KOOLS-IFUによる ブラックホール形成環境の解明

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iTHEMS

Less Metal, Heavier Remnant Black Holes



• Less mass loss at lower metallicity (e.g., Spera+'15).

Luminous X-ray binaries (XRBs) such as ultra-luminous X-ray sources (ULXs) may favor lower metallicity environment (Belczynski+'10)

• A ULX NGC 1313 X-1 has 50% of oxygen abundance than solar value (Mizuno+'07)

Environment of X-ray Binaries



- ULXs are hosted by galaxies with Z< 0.5 Z_{sun} (Mapelli+'10)
- BUT, galaxies are not chemically homogeneous (Rolleston+'00)

Let's see local environment

XRBs are associated with stellar clusters

- Correlation between XRBs and stellar clusters (Kaaret+14)
- Mostly showing strong emission lines
- ULXs are associated with young (<10 Myr) stellar clusters (Poutanen+13)



Poutanen+'13



M51 (NGC5194/5195)

ULX NGC5194 005, 202.50422, 47.22889



56.50s

RA (J2000)

12.00s 30m00.00s 48.00s 36

RA (J2000)

()2000)

XRB NGC5194 091, 202.46721, 47.21252 13'00.0' 5 arcsec 54.0' 48.0' Dec (J2000) 42.0" +47°12'36.0" 53,00s 52.00s 51.50s 13h29m51.00s 53.50s 52,50s RA (12000)



RA (J2000)

KOOLS-IFU Observation

- 1 ULX + 3 XRBs (2019/04/10-11)
- 600 s x ~5 for each



2CX0 J132952.1+471245



• Very preliminary...

• [O III] is not detected... Need further checks.

A New X-ray Binary Catalog





- 天体の位置を一定に保ってほしい。
- 解析ツールの更新情報は逐次展開してほしい。
- IFUとして意味のある観測ができるようにしてほしい。
- 安定運用後は三鷹リモートができるようにしてほしい。

Summary

- Theoretically, lower metallicity hosts heavier black holes.
- We would like to observationally investigate this hypothesis w/ Seimei/KOOLS-IFU.
- We observed 1 ULX + 3 XRBs w/ KOOLS-IFU.
 - 3 XRBs are detected.
 - Spectral analysis is on-going.