

Bent-Double Radio Sources as Probes of the Intragroup Medium

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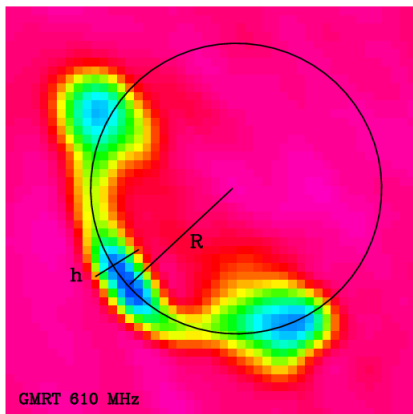
May 21, 2007 / Extragalactic Jets

Introduction

Most galaxies in the universe belong to groups (Tully 1987).

- 3 – 50 members
- $10^{12} - 10^{14} M_{\odot}$
- velocity dispersions of $30 - 500 \text{ km sec}^{-1}$
- typical size $\sim 1 \text{ Mpc}$
- uncertain baryon content
 - UV absorption lines
 - X-ray observations

Bent-Double Radio Sources



Jets swept back by ram pressure from the motion of host galaxy through the intragroup medium (IGM). Euler's equation,

$$\frac{\rho_{\text{IGM}} v_{\text{gal}}^2}{h} = \frac{w \Gamma^2 \beta^2}{R}$$

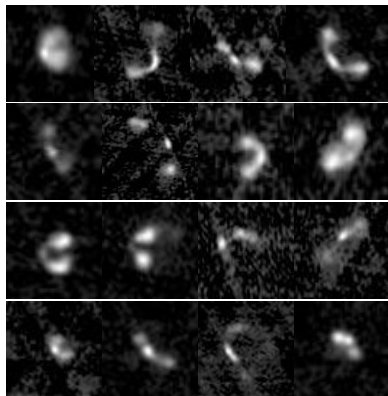
$$v_{\text{gal}} = \sigma_v$$

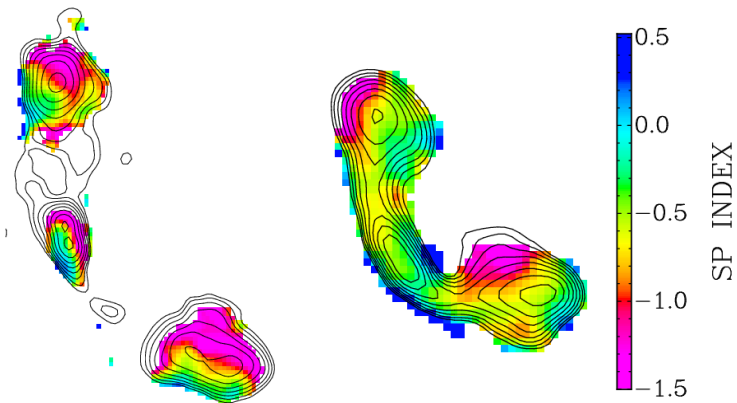
$$w = 4P_{\text{min}} + \rho_{\text{jet}} c^2$$

$$\beta = 0.5$$

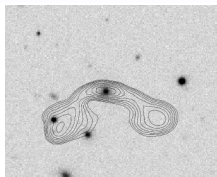
Observations

- Sample of bent-double sources from the FIRST VLA survey (1420 MHz)
 - large sample culled to ~ 16 with $0.04 < z < 0.4$
- GMRT 610 MHz observations
 - spectral index
 - jet characteristics
- WIYN Multi-Object Spectroscopy
 - membership
 - group velocity dispersion
- X-ray Observations



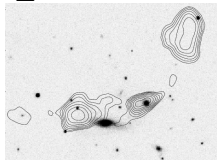


Early Results



$$z = 0.23$$

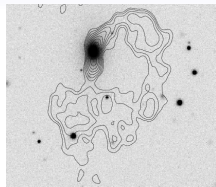
$$n \geq 2 \times 10^{-4} \text{ cm}^{-3}$$



$$z = 0.24$$

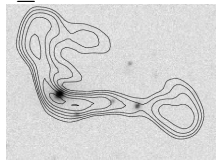
$$n \geq 3 \times 10^{-5} \text{ cm}^{-3}$$

- $v_{\text{gal}} = 500 \text{ km sec}^{-1}$



$$z = 0.04$$

$$n \geq 3 \times 10^{-4} \text{ cm}^{-3}$$



$$z = 0.19$$

$$n \geq 2 \times 10^{-4} \text{ cm}^{-3}$$