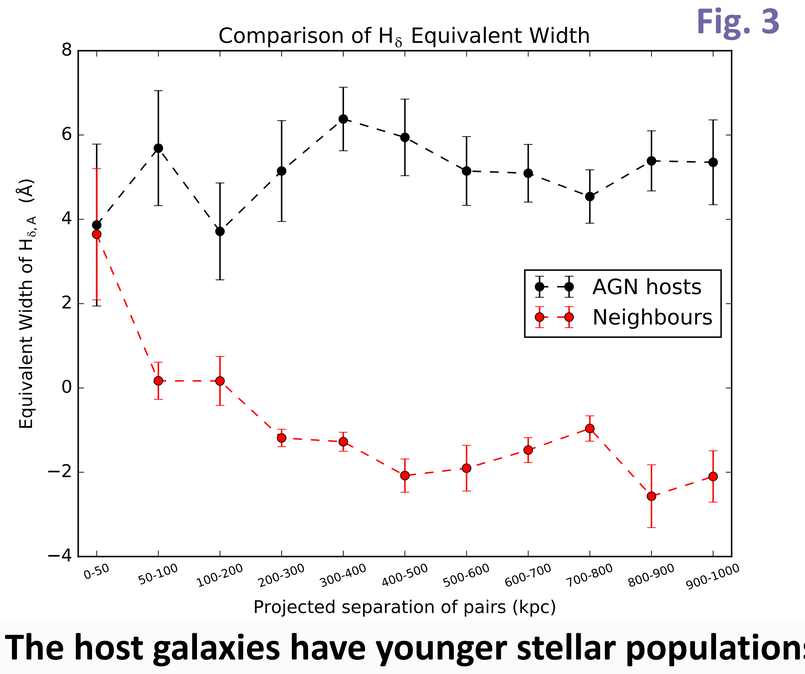

Fig. 3

The host galaxies have younger stellar populations, as their H_δ EW values are greater. The H_δ values for the case of the neighbours increase with decreasing separation, translating into either a more recent starburst or a star-formation enhancement.

The neighbours show younger mean age at the smallest separation range, as their H_δ EW is stronger.

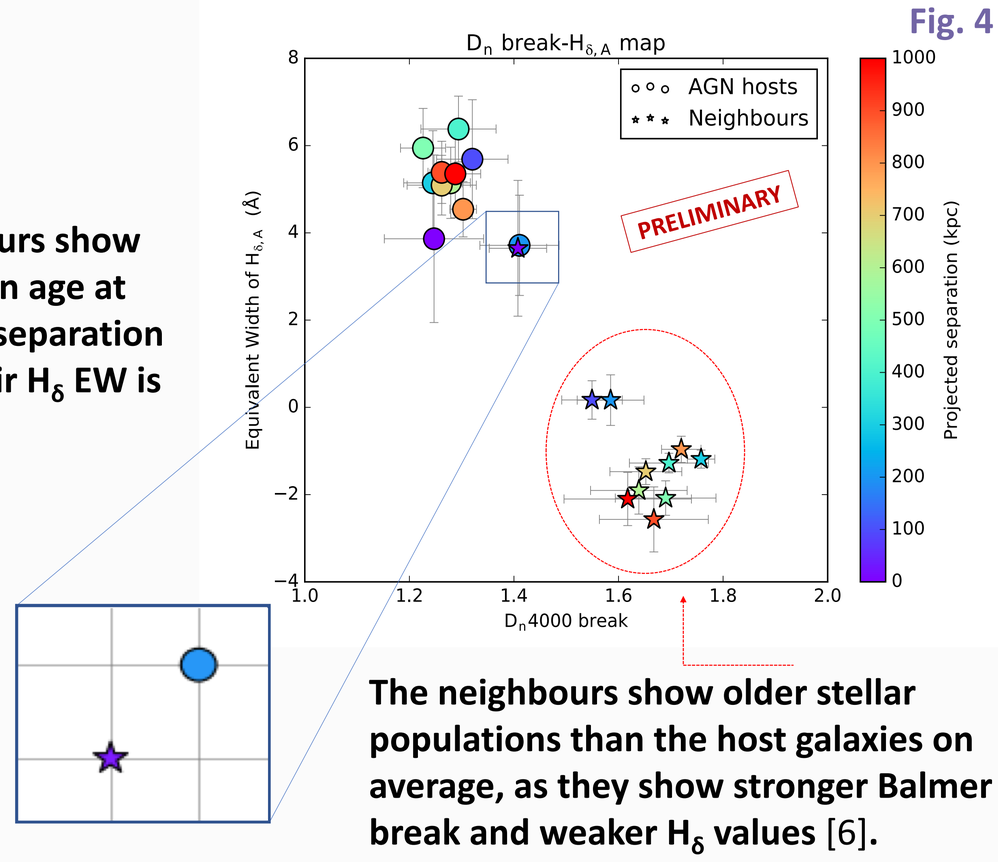

Fig. 4

The neighbours show older stellar populations than the host galaxies on average, as they show stronger Balmer break and weaker H_δ values [6]**.**

References

[1] Abazajian et al. 2009
[2] Wild & Hewett, 2010
[3] Foreman-Mackey et al. 2012
[4] Sabater et al. 2014
[5] Ellison et al. 2013
[6] Kauffmann et al. 2003