
KINEMATICS SIGNATURES OF GAS FUELING IN LOW LUMINOSITY AGN GALAXIES.

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AGN FUELING

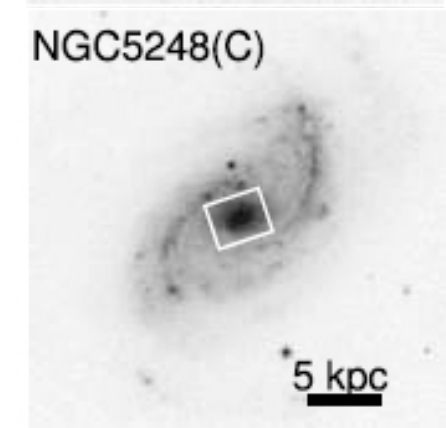
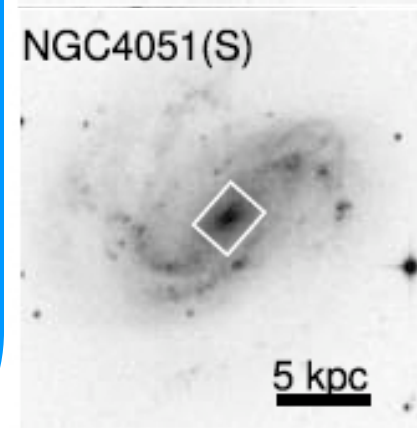
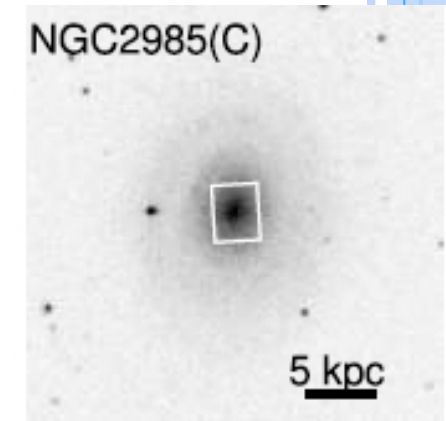
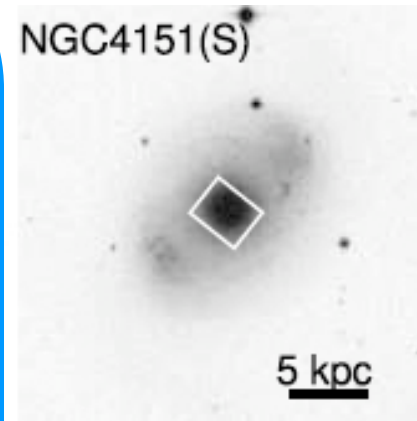
LOW LUMINOSITY AGN

- Low accretion rates: $\sim 10^{-2} M_{\odot}/\text{yr}$
 - Need small amount of gas
 - Small-scale accretion events (King & Pringle 07)
- Angular momentum problem
 - Presence of gas in the inner 100pc in Seyfert galaxies
 - Transport down to few 0.1pc = remove totally the angular momentum!
- Search for kinematic evidence of fuelling mechanisms
 - Inner kpc regions
 - Connection AGN/host galaxy => large scales

AGN FUELING

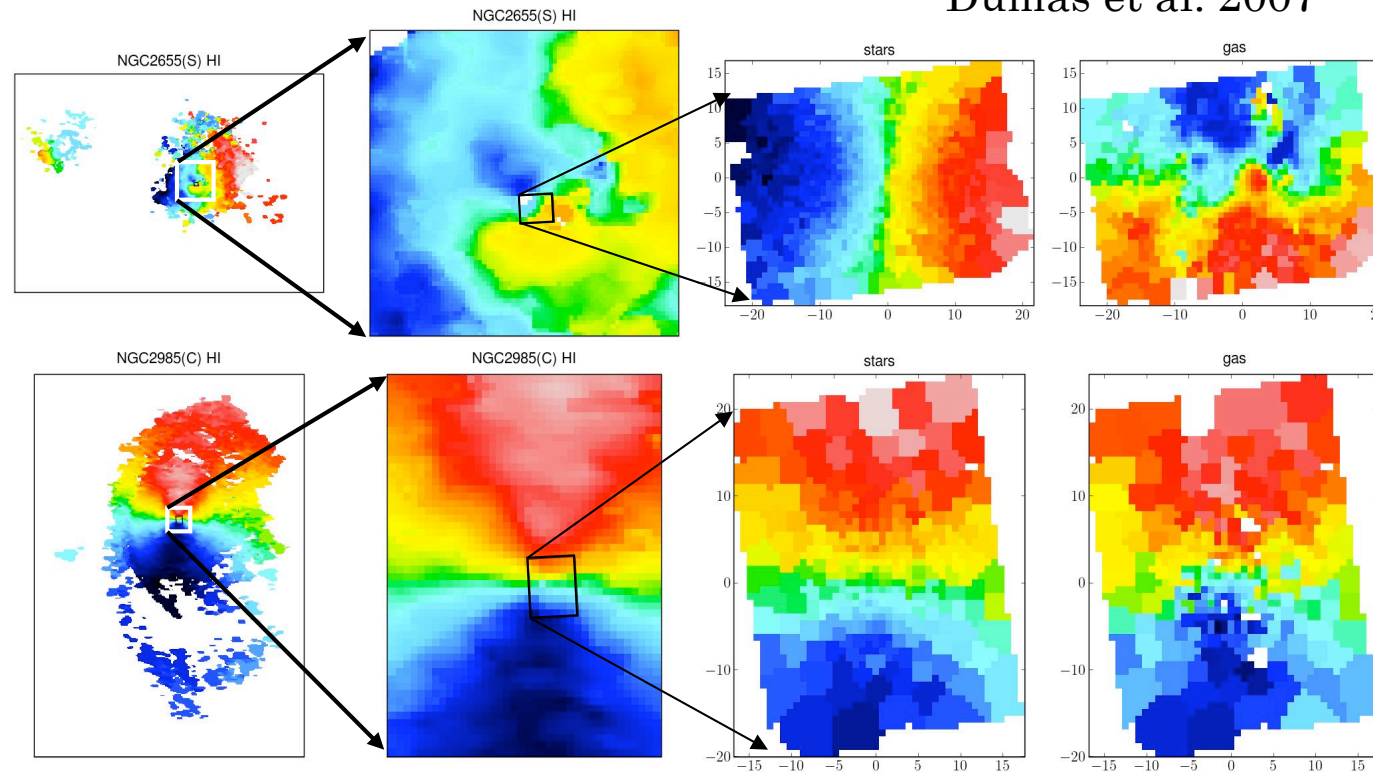
LOW LUMINOSITY AGN

- Morphology & dynamics
28 pairs Seyfert/non-active galaxies
matching large scales properties
- **VHIKINGS** (Mundell et al. 07)
VLA: HI (21cm)
Galactic disk + nearby environment
- **Sauron/Seyfert** (Dumas et al. 07)
Sauron: 3D spectroscopy
Ionized gas + stars
Central regions (< 1 kpc)



AGN FUELING KINEMATIC STUDY

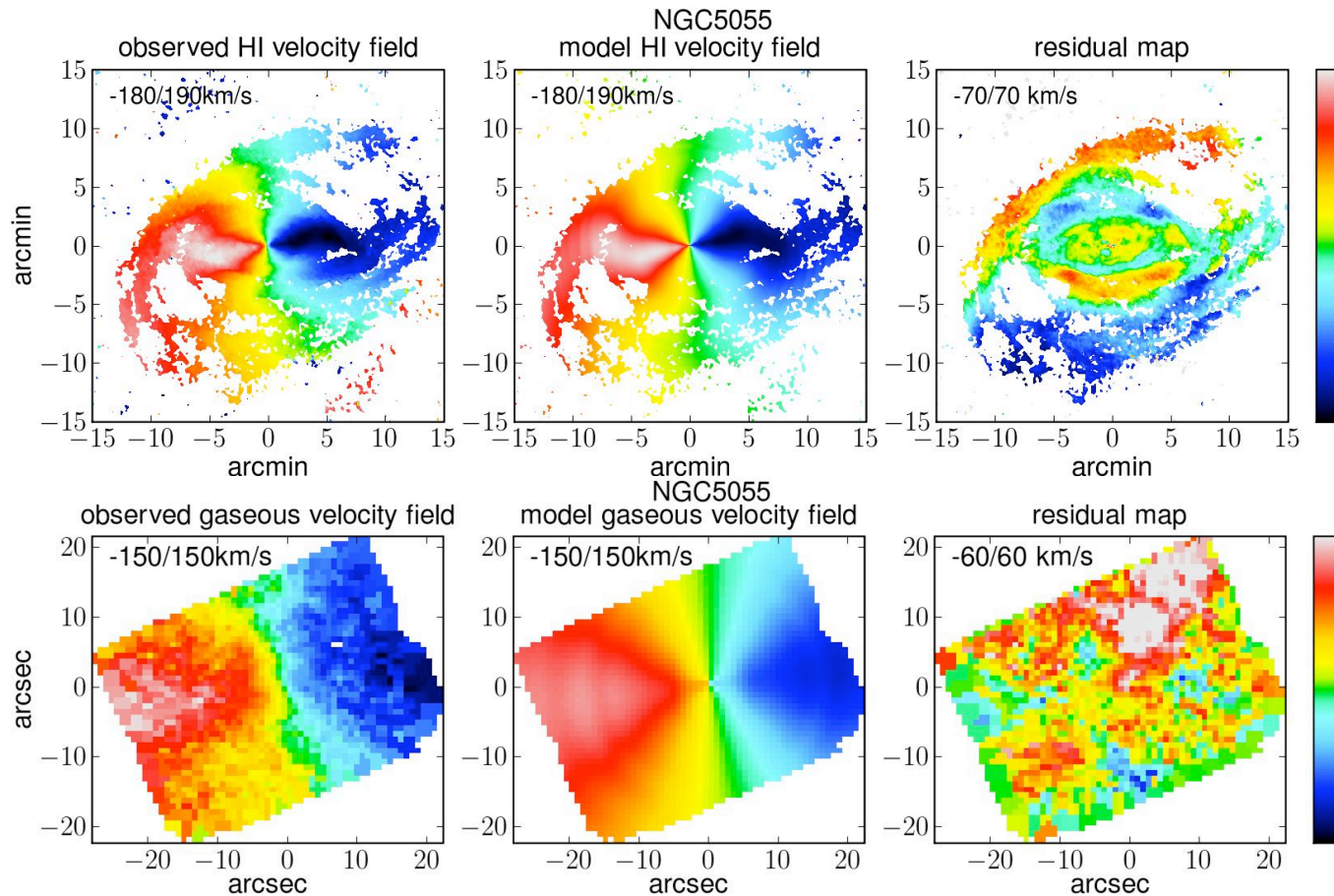
Dumas et al. 2007



- Central regions: gas vs stars, emission from AGN masked
- Kinematic misalignments: 50% Seyfert
- Gaseous kin. Perturbations: larger/more frequent in Seyfert

AGN FUELING KINEMATIC STUDY

Dumas et al. in prep.



- Non circular motions
- Large scale structures vs nuclear regions

AGN FUELING

HARMONIC ANALYSIS

from Schoenmakers et al. 1997, Wong et al. 2004

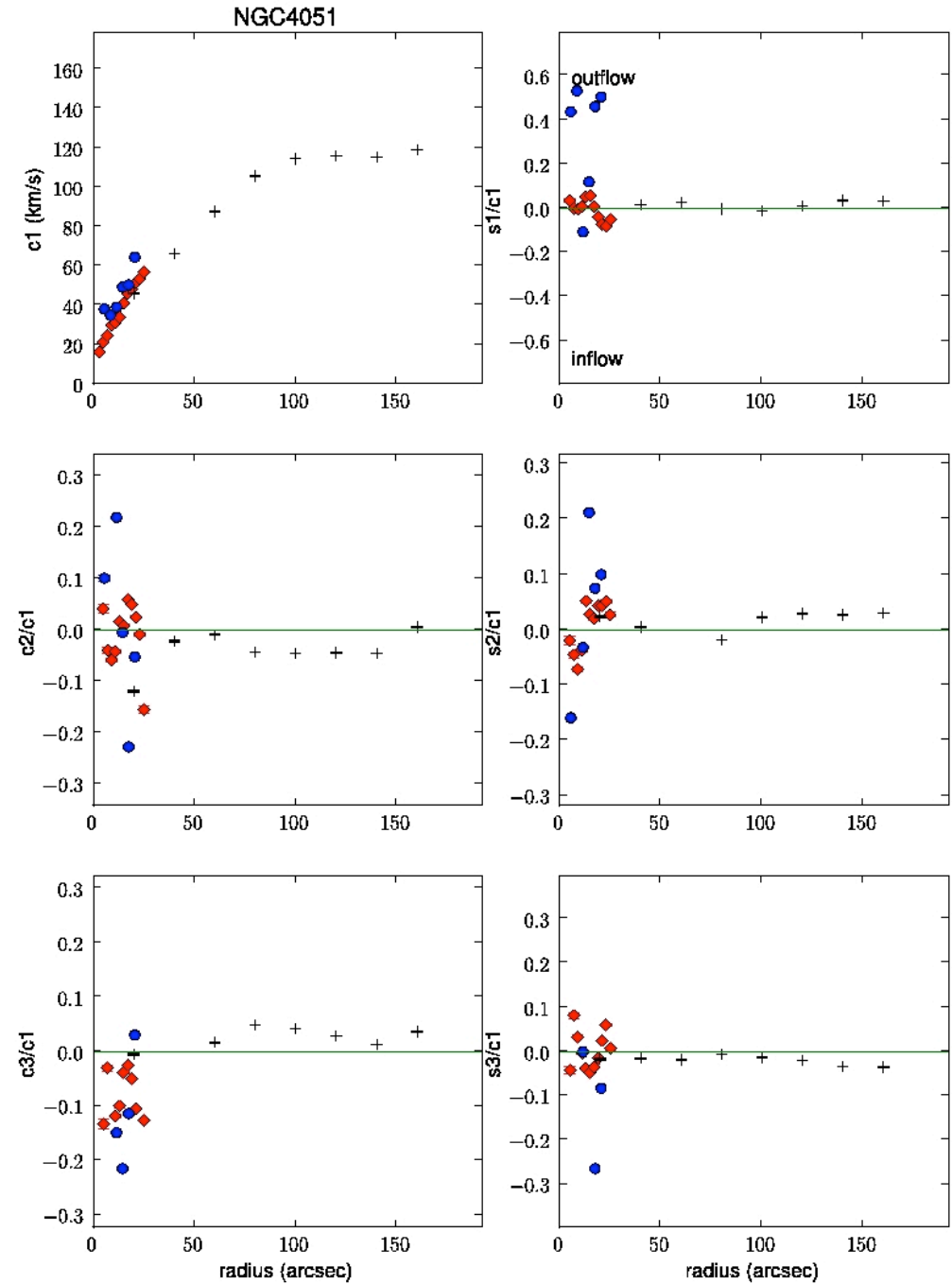
$$V_{LOS} = c_0 + \sum_{n=1}^k c_n(R) \cdot \cos(n\phi) + s_n(R) \cdot \sin(n\phi)$$

Interpret the non circular components

- Decomposition of the LOS velocity as Fourier series
- Fourier coefficient \Leftrightarrow non-circular terms
- Dynamical perturbations
 - Barred, oval potential
 - Radial streaming
 - Spiral streaming

AGN FUELING HARMONIC ANALYSIS

Non-circular motions
 \neq
 inflows/outflows



ALMA & ELTs PERSPECTIVE

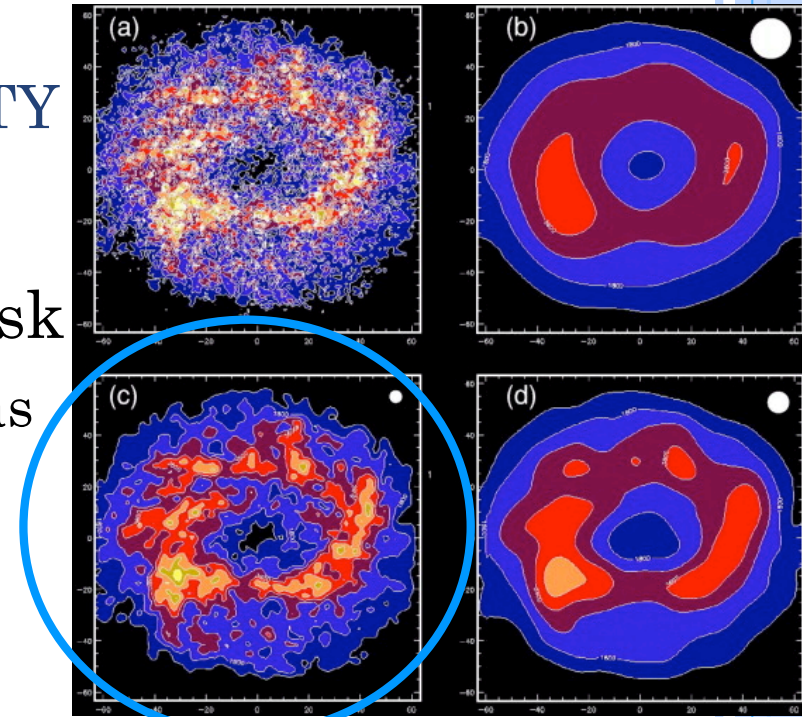
PC TO SUB-PC SCALES

NEED RESOLUTION & SENSITIVITY

ALMA

- Probe dusty torus and accretion disk
- Kinematics & morphology of molecular gas
- Different species: HCN, HCO+...
- Physics properties: T, density...
- Clumps resolution
 - ⇒ Constrains on models

Wada & Tomisaka 2005
NGC1068 torus



ALMA resolution

- Detection heavy obscured AGN
- BH sphere of influence => BH mass, probe of M_{BH}/σ relation at low masses end

ALMA & ELTs PERSPECTIVE

PC TO SUB-PC SCALES

NEED RESOLUTION & SENSITIVITY

ELTs

- Stellar components
 - ⇒ BH mass from kinematics: LLAGN, late type galaxies...
 - + ALMA: M_{BH}/σ relation at low masses
 - ⇒ Stellar populations: recent SF events, starburst vs AGN
- Gaseous components
 - ⇒ Probing turbulence, viscous torques
 - ⇒ Warm dust and gas → compare to the cold component (ALMA)

ALMA & ELTs PERSPECTIVE PC TO SUB-PC SCALES

ELTs

- IR and optical
- Stellar comp
 - ⇒ BH mass
 - + ALMA
 - ⇒ Stellar
 - ⇒ Probe influence

