

COLD MOLECULAR FILAMENTS AROUND THE COOLING FLOWS GALAXY NGC1275

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Abstract. Cold molecular gas has been found in several cooling flow clusters cores with single dish telescopes. We present here single dish observations of the NGC 1275 galaxy, at the center of the Perseus cluster. We have detected hints of large molecular gas filaments around the galaxy, with the multipixel camera HERA, through CO(2-1) emission lines. We have recently confirmed these detections with new 30m observations, showing that the cold gas follow the very peculiar H α filamentary structure around the central galaxy and is certainly tracing, in some part, accreted gas toward the central object.

1 Introduction

The giant galaxy NGC 1275 lies in the center of the X-ray brightest cluster of galaxies, at a redshift of 0.0183. This cluster harbors a strong cooling flow and has remained the only cooling flow cluster core revealed in CO for about 10 yrs. Cold molecular gas has been detected in the center of many cooling flow cluster cores and have been shown to be associated with H α filaments. Plateau de Bure maps (Salomé et Combes 2004) pointed out the possible cooling flow origin of this cold gas, in agreement with the intermittent cooling flow scenario where the AGN plays an important role to regulate the cooling of the hot intra-cluster medium gas.

2 Results

The CO(2-1) emission avoids radio lobes X-ray cavities and coincides with the large H α filaments around NGC 1275 towards the East and West of the galaxy. The molecular gas is not in rotation in the galaxy potential well. Velocities agree with H α alpha and excited H2 velocities computed by Hatch et al., 2005, 2005b.

Region	T(2-1)/T(1-0)	W(2-1)/W(1-0)	M _{gas} (10 ⁸ M _⊙)
Off 1	3.6	3.3	1.1
Off 1 ring	1.0	1.3	1.1
Off 2	3.8	1.9	1.1
Pos 2	1.8	1.5	0.7
Pos 11	0.7	-	0.9
East	1.0	0.8	8.3
Off 3	0.6	0.8	4.9

Table 1. Emission lines ratios for the different regions observed. CO(2-1) intensities have been computed with both HERA data and the new 30m observations before to be convolved by the beam size at 3mm. Molecular gas masses have been computed, using a standard I_{co}/N(H₂) conversion ratio. The total mass found with HERA is 4.10¹⁰M_⊙.

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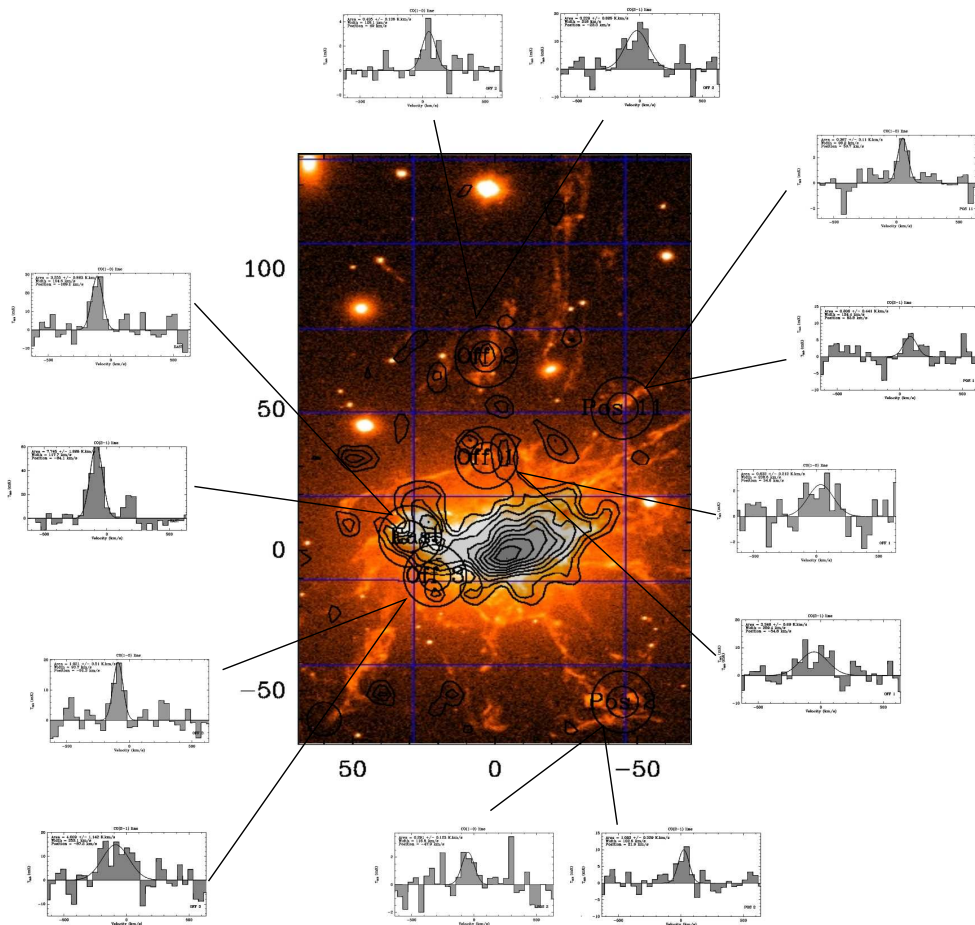


Fig. 1. $H\alpha$ filamentary structure observed around NGC1275 by Conselice et al., (2001). Overlaid in contours is the CO(2-1) emission line map obtained by Salomé et al. (2006) with HERA (HEterodyne Receiver Array, Schuster et al. 2004) installed on the IRAM 30m telescope. We have re-observed selected regions (identified on the image) through CO(1-0) and CO(2-1) emission lines with standard receivers on the 30m telescope. The spectra obtained for those regions are shown here, with the results of a gaussian fit at each frequency.

References

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