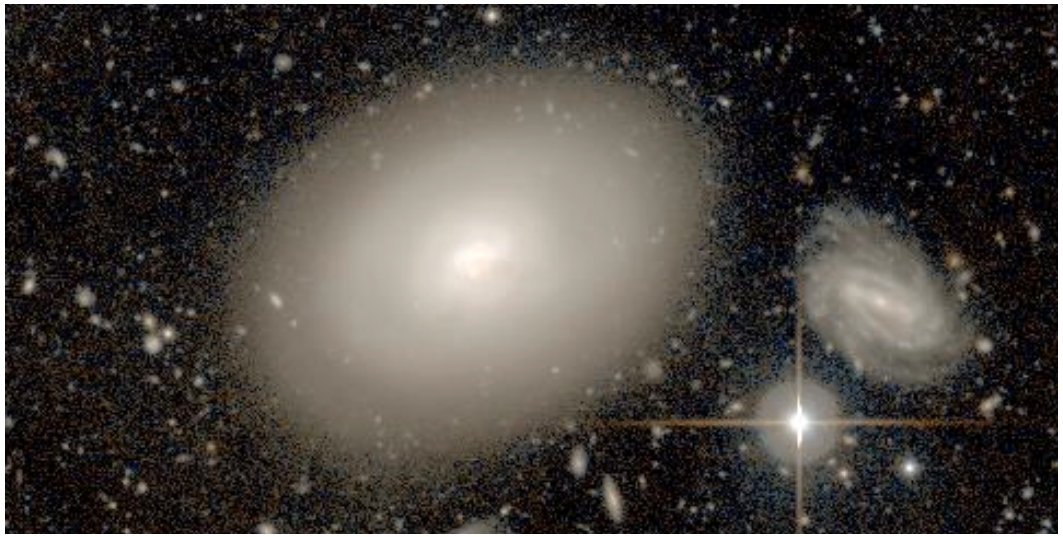
The Elusive Nature of the AGN in NGC1266



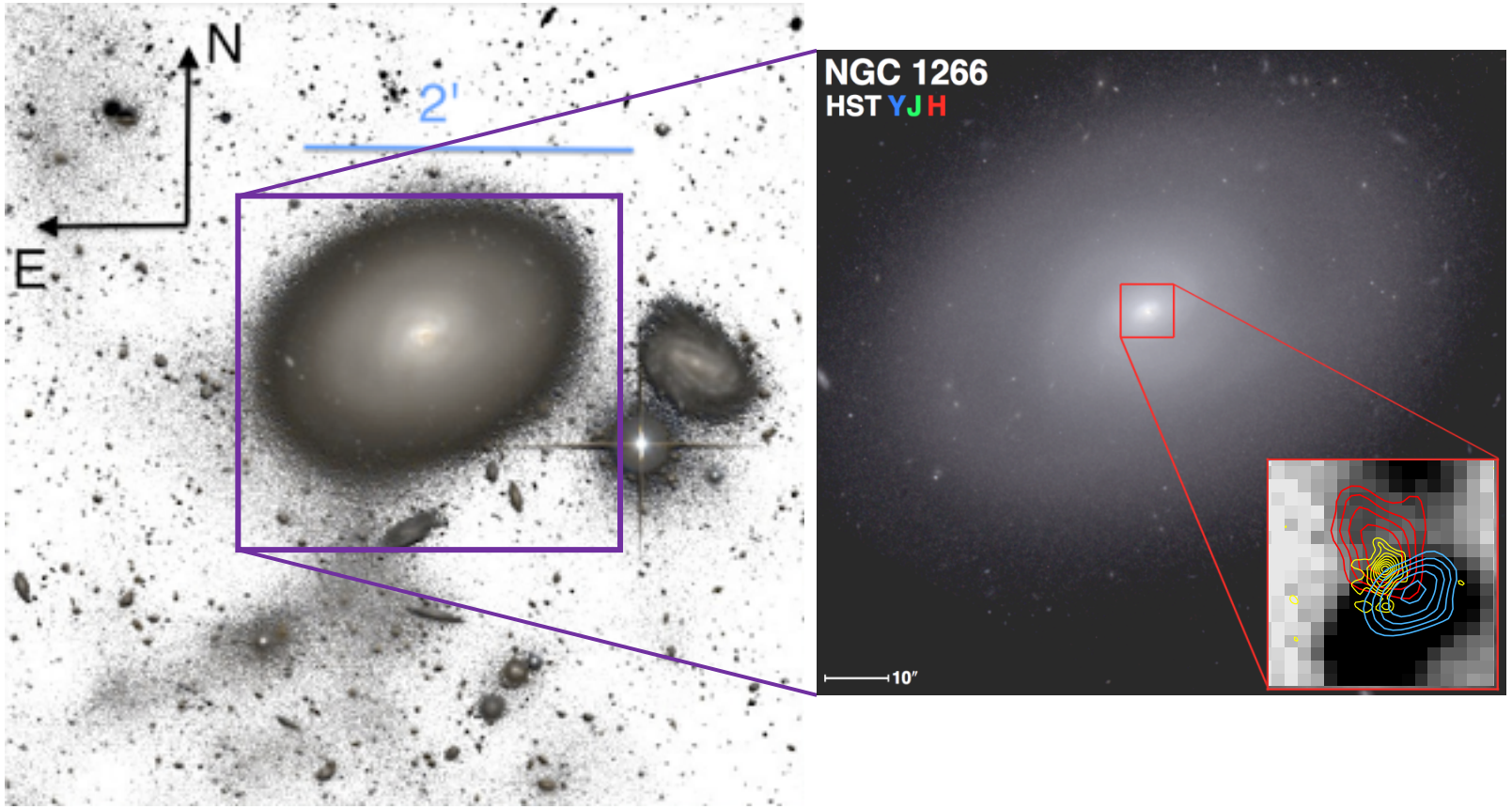
Lauranne Lanz

Dartmouth College

In Collaboration with: Katherine Alatalo, Andy Goulding, Ryan Hickox

Phil Appleton, Patrick Ogle, Kristina Nyland, Murray Brightman, Mark Lacy

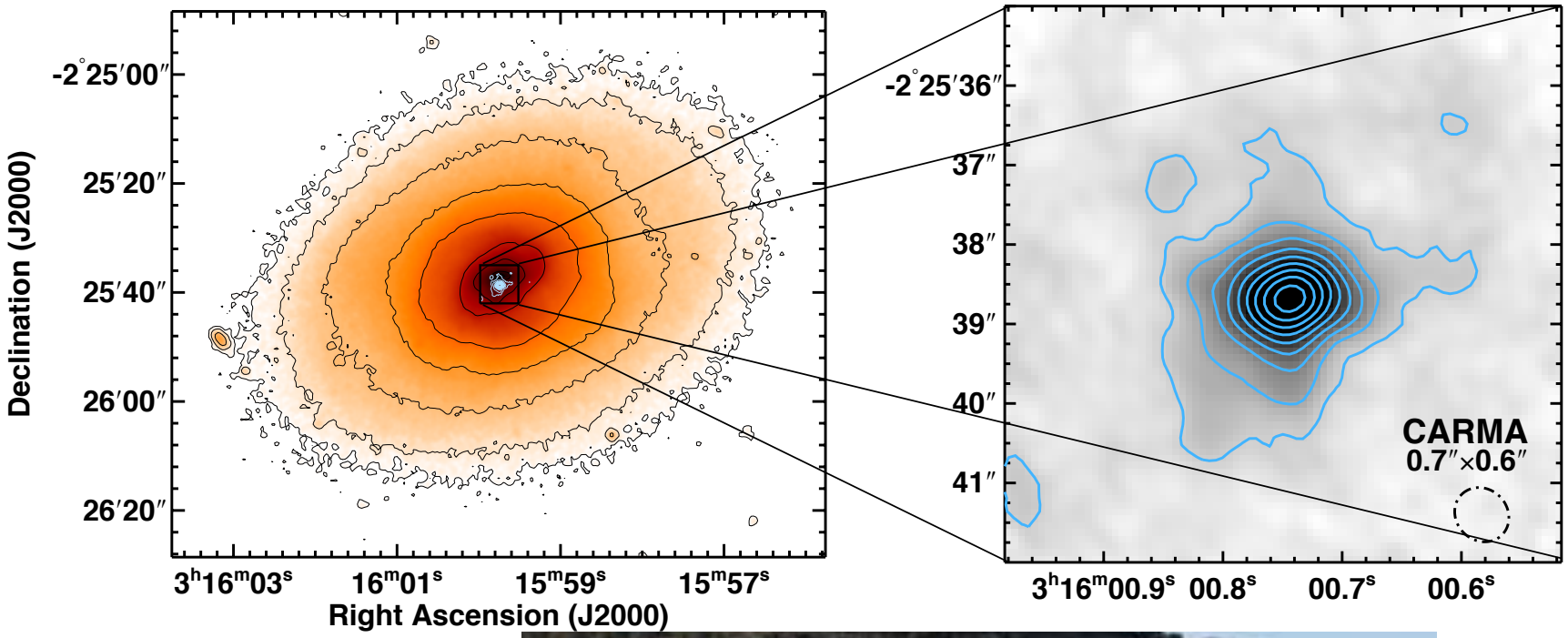
NGC1266



Outflow-driving
low-luminosity AGN
in
compact nuclear starburst
surrounded by
very infertile molecular disk

Alatalo+11; Nyland+13; Duc+15

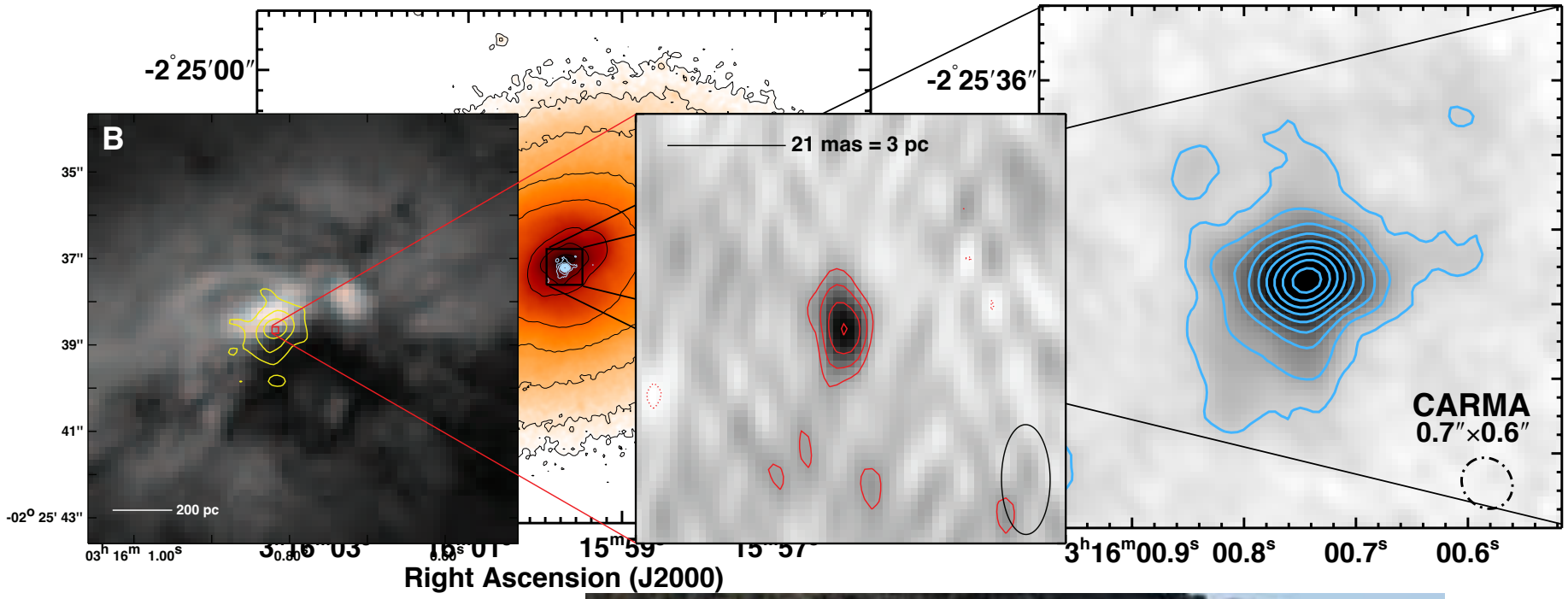
Molecular Gas Emission



$1 \times 10^9 M_\odot$ molecular gas

Alatalo+11, +15

Molecular Gas Emission

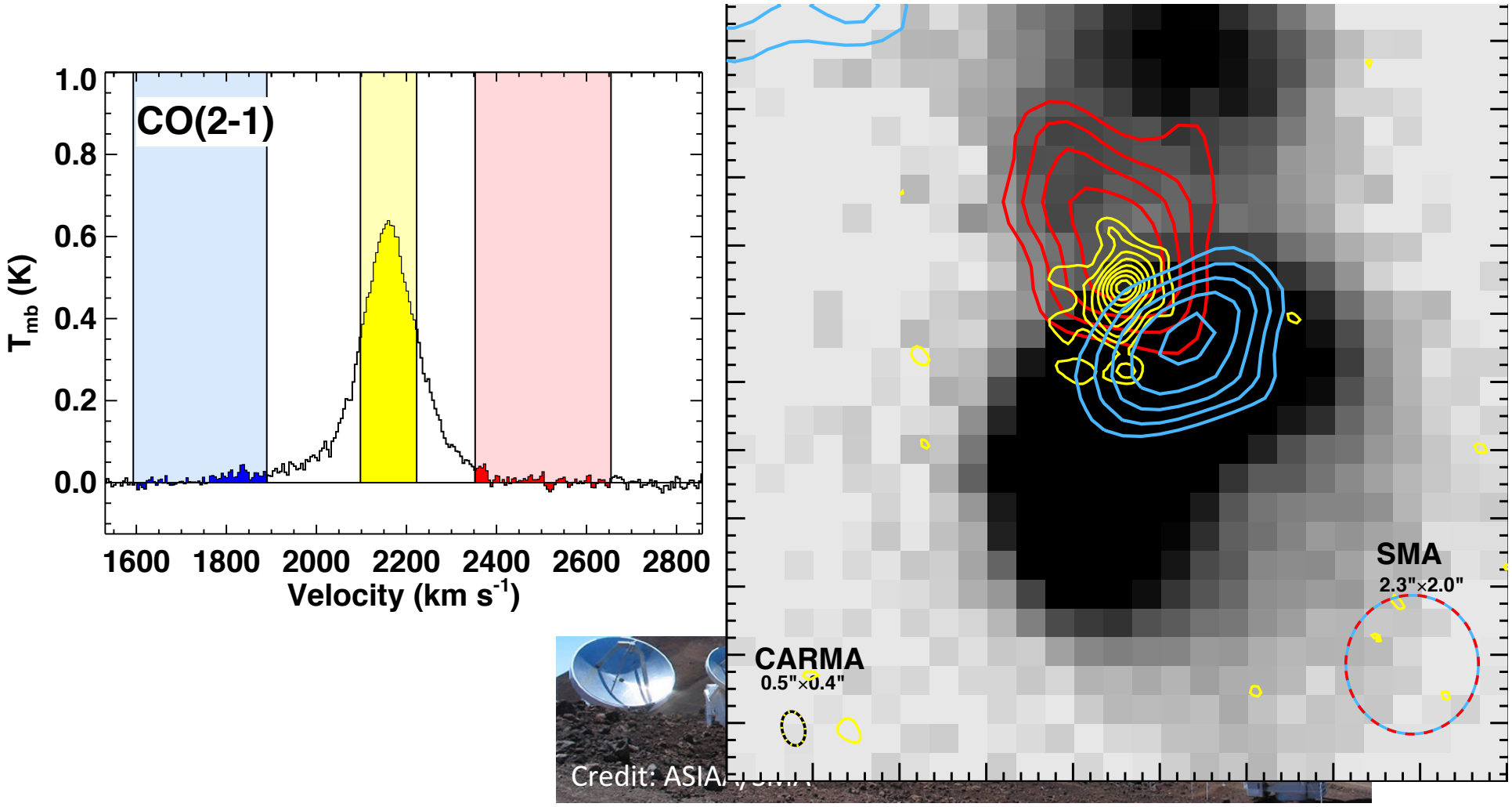


$1 \times 10^9\ M_\odot$ molecular gas

$N_{H_2}(\text{VLBA PS}) = 3 \times 10^{24}\ \text{cm}^{-2}$

Alatalo+11, +15; Nyland+13

Molecular Gas Emission



$1 \times 10^9\,M_\odot$ molecular gas

$N_{H_2}(\mathrm{VLBA\ PS}) = 3 \times 10^{24}\ \mathrm{cm}^{-2}$

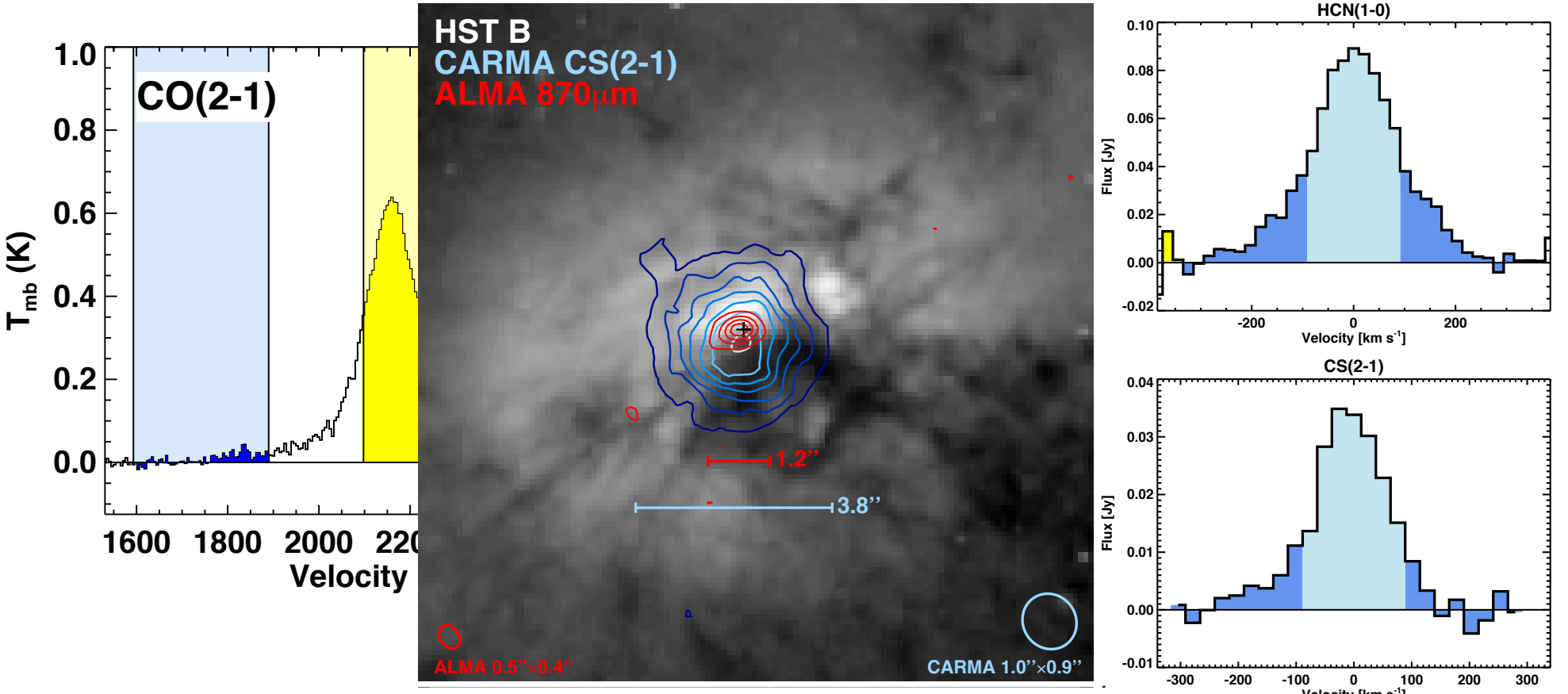
$2 \times 10^8\,M_\odot$ in outflow

$v = 180\ \mathrm{km\,s}^{-1}$

$\dot{M} = 110\ M_\odot\,\mathrm{yr}^{-1}$

Alatalo+11, +15

Molecular Gas Emission



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Alatalo+11, +15

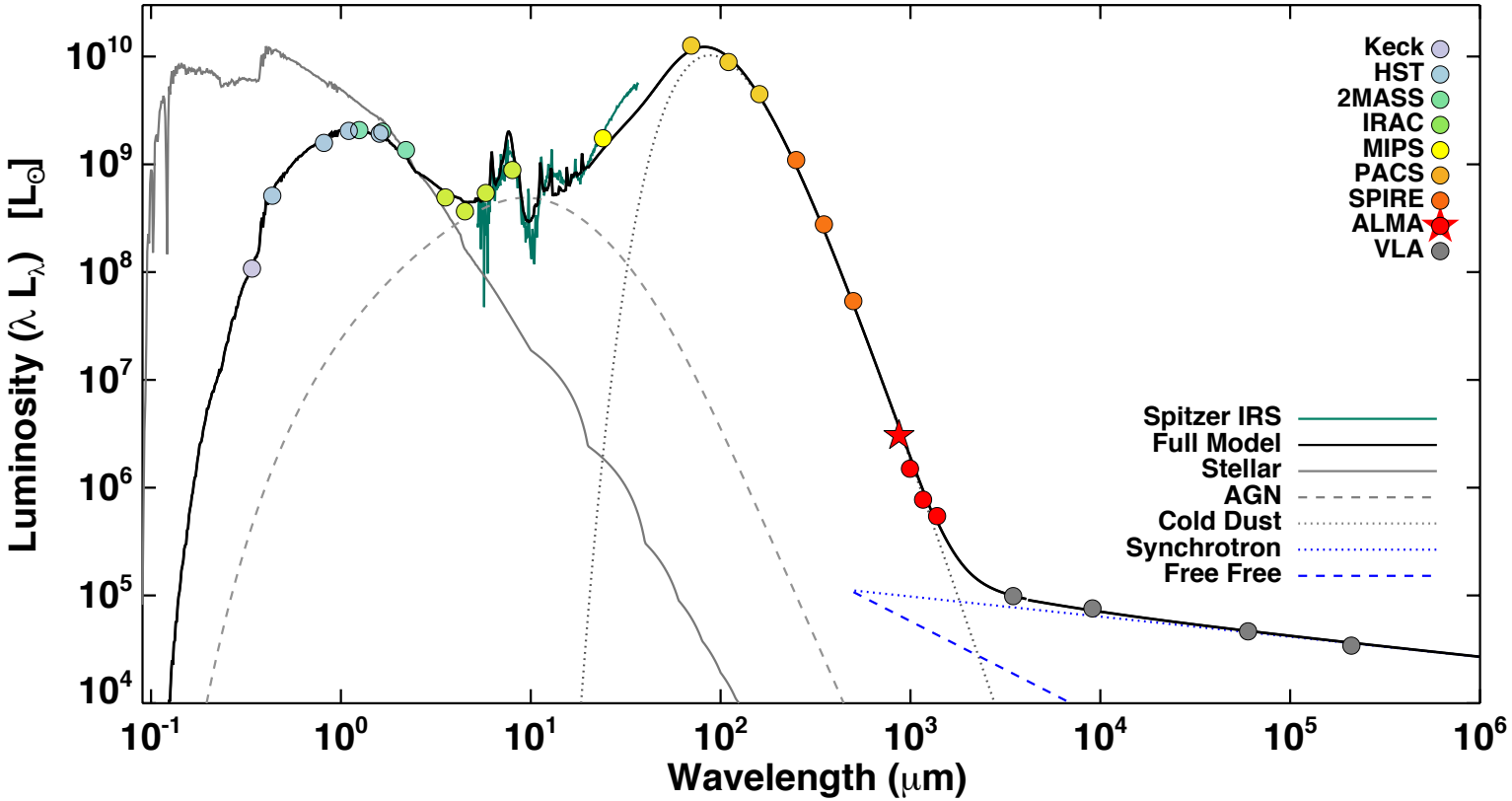
Driving the Outflow

SFR or AGN?

$$\dot{\mathrm{M}} = 110\ \mathrm{M}_{\odot}\,\mathrm{yr}^{-1}$$

$$\mathrm{L}_{\mathrm{mech}} = 7.6 \times 10^{41}\ \mathrm{erg\,s}^{-1}$$

Driving the Outflow



$$2\ M_\odot\ yr^{-1} > SFR > 0.3\ M_\odot\ yr^{-1}$$

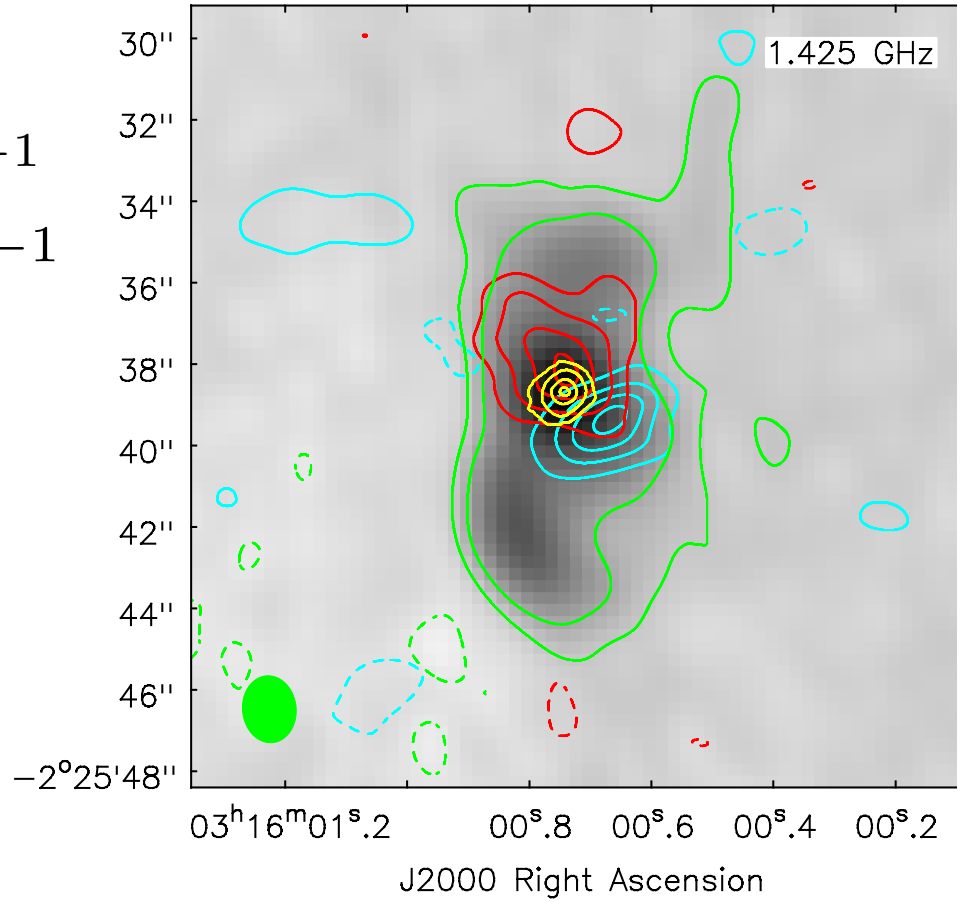
Alatalo+15

Driving the Outflow

AGN!

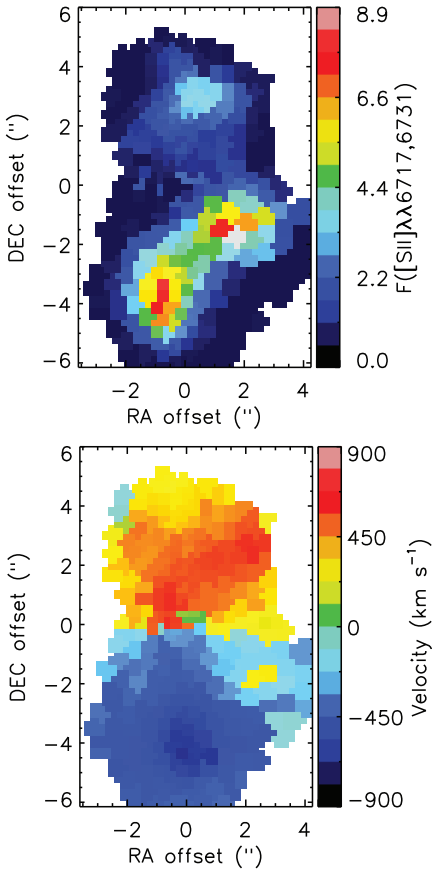
$$L_{mech} = 7.6 \times 10^{41}\ erg\,s^{-1}$$

$$P_{radio} = 3 \times 10^{42}\ erg\,s^{-1}$$

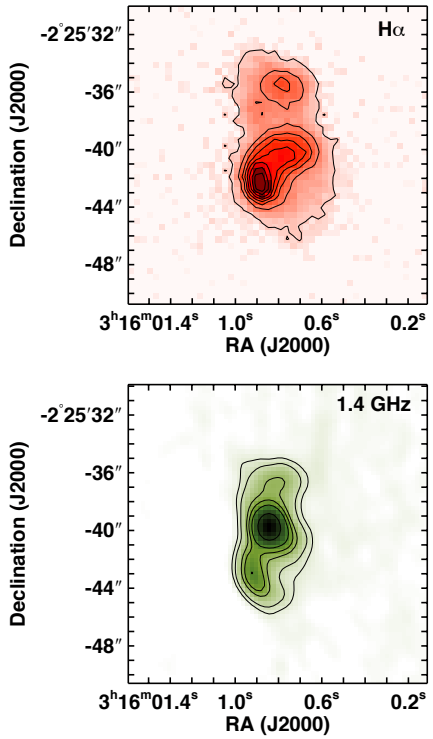


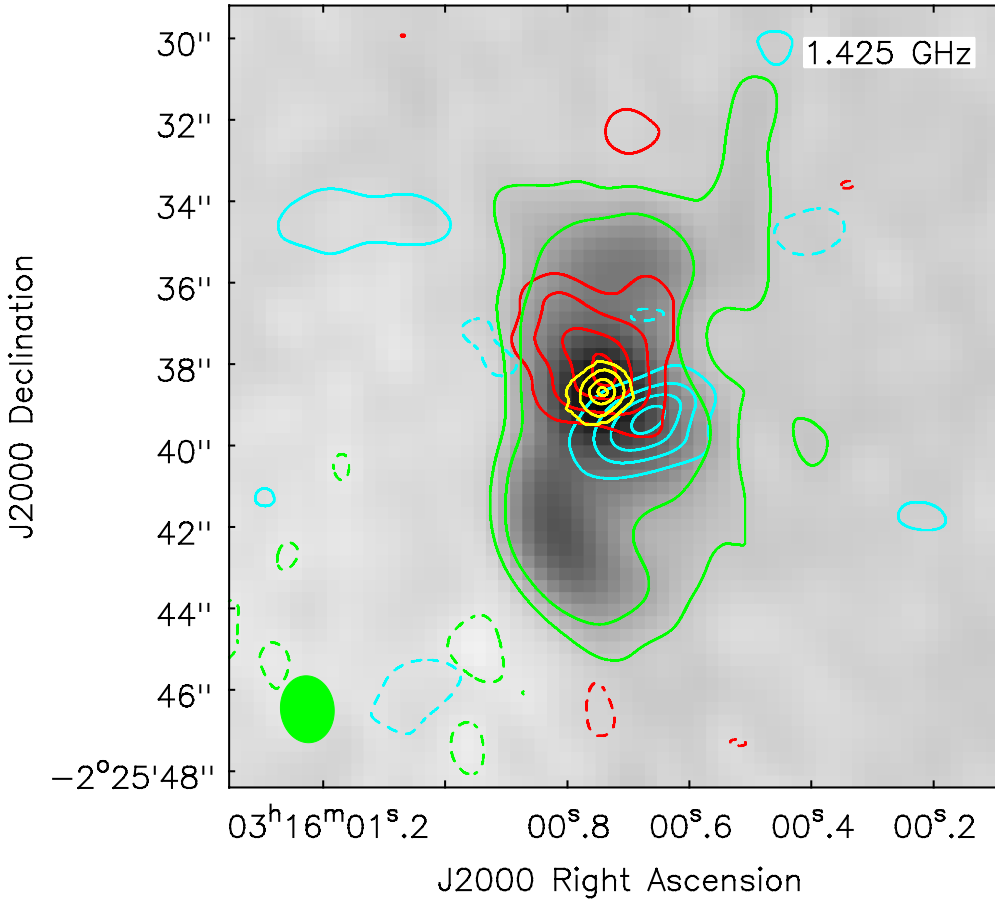
Nyland+13

Driving the Outflow



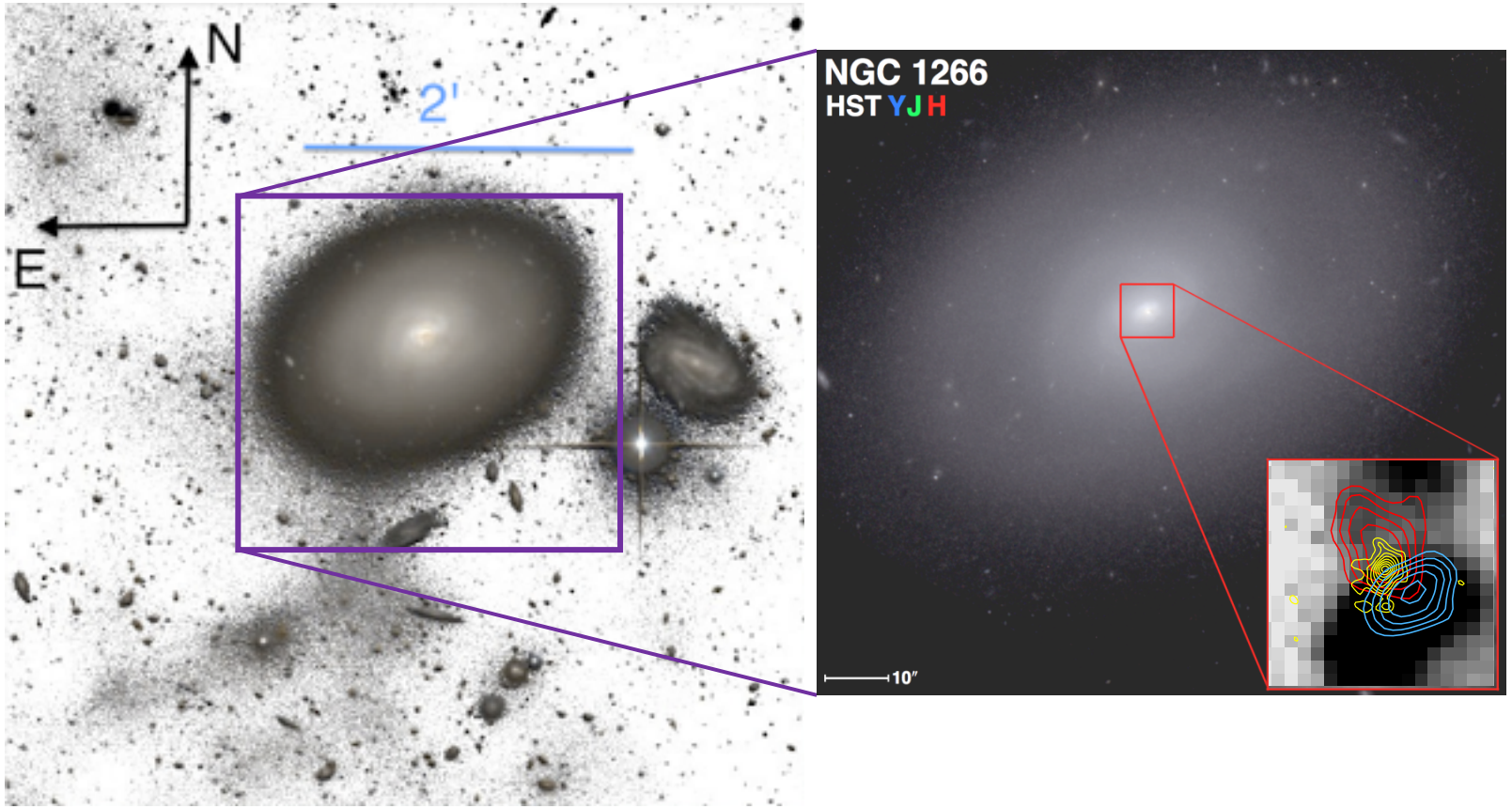
AGN!





Davis+12; Alatalo+11; Nyland+13

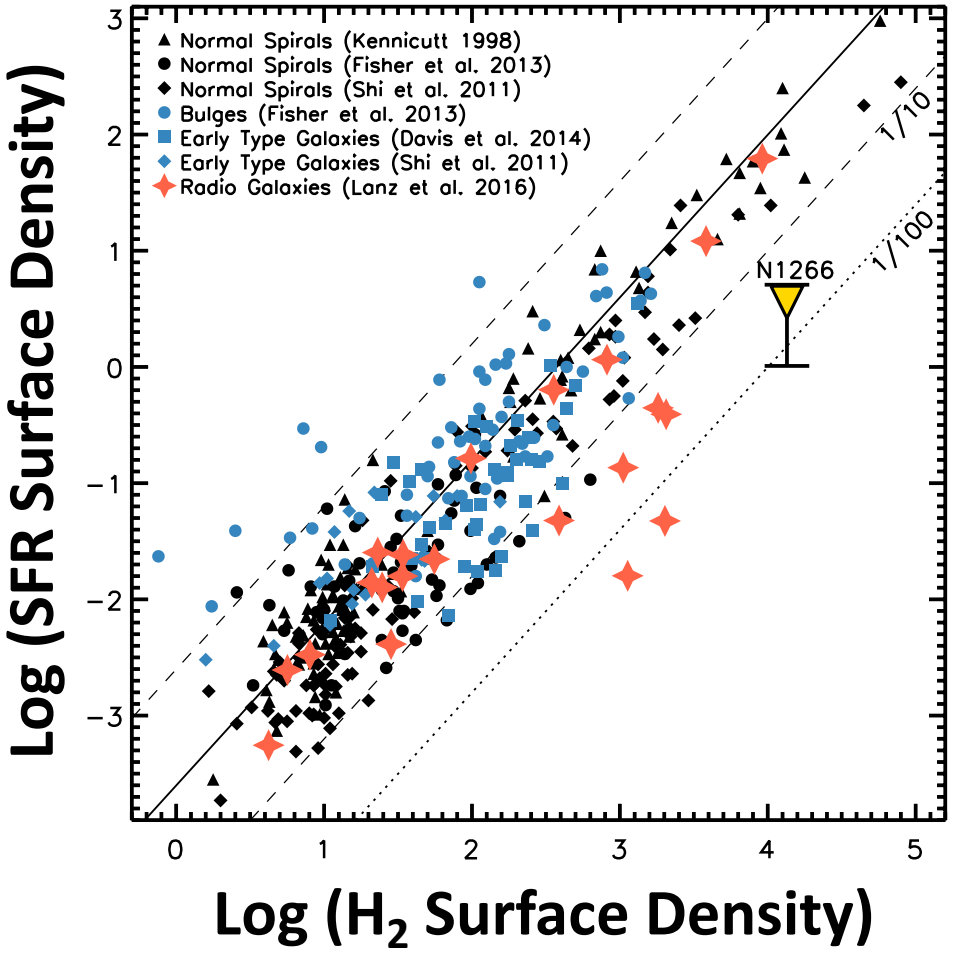
NGC1266



Outflow-driving
low-luminosity **AGN**
in
compact nuclear starburst
surrounded by
very infertile molecular disk

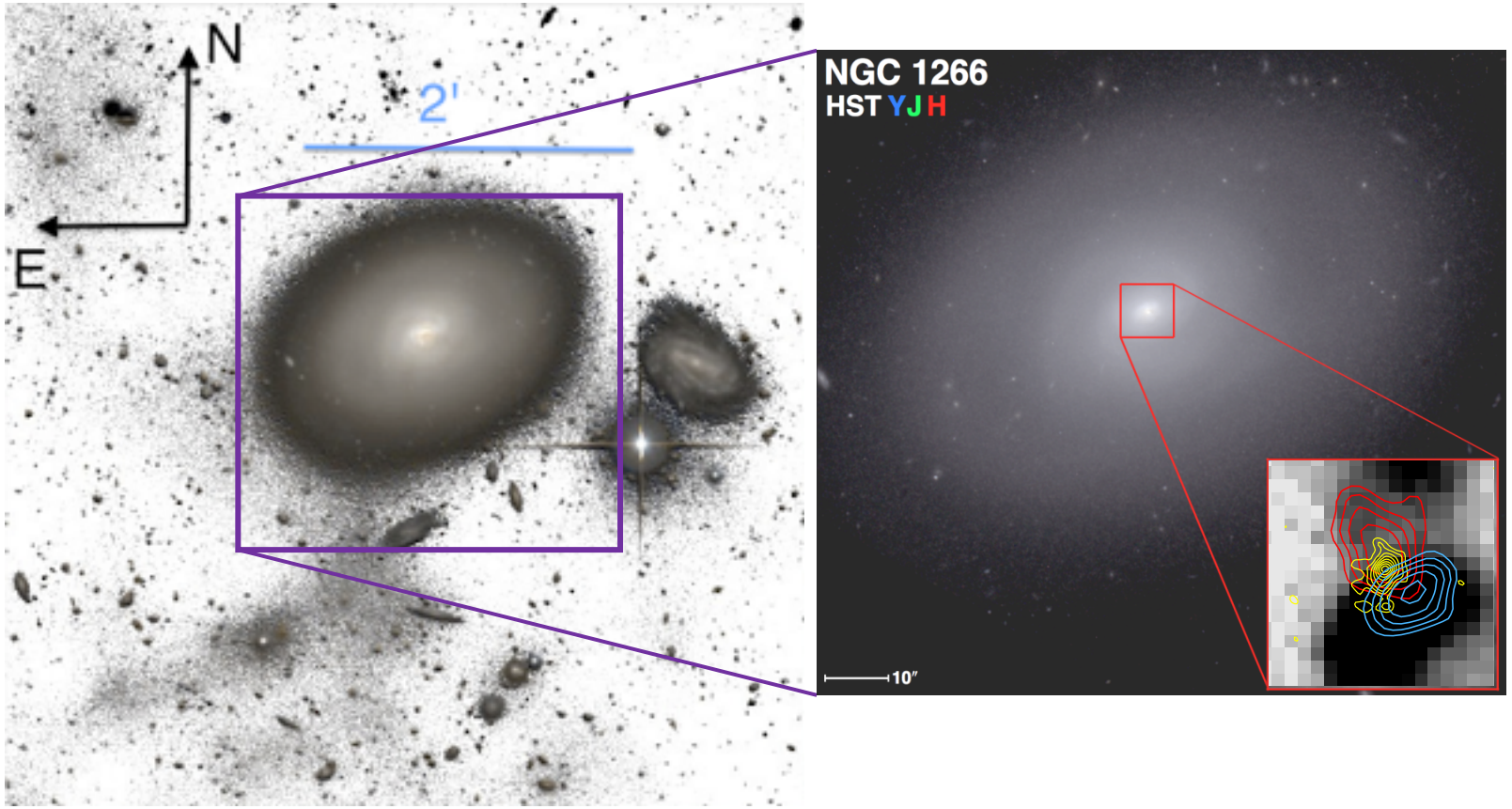
Alatalo+11; Nyland+13; Duc+15

SFR + Resolved Molecular Gas = **In**-Efficiency



Alatalo+15; Lanz+16

NGC1266



Outflow-driving
low-luminosity AGN
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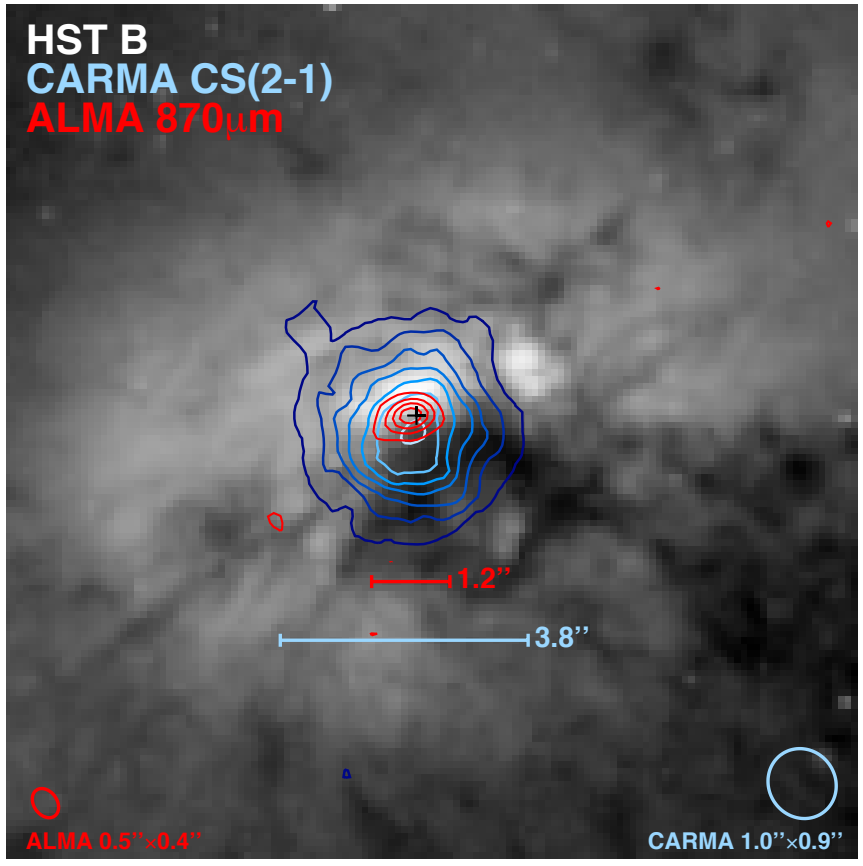
Alatalo+11; Nyland+13; Duc+15

ALMA and distribution of IR Emission



IR Nuclear Luminosity

$8.5 \times 10^9 L_\odot$

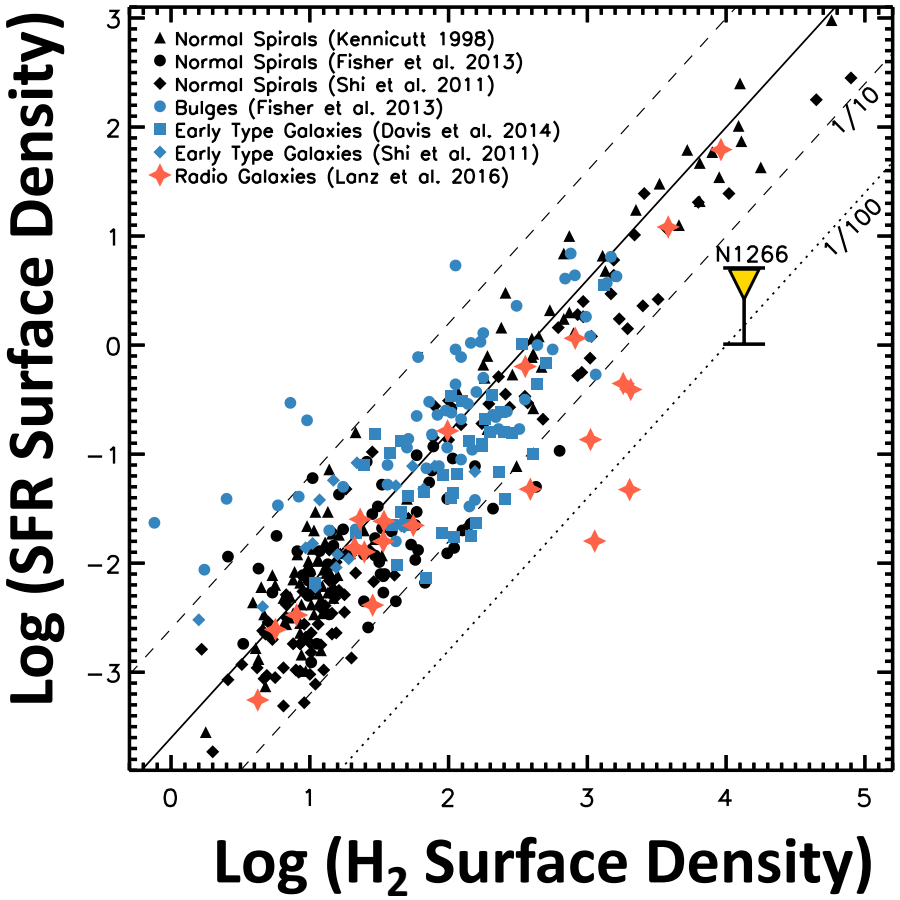
Just Resolved with

$D \approx 50$ pc

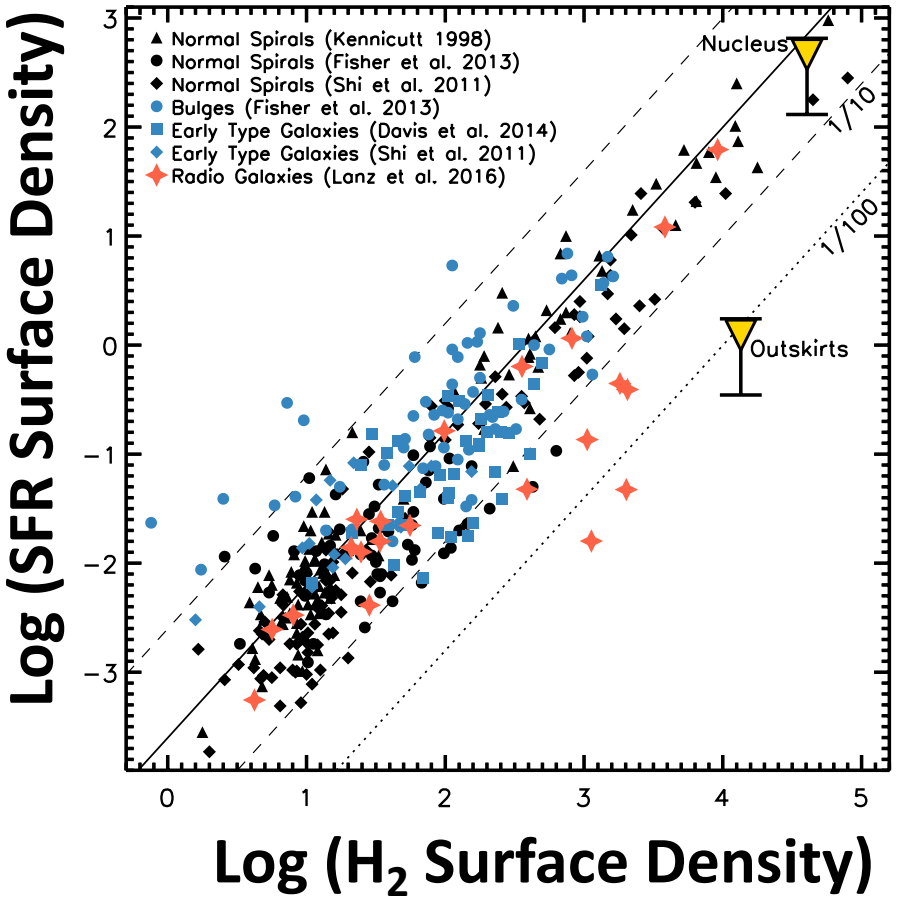
Alatalo+15

Nature of Nucleus and SF suppression

Powerful Buried AGN



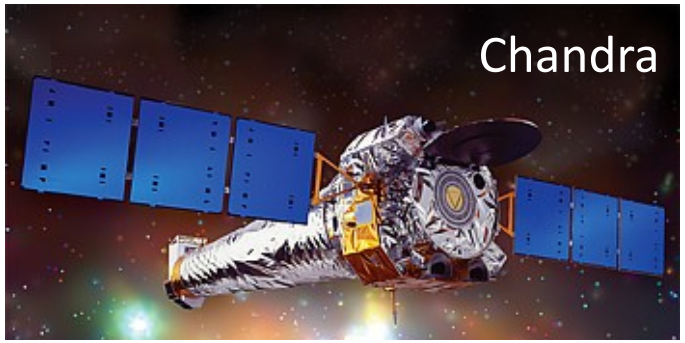
Buried Compact Starburst



Alatalo+15

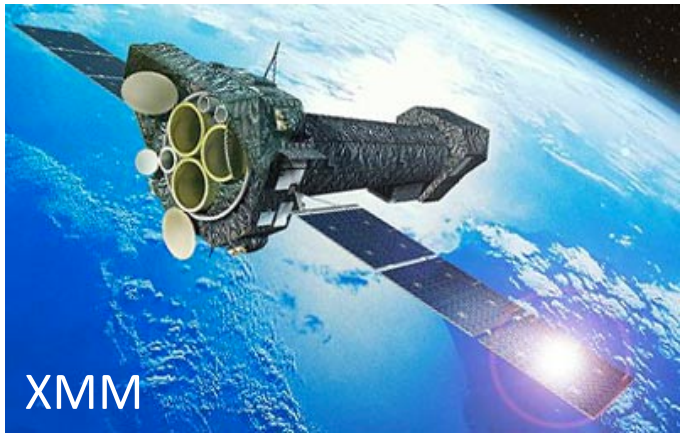
As of 2015: Chandra and XMM

Credit: NASA/CXC/NGST

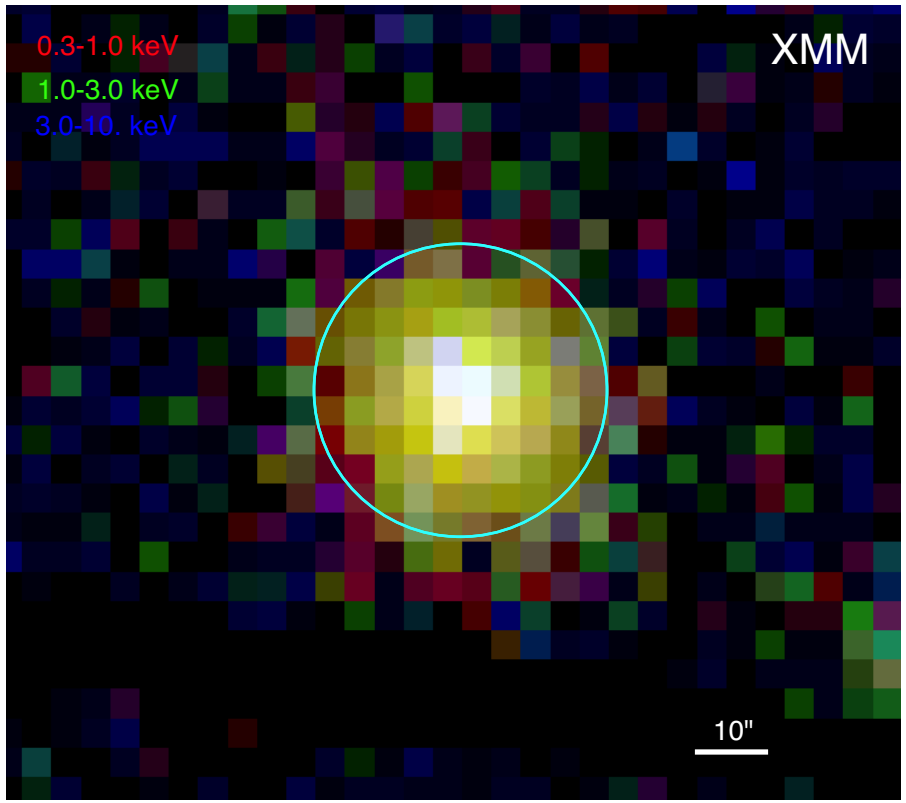


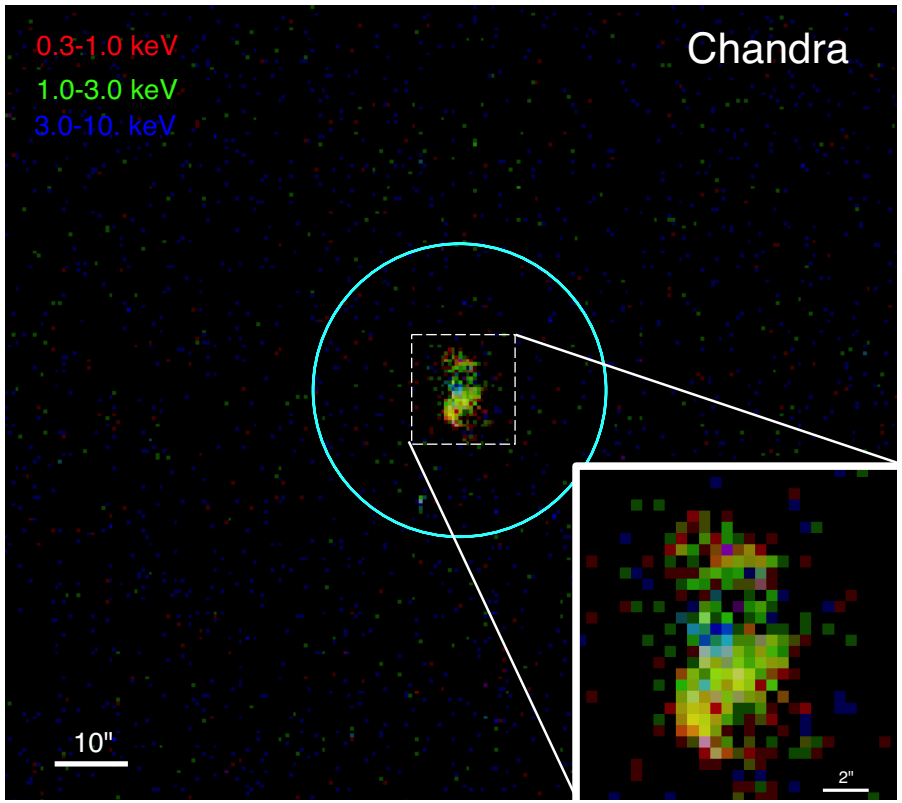
30 ks

Credit: ESA



140 ks





Alatalo+15

As of 2015: Chandra and XMM

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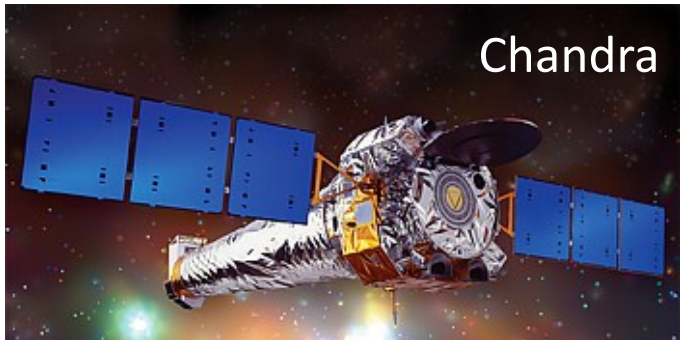
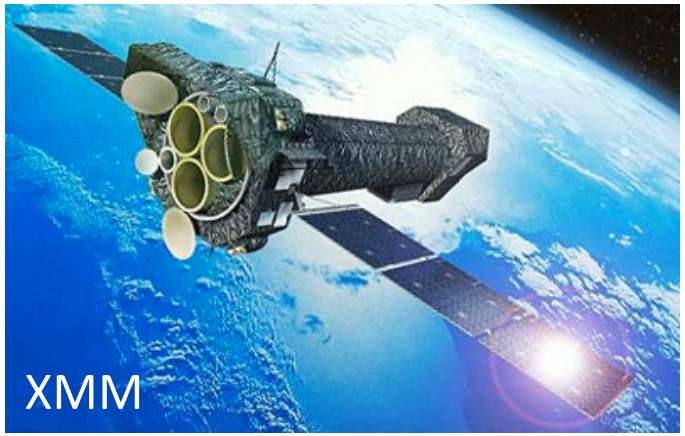
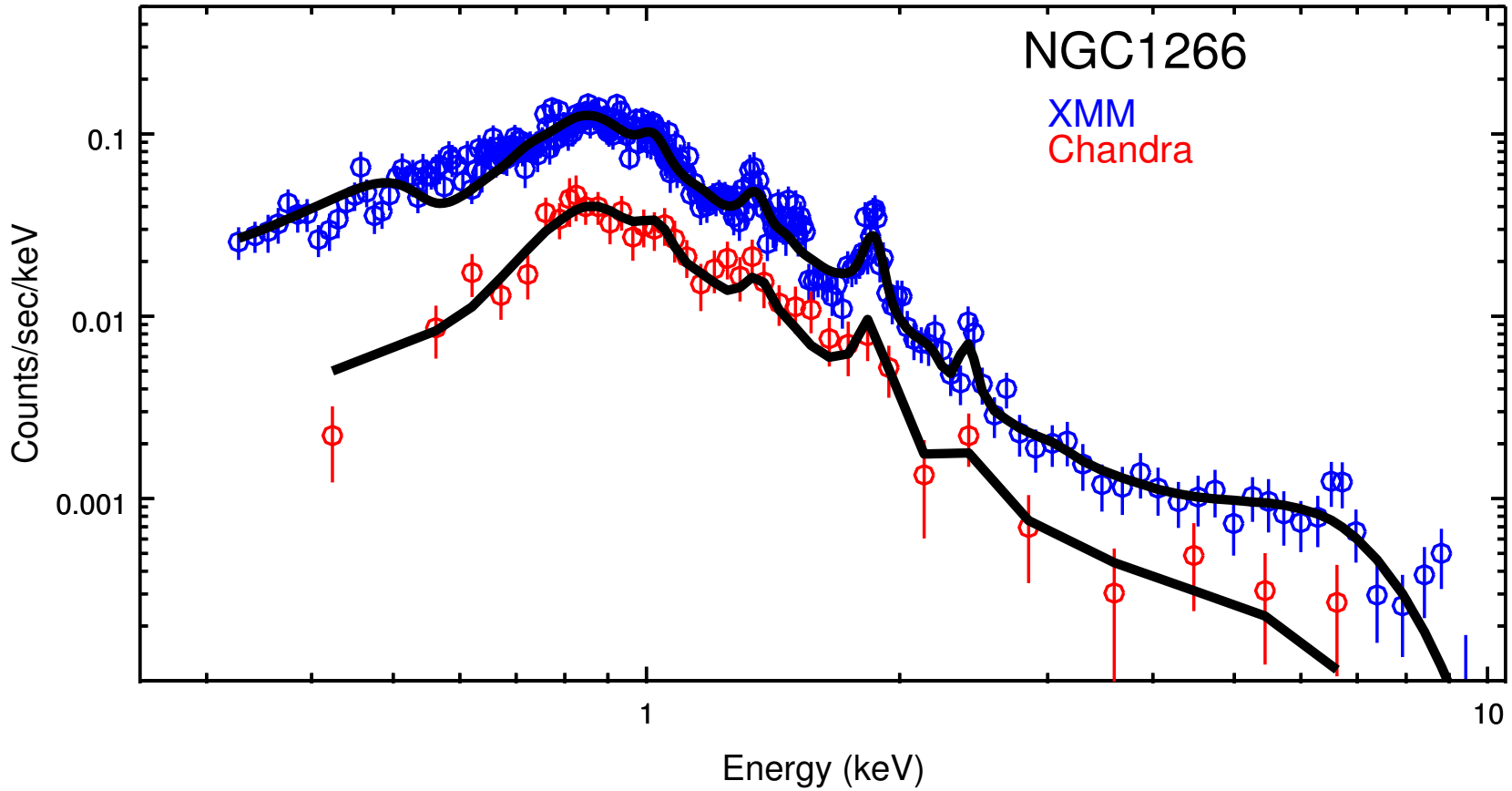


30 ks

Credit: ESA



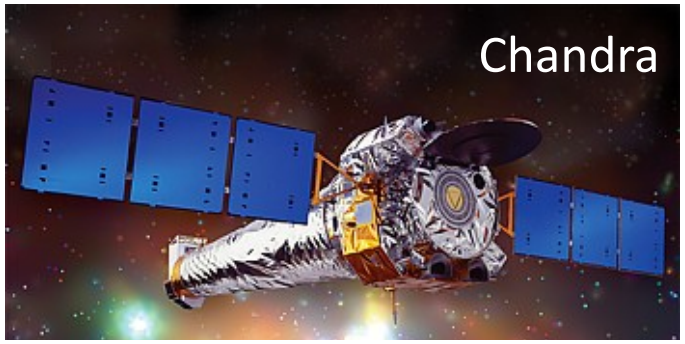
140 ks



Alatalo+15

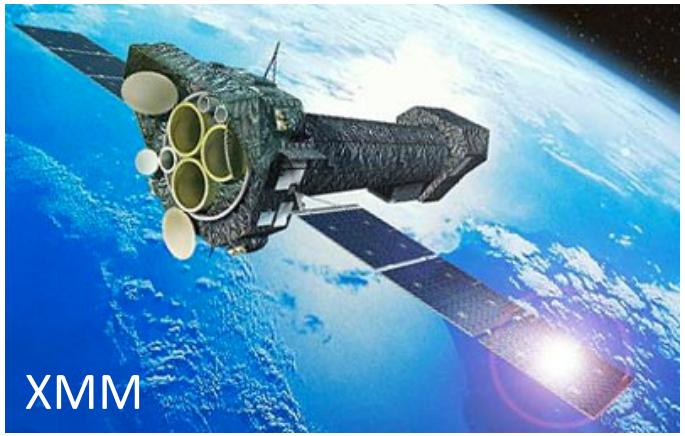
As of 2015: Chandra and XMM

Credit: NASA/CXC/NGST

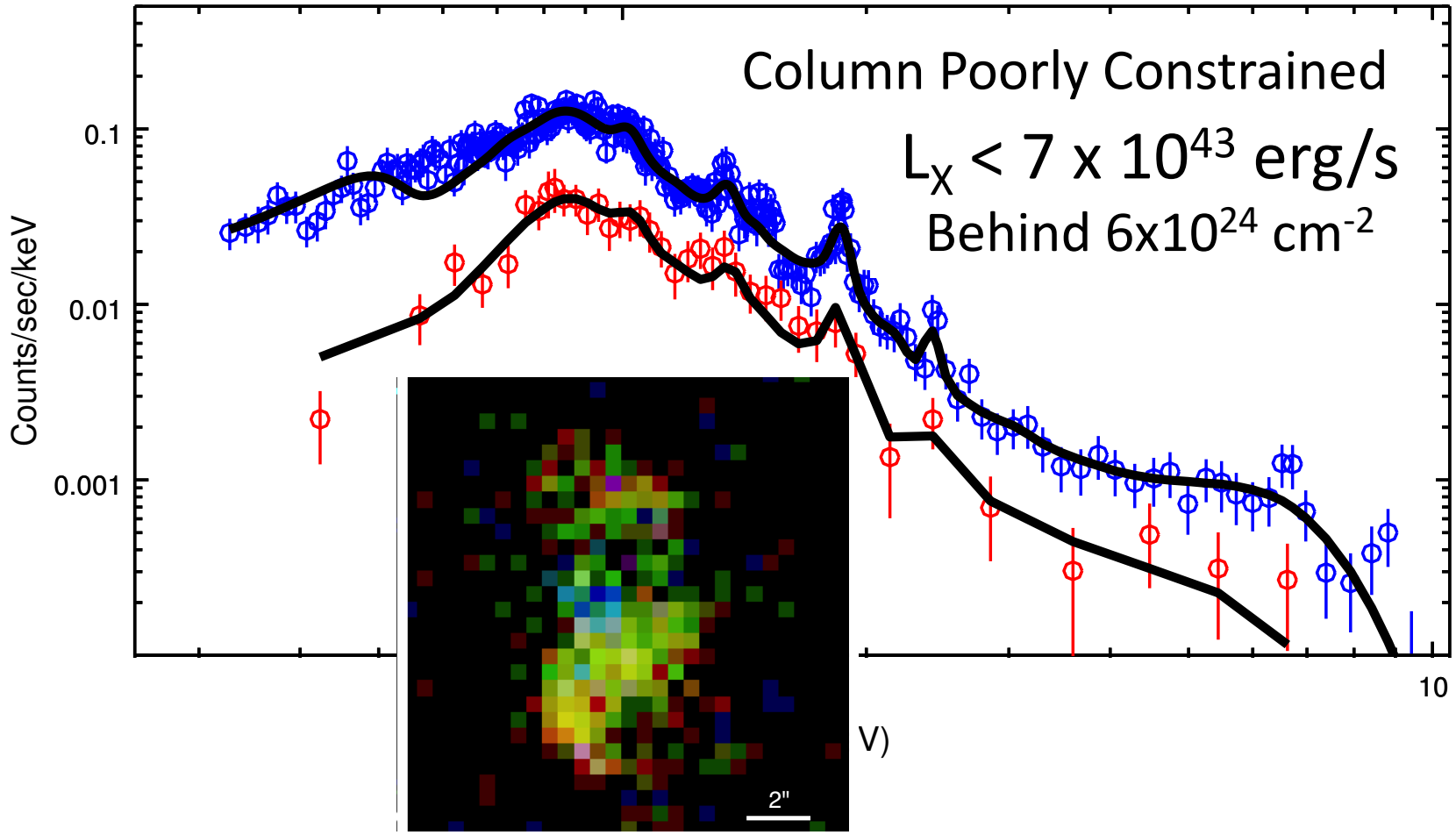


30 ks

Credit: ESA

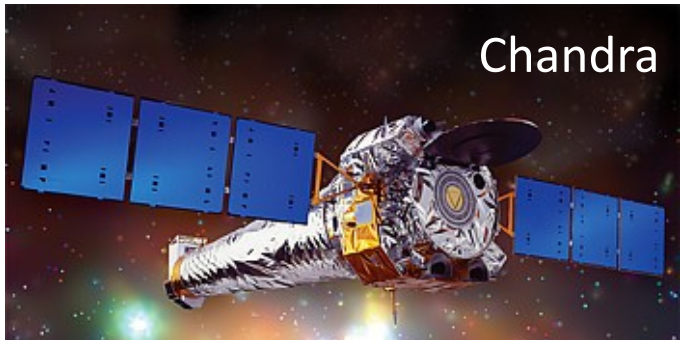


140 ks



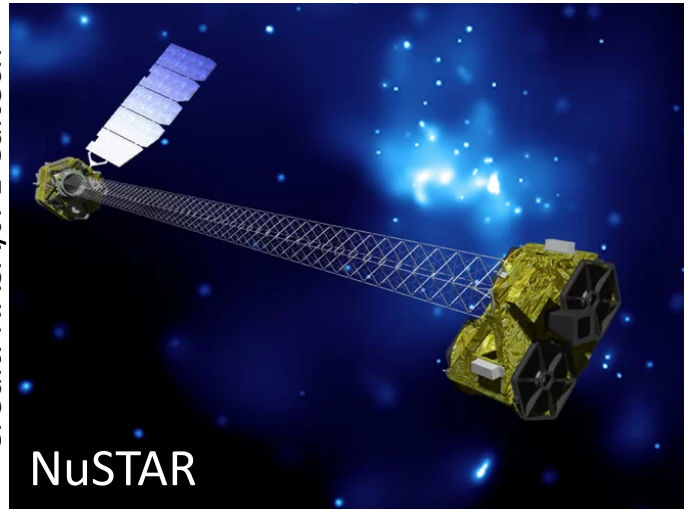
Alatalo+15

New Chandra and NuSTAR



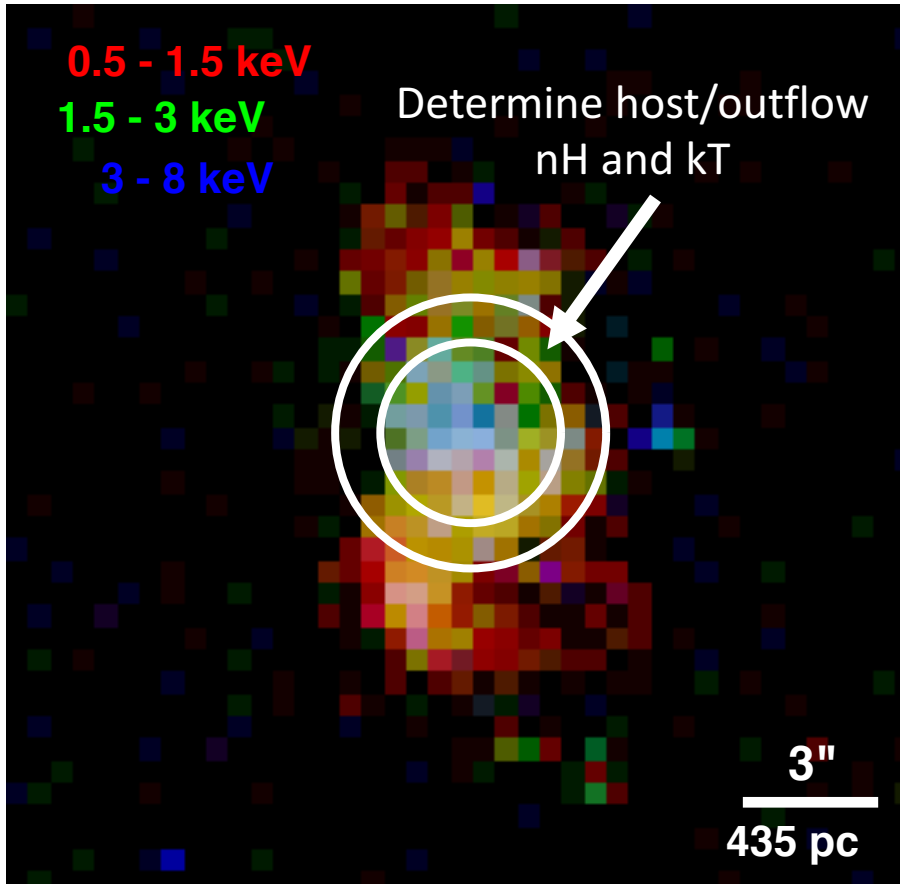
Credit: NASA/CXC/NGST

120 ks -> 150 ks (PI Alatalo)



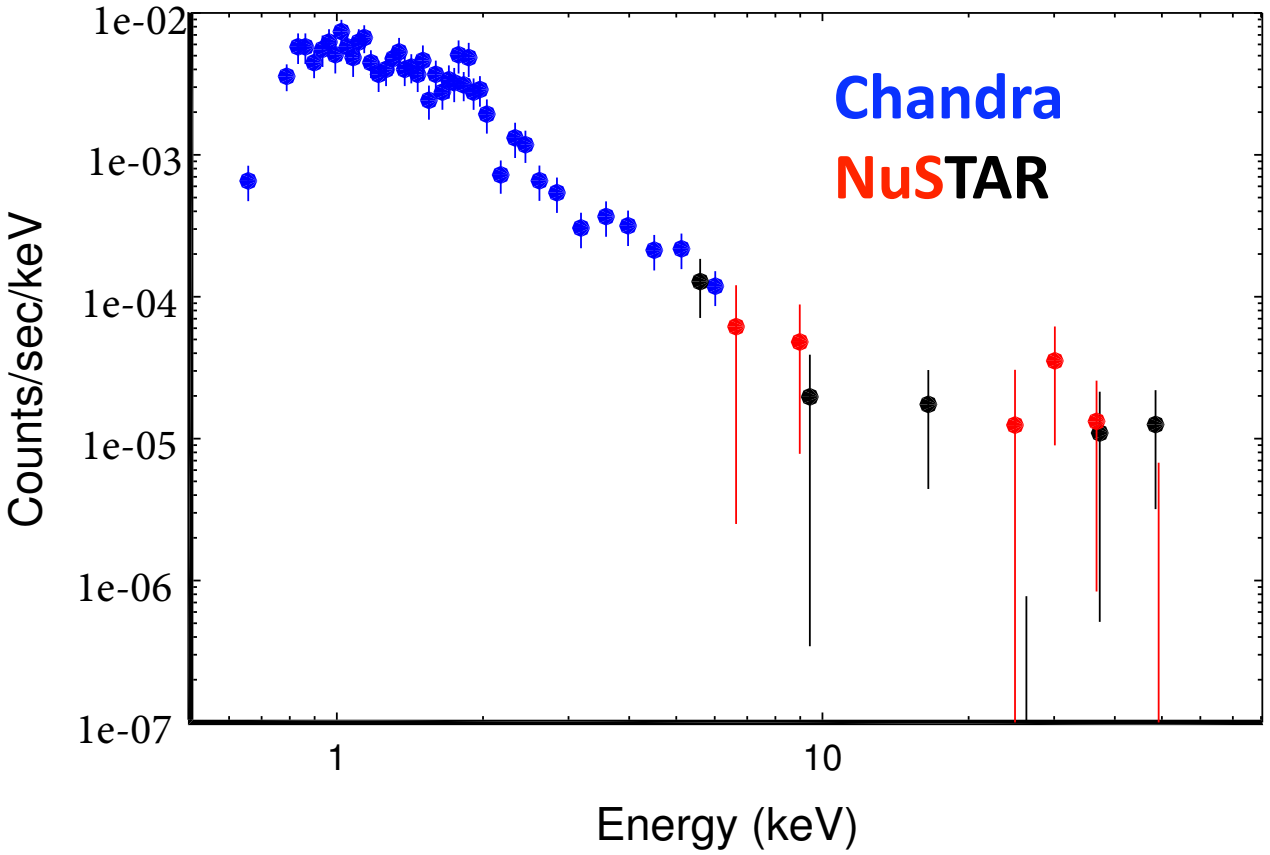
Credit: NASA/JPL-Caltech

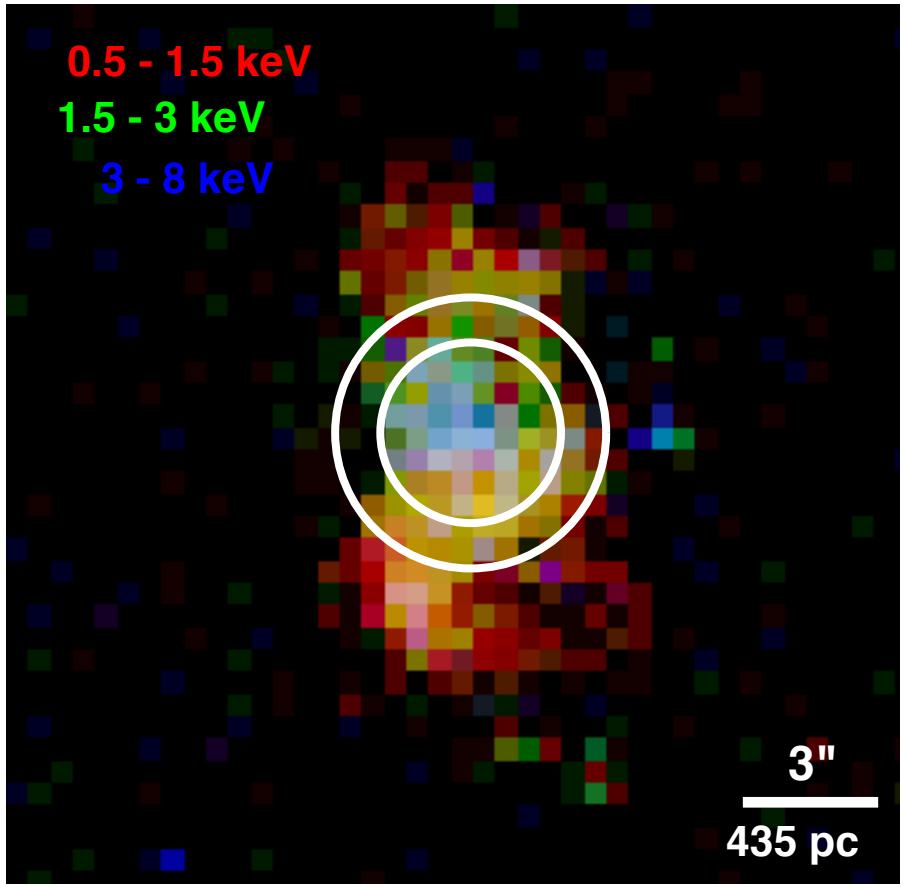
50 ks (PI Lanz)



Lanz et al. in prep.

New Chandra and NuSTAR





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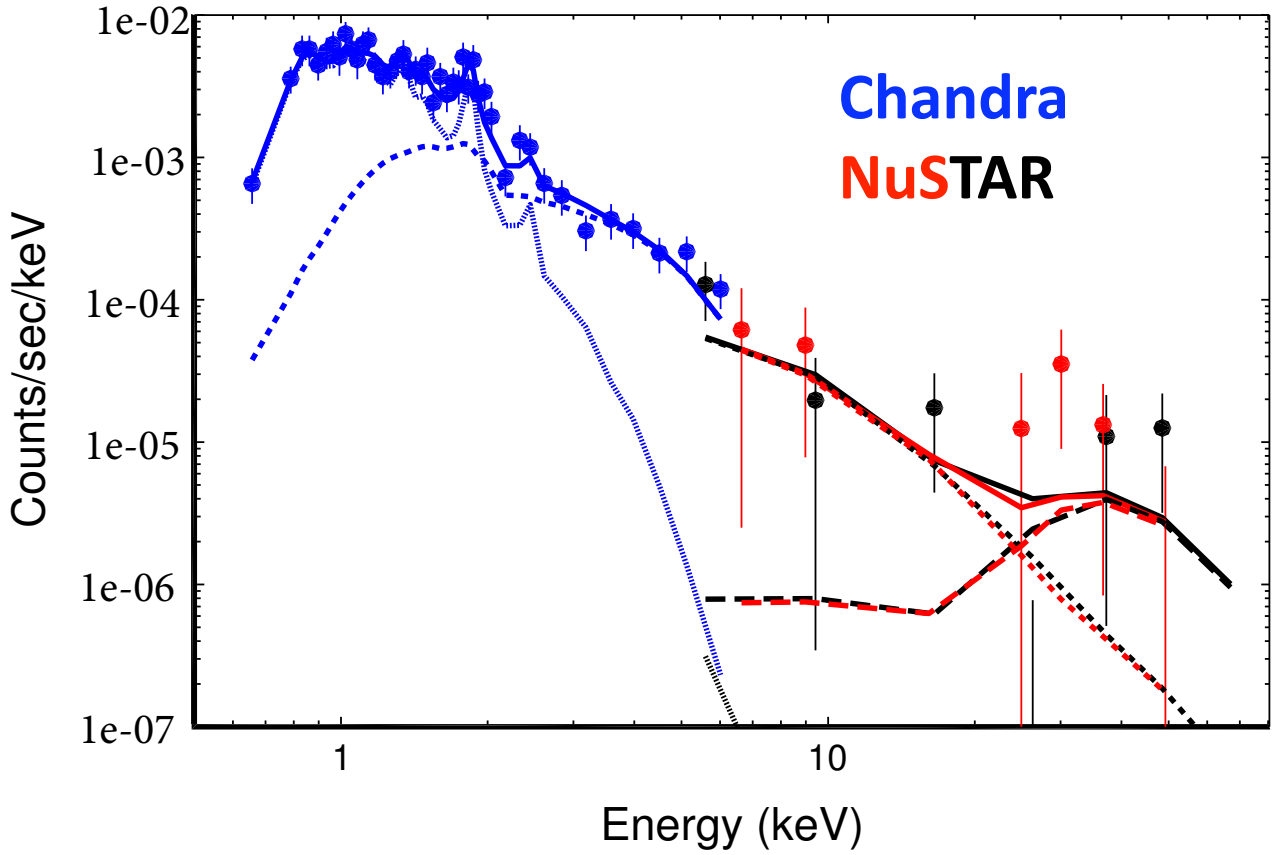
New Chandra and NuSTAR



MW Foreground

$$\mathrm{xsphabs.a1} * (\mathrm{xsphabs.a2} * \mathrm{powerlaw1d.p1} +$$

Transmitted PL (AGN): Γ = 1.8 behind 4.0 x 10^{25} cm^{-2}

$$\mathrm{xsphabs.a3} * (\mathrm{xsapec.th1} +$$

Thermal (Outflow): 0.61 keV behind 7.5 x 10^{21} cm^{-2}

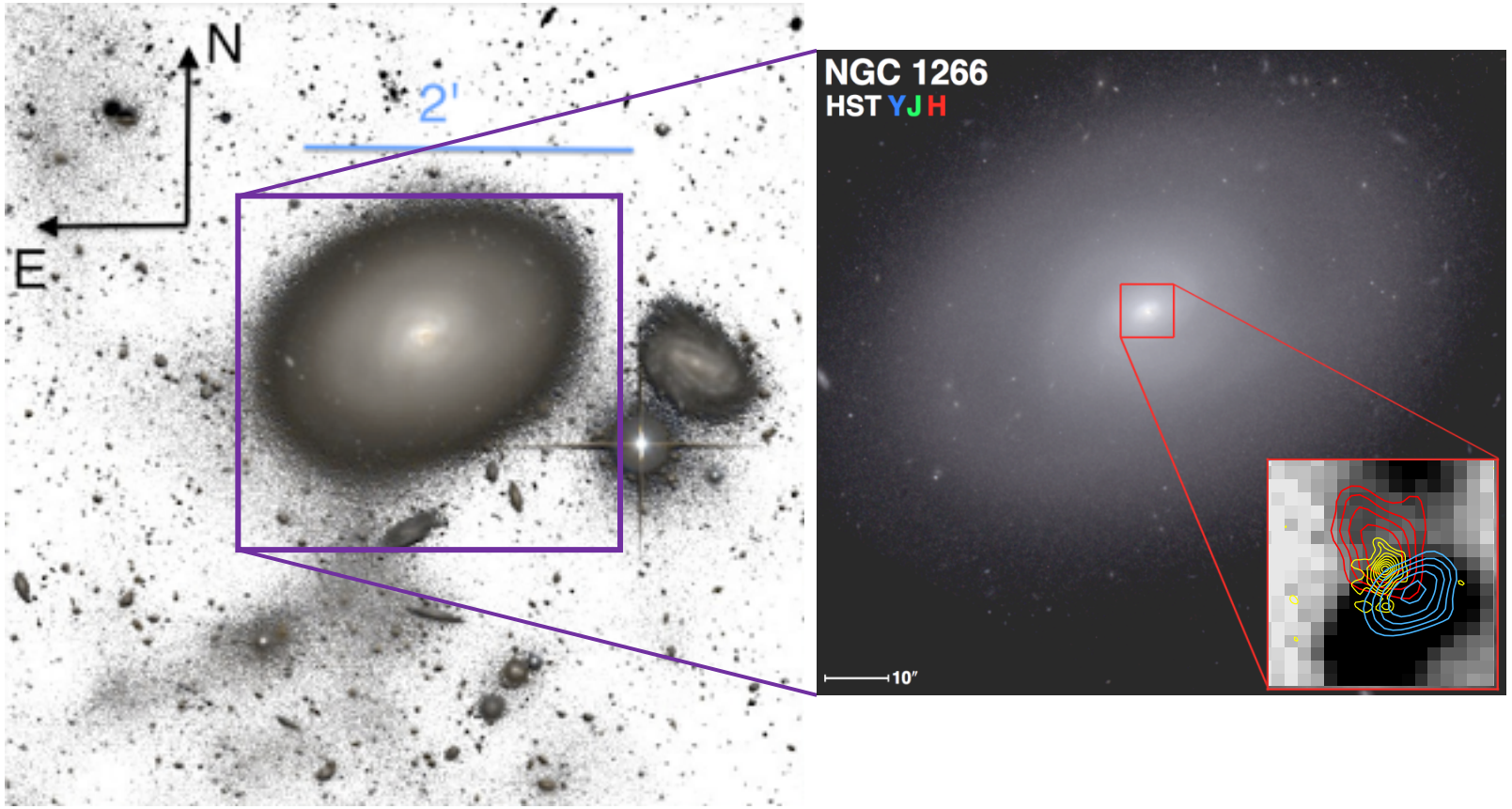
$$\mathrm{powlaw1d.p2} + \mathrm{xspexrav.px1}))$$

Scattered PL + Reflection (AGN): Γ = 1.8 (fixed)

2-10 keV Intrinsic Luminosity:
7.7 x 10^{40} erg s^{-1}

Lanz et al. in prep.

NGC1266



Outflow-driving
low-luminosity AGN
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Alatalo+11; Nyland+13; Duc+15

Implications for SF (Suppression) Distribution

AGN:

$L_{2\text{-}10\ keV} = 7.7 \times 10^{40}$ erg s^{-1}

$L_{bol} = (1.2 - 2.2) \times 10^{42}$ erg s^{-1}

$\approx 5\%$ nuclear lumin.

Compact Starburst:

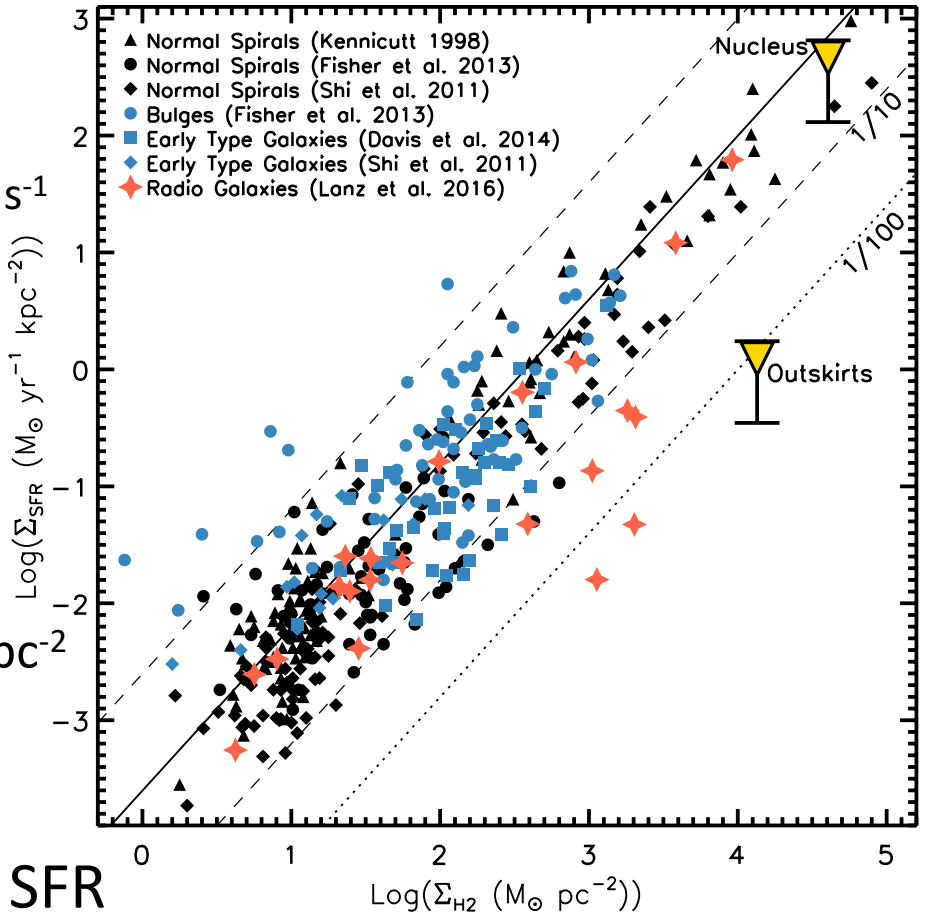
$L_{IR} \approx 8 \times 10^{9}\ L_{\odot}$

$\approx 60\%$ total L_{IR}

Lum. density $\approx 1 \times 10^{13}\ L_{\odot}$ kpc^{-2}

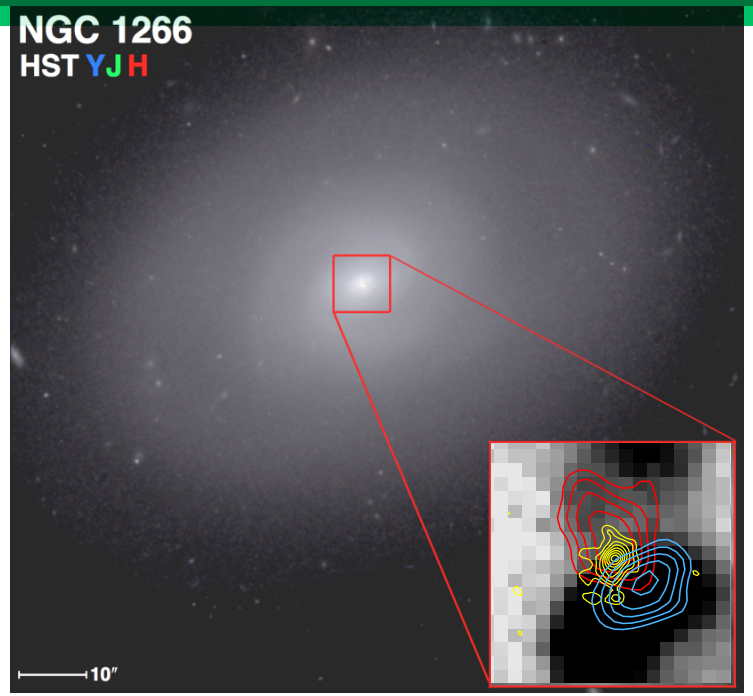
Surrounding Gas Disk:

98% of gas contains 40% SFR



Credit: NASA/K. L. Luhman/CfA

Alatalo+15; Lanz et al. in prep.



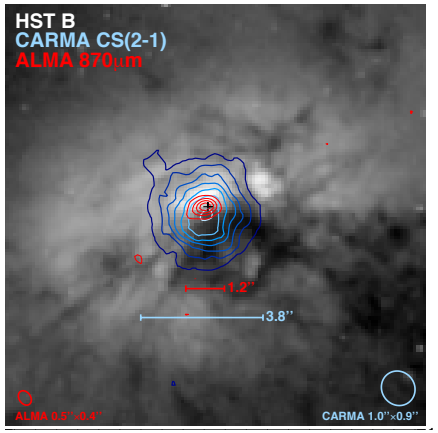
Summary

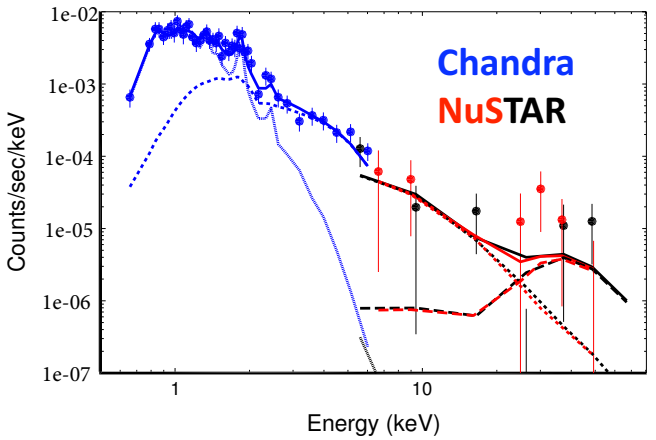
NGC1266:

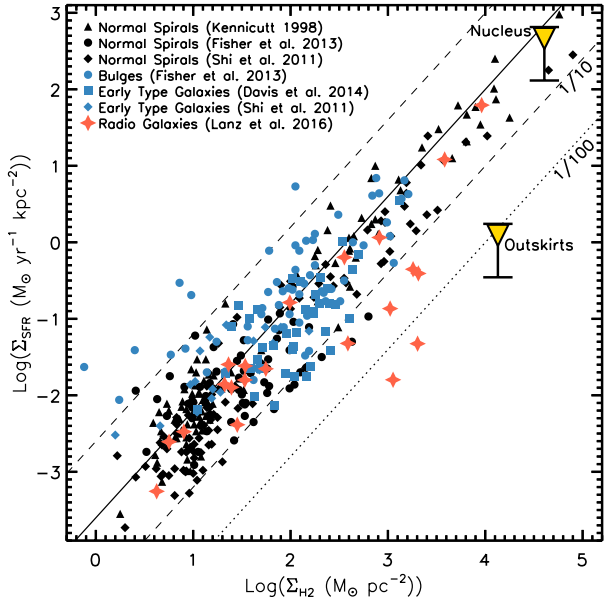
Outflow-driving
low-luminosity AGN

in

compact nuclear starburst
surrounded by
very infertile molecular disk







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