A double radio lobes X-ray source kicked-off from M83 nucleus.

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Nuclear Starburst

Are accretion onto SMBH and violent star formation co-evolving phenomena or necessary partners of the activity?

Mechanisms triggering the nuclear extended star formation

Relationship of the triggering mechanisms to galaxy evolution

D = 3.7 Mpc (h=0.75) \[ \sim 18 \text{ pc (")}^{-1} \]

Diameter (arcmin) : 12.9 x 11.5

Classification : SB(rs)b
The physical problem
The correlation between the bulge mass and that of central SMBH in spiral galaxies points to a strong interplay between these systems in a hierarchical scenario of disk-galaxies formation. A paradigmatic outcome of a black holes merger is the recoil of the resulting black hole as a response to the anisotropic emission of gravitational waves. In triple black holes system the ejection of the smallest one may happen much in advance to the merger of the two largest objects. There are two caveats to this scenario: The search for kicked-off black holes has been unsuccessful up to now and super-massive binary black holes systems that should also be common objects, are elusive as well.
M83 Neighborhood

M83 belongs to the Hydra-Centaurus group, one of the most active regions in the nearby universe and recently detected as source of Ultra High-Energy Cosmic Rays (UHECR) by the AUGER consortium.
The M83 Group

IC 4247

NGC 5253

NGC 5264

IC 4316

UGCA 365

9 confirmed members (Karachentsev et al. 2006)
The Centaurus Group

NGC 5237

NGC 5102

PGC 47171

NGC 4945

NGC 5206

25 confirmed members (Karachentsev et al.)
Inner parts and pseudo-bulge
Image and isodensities are from 2-MASS
The distribution and kinematics of the molecular gas is typical for barred galaxies down to 1 kpc.

Unusual kinematics around the double nucleus in the central ~ 300 pc.

Resolution ~3″. Second nucleus would coincide with the center of the bulge.
Harris et al. (2001)

Giant arc:
3” and 7” from galaxy center.
Spans 15” (225 pc)
Includes 20 massive young clusters ~30 Dor
The starburst began ~10 Myr ago.
Radio map 6cm, Telesco 88

FIR 10mu, Telesco 88
Maddox, AJ 2006
GEMINI-S Observations
June 2007
Half a emission line detail. In yellow the reference HII region and in green $J \, 133658.3-295105$. 
If local, $J\,133658.3-295105.$ would have a projected size $\sim 1.0\,kpc$ ($3-5\times10^6\,ly$).

*Is RS 28 a gravitational recoil?*, Question remains open.

Ejecta RS 27 and RS 29 $\rightarrow$ accretion disk like microQSOs and QSOs.

Why RS 27 and 29 sit along line of kick? *unclear.*
Physical properties of accreting black holes (temperature, ejecta size, etc) scale with some power of the BH mass (Mirabel & Rodríguez 1999).

If ejecta size scales with the BH mass, comparison with galactic microquasar (MBH ~ 10Ms, size~5 pc) leads to a mass for a RS 28 BH ~1000 to 2000Ms.

BB temperature for Eddington-limit accretion (Rees 1984; Mirabel & Rodríguez 1999) should be $T = 10^7 (M/Ms)^{(-1/4)} \sim 1/3$ to 1/5 of that of a galactic microquasar.

X-ray spectroscopic will be necessary to unequivocally determine the distance to and the nature of J 133658.3–295105.
CHANDRA observations 2000
50 ksec
The Fe-Ka line physics

Fe-Ka line indicates $z=0.0018$ (6000km/sec), it points to a distance much lower than $z=1$.

It is compatible with the distance of M83 in an accretion disk scenario in which the line is produced at 20-25 Rg.
Pos-newtonian numerical simulation of 2 and 3 body systems
Concluding remarks

X-ray observations confirms \textit{J 133658.3–295105 as an object at the distance of M83.}

The source is not of stellar origin, might be intermediate or high mass BH.

Three BHs system seems to be a more realistic scenario for the origin of the kick-off.

Longer XMM-Newton observations will allow to better study the Fe-Kα.
THE END
Detection limit at $S/N \geq 3$, $m_i = 23.5 \pm 0.5$. This is based on an average seeing of $0.8''$, disk absorption $1-1.3mg \rightarrow m_i = 22.2mg$.

We could detect 80% of the BL and NL AGN in SEXSY sample!! (Eckart06).

If Cen A was located at $z \approx 1$, NGC5128 would shine at $m_I = 21.5mg$, or $m_I = 23.1mg$ if located at $z = 2$. Cen A radiolobes are at $\sim 600kpc$ twice that quoted by Soria & Wu (2003) for R28.

(Hewitt & Burbidge 1993): $[OII] \sim 3727\ A (0.34,1.4); [NV] \sim 3426\ A (0.46,1.77); [MgII] \sim 2798\ A (0.8,2.4); [CIII] \sim 1909\ A (1.6,3.9); [HeII] \sim 1640\ A (2.1,4.7); [CIV] \sim 1549\ A (2.2,5.1); [SIV] \sim 1402\ A (2.6,6.7); [NeV] \sim 1240\ A (3.4,7.6). \rightarrow 2<z<3$ for large radio galaxies.