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Precise measurements of star-formation rates of gamma-ray loud Seyfert AGNs

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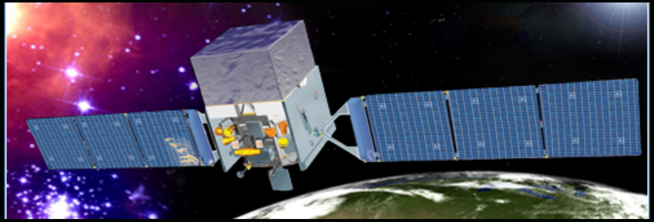
Gamma-ray Origins of AGNs



Fermi/LAT (20MeV<E<300GeV All sky survey)

銀河/AGNには(少なくとも)2種類のγ線源があることを発見

Abdo+ (2010)

種類 その1: Beamed AGNs (Blazars, radio galaxies)

(γ線源&機構: 相対論的jet由来のInverse Compton)

種類 その2: Starburst galaxies

(γ線源&機構: ISMと宇宙線のp-p interaction)

さらに, Ackermann+ ’12 はjet成分を持たない

Seyfert AGNsもγ線を持つ可能性を示唆

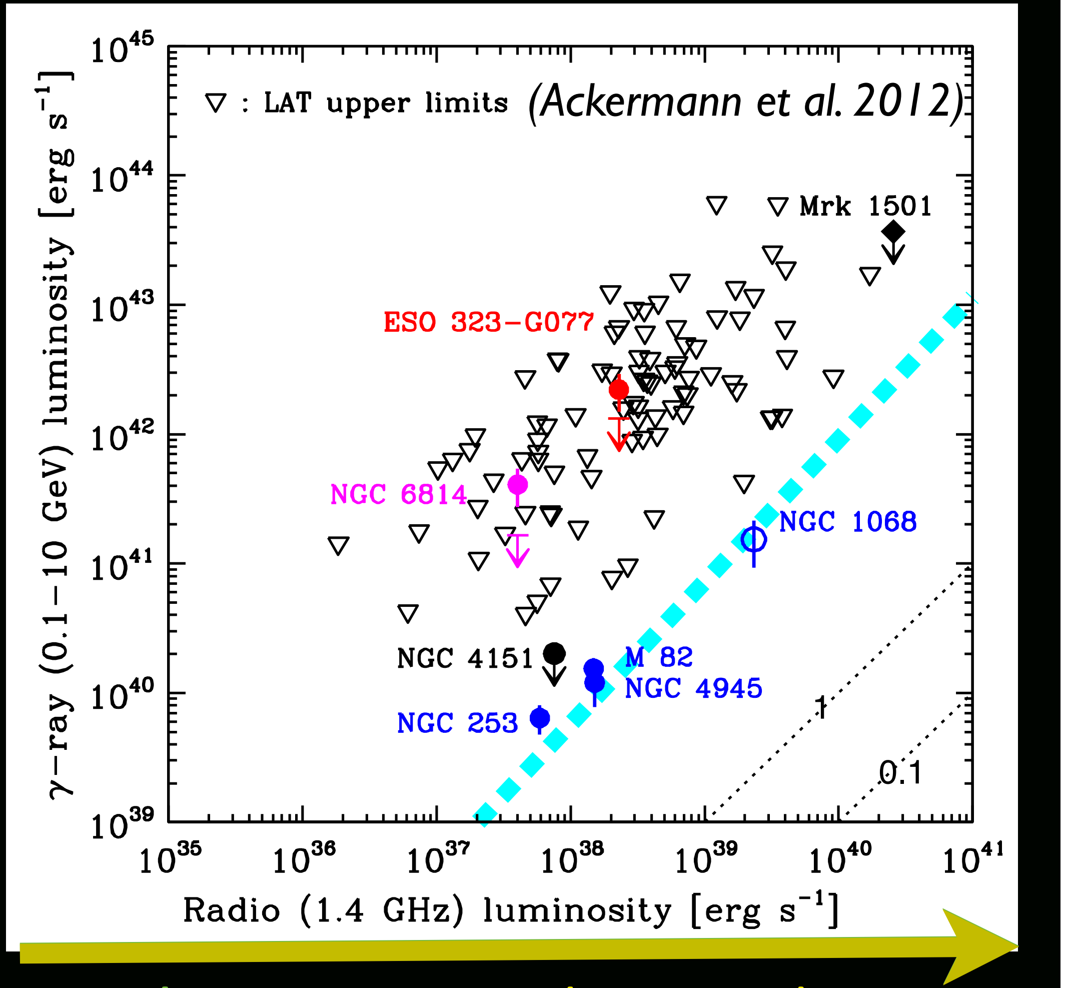
Question

Seyfert AGNのγ線源は何なのか? (Starburst? or AGN activity?)

Starburst Activities in Seyfert AGN host galaxies

▬ ▬ ▬ γ/radio相関関係

from starburst galaxies



Starburst Activity (+ AGN?)

ESO 323-G077 γ線detection

NGC 6814 “してるかも”

問題点

radio光度にはAGN成分のコンタミの可能性

より定量的にSeyfert AGN母銀河の星生成量を見積もる方法が必要

Starburst estimator for Seyfert AGNs

Q. より定量的にSeyfert AGN母銀河の星生成量を見積もるには?

A. Pa α, Pa β, (PAH)が強力な星生成tracer

mini-TAO/ANIRがベスト!!

(Pa αは現在mini-TAOの独壇場)

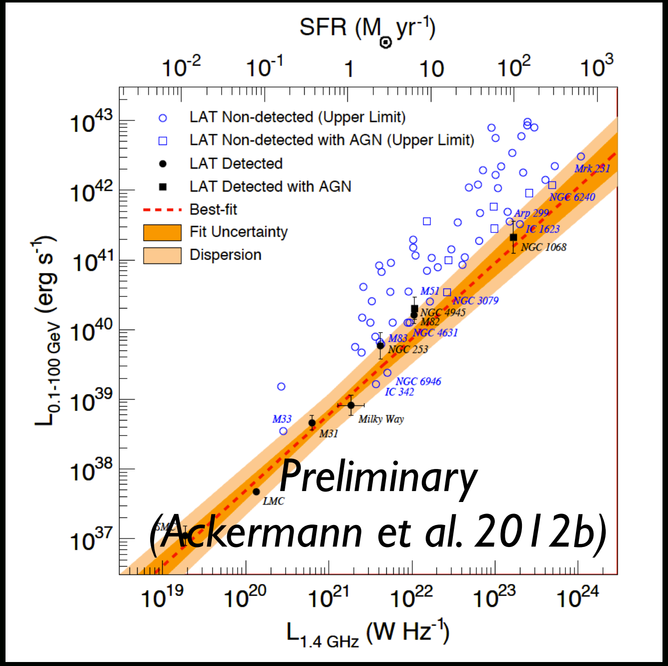
VLT/ISAAC
Gemini/NIRI
UKIRT/UIST

+ Hα, Hβ 情報 (from Kennicutt+ 98, 08 etc..)

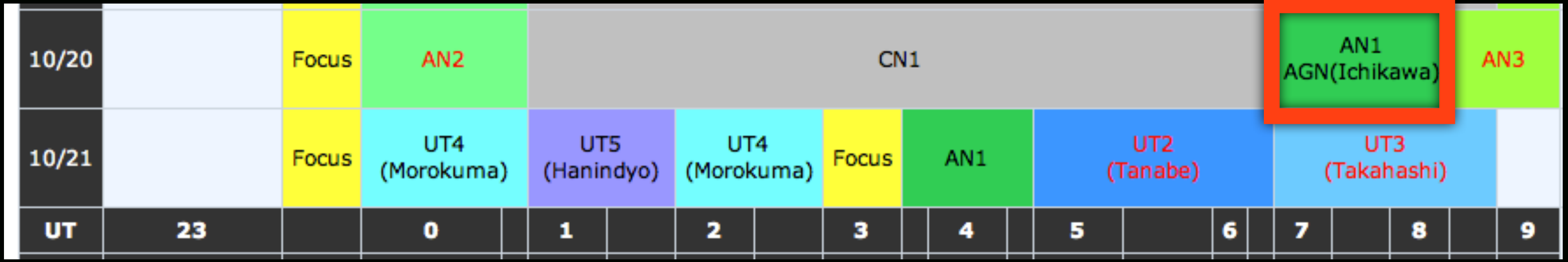
-> 星生成率が求まる

星生成率SFR -> γ線光度は

Ackermann et al. 2012b を用いる



前期観測RUN: NGC 1068

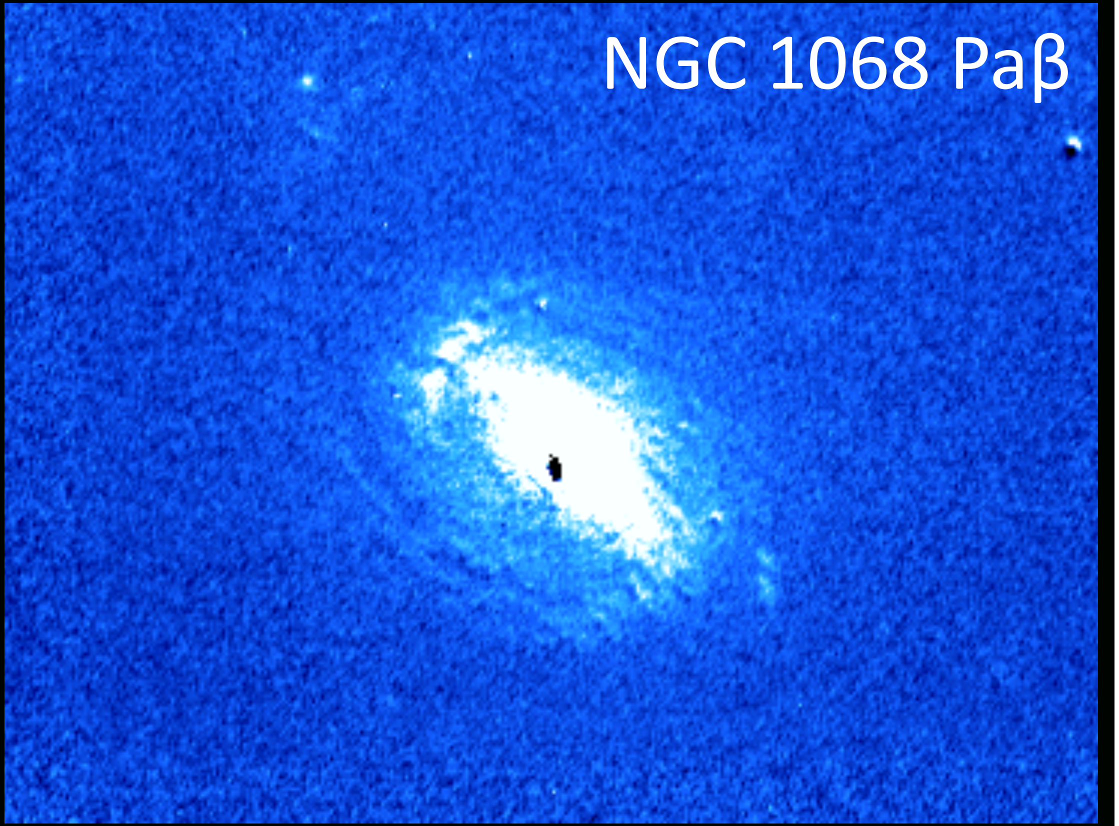


10/20		Focus	AN2	CN1					AN1 AGN(Ichikawa)	AN3
10/21		Focus	UT4 (Morokuma)	UT5 (Hanindyo)	UT4 (Morokuma)	Focus	AN1	UT2 (Tanabe)	UT3 (Takahashi)	
UT	23		0	1	2	3	4	5 6	7 8	9

Paβ: 120s/flame

J band: 60s/flame

100” 9点ディザリング



Thank you for the observation!!

List of Targets

’11 (秋) 観測 (1天体)

NGC 1068 (cz=1137 km/s: Paβ O.K.) 観測done.

’12 (春) 観測希望 (4天体)

NGC 4945 (cz=563 km/s: Paβ O.K.)

NGC 6814 (cz=1563 km/s: Paβ O.K.)

ESO 323-G77 (cz=4501 km/s: Paα/β O.K.)

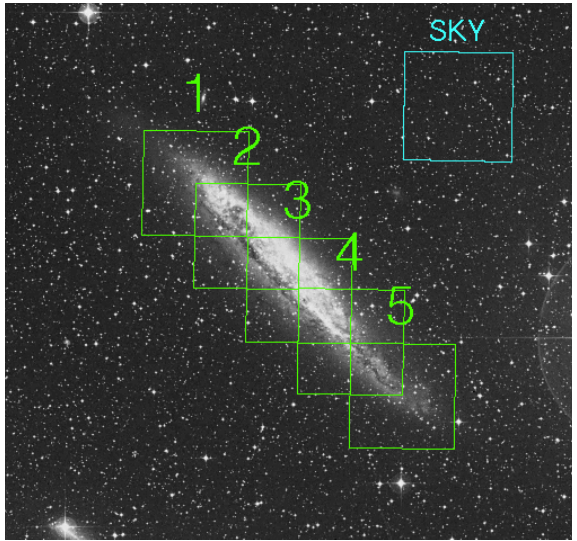
Circinus Galaxy (cz=434 km/s: Paα/β O.K.)

List of Targets

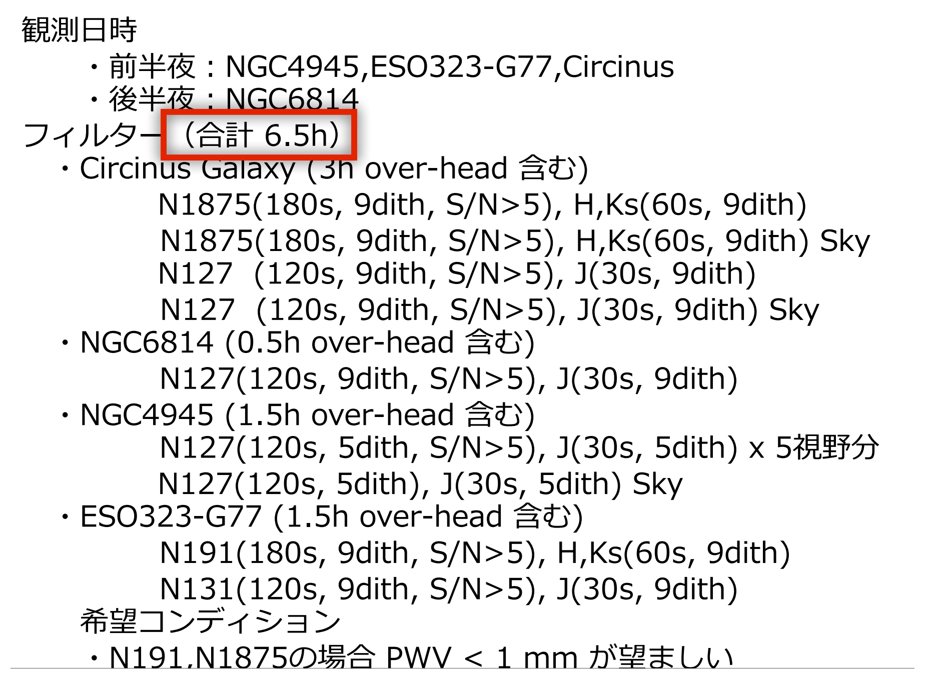
Circinus Galaxy	14h13m09.9s -65h20m21s Sky 要相談
NGC6814	19h42m40.6s -10h19m25s
NGC4945(下図参照)	①13h05m55s -49d23m53s ②13h05m39s -49d26m33s ③13h05m23s -49d29m15s ④13h05m07s -49d31m51s ⑤13h04m51s -49d34m35s Sky 13h04m34s -49d20m00s
ESO323-G77	13h06m26.1s -40d24m52s

優先順位

1. Circinus Galaxy : 434 km/s (z=0.001448)
2. NGC6814 : 1563 km/s (z=0.005214)
3. NGC4945 : 563 km/s (z=0.001878)
4. ESO323-G77 : 4501 km/s (z=0.015014)



NGC4945
四角はANIRの視野
番号は座標に対応



観測日時
- 前半夜：NGC4945,ESO323-G77,Circinus
- 後半夜：NGC6814

フィルター（合計 6.5h）
- Circinus Galaxy (3h over-head 含む)
  N1875(180s, 9dith, S/N>5), H,Ks(60s, 9dith)
  N1875(180s, 9dith, S/N>5), H,Ks(60s, 9dith) Sky
  N127 (120s, 9dith, S/N>5), J(30s, 9dith)
  N127 (120s, 9dith, S/N>5), J(30s, 9dith) Sky
- NGC6814 (0.5h over-head 含む)
  N127(120s, 9dith, S/N>5), J(30s, 9dith)
- NGC4945 (1.5h over-head 含む)
  N127(120s, 5dith, S/N>5), J(30s, 5dith) x 5視野分
  N127(120s, 5dith), J(30s, 5dith) Sky
- ESO323-G77 (1.5h over-head 含む)
  N191(180s, 9dith, S/N>5), H,Ks(60s, 9dith)
  N131(120s, 9dith, S/N>5), J(30s, 9dith)

希望コンディション
- N191,N1875の場合 PWV < 1 mm が望ましい

今期(12春)は

4天体 (**6.5 hr**) を希望