

The redshift evolution of major merger triggering of luminous AGN: a slight enhancement at $z \sim 2$

ABSTRACT

Active galactic nuclei (AGN), particularly the most luminous AGN, are commonly assumed to be triggered through major mergers, however observational evidence for this scenario is mixed. To investigate any influence of galaxy mergers on AGN triggering and luminosities through cosmic time, we present a sample of 106 luminous X-ray selected type 1 AGN from the COSMOS survey. These AGN occupy a large redshift range ($0.5 < z < 2.2$) and two orders of magnitude in X-ray luminosity ($\sim 10^{43} - 10^{45}$ erg s^{-1}). AGN hosts are carefully mass and redshift matched to 486 control galaxies. A novel technique for identifying and quantifying merger features in galaxies is developed, subtracting GALFIT galaxy models and quantifying the residuals. Comparison to visual classification confirms this measure reliably picks out disturbance features in galaxies. No enhancement of merger features with increasing AGN luminosity is found with this metric, or by visual inspection. We analyse the redshift evolution of AGN associated with galaxy mergers and find no merger enhancement in lower redshift bins. Contrarily, in the highest redshift bin ($z \sim 2$) AGN are ~ 4 times more likely to be in galaxies exhibiting evidence of morphological disturbance compared to control galaxies, at 99% confidence level ($\sim 2.4\sigma$) from visual inspection. Since only $\sim 15\%$ of these AGN are found to be in morphologically disturbed galaxies, it is implied that major mergers at high redshift make a noticeable but subdominant contribution to AGN fuelling. At low redshifts other processes dominate and mergers become a less significant triggering mechanism.

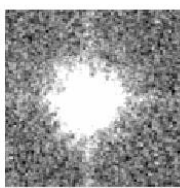
○introduction

- AGNのtrigger: disk instability, bar, minor merger
major mergerについてははっきりしていない
- morphologyからmergerを判断
=> 明るく、high-zにあるAGNでは困難
- $z \sim 2$ はAGNが活発、かつ、mergerが活発
=> mergerによってAGNが活発に?
- $z=0.5-2.2$ で調査を行った

Control galaxy



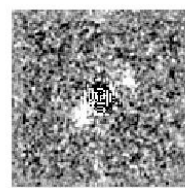
Star



Galaxy + star



Star subtracted



○sample data

- 106個のAGN(X-ray selected, COSMOS)
- 486個のcontrol galaxy(mass, redshiftが近い)
- 8個のstar(control用)
- HSTのACS F518Wのデータ

○method

- GALFITでAGNのPSFを差し引きhost galaxyを取り出す
- control galaxyにはstarを重ね、同じ処理をする
=> host galaxyの形態、fluxを測定

○result

- 形態 vs. magnitude, flux vs. magnitude
flux vs. redshift 有意な差はない
- 形態 vs. redshift
=> mergerは $z \sim 2$ でAGNが多い

○discussion

- AGNの内<10%がmerger
=> mergerはAGNに必要なではない
- Sersic index: ~ 1.15 (disk)
=> mergerから時間が経過
- mergerからAGNになるまでの遅れを考慮する必要あり
- M-Mb relationによるミスマッチの可能性
- サンプル数の不足
=> high-zで30以上のAGN merger

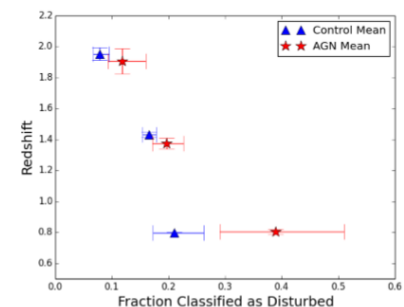
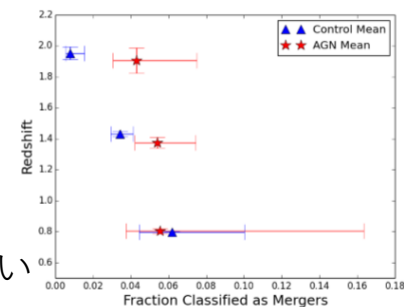


Figure 10. The fraction of galaxies classified by humans as mergers (upper panel) or disturbed (lower panel) in bins of redshift. 1 sigma confidence levels are calculated according to the prescription of Cameron (2011).