Astrophysical Phenomena Revealed by Space VLBI
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VSOP Observations of Bright, Compact Southern Hemisphere AGN

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Abstract

Observations of 11 of 23 Southern Hemisphere AGN are presented from three separate VSOP projects: comparisons of EGRET-identified and γ-ray quiet AGN, investigations of the high resolution structure in low redshift AGN, and comparisons of radio and X-ray structure in AGN jets. The observations have used HALCA in conjunction with Southern Hemisphere antennas and the VLBA, where appropriate.

1 Introduction

We list core model components for each source observed and calculate corresponding brightness temperatures in the co-moving frames of the sources. For a small number of sources we have derived errors on the brightness temperature estimates. Table 1 contains a list of the sources proposed/observed.

2 Results

Data from the Socorro, Penticton, and Mitaka correlators were reduced in standard fashion in AIPS. Images and model-fits were made in Difmap

(Shepherd et al. 1994). Error analyses, where completed, were made using the Difwrap software (Lovell, these proceedings).

Table 1: The source list from the three proposals: *Column 1*, Source name. *Column 2*, Alternate name. *Column 3*, Source type. *Column 4*, Have the data been imaged?

Name	Alt.	Type	Image
PKS 0208−512		EGRET-identified AGN	YES
PKS 0438−436		γ-ray quiet AGN	YES
PKS 0518−458	Pic A	low z FR-II radio galaxy	NO
PKS 0521−365		low z BL Lac	NO
PKS 0537−441		EGRET-identified AGN	YES
PKS 0637−752		γ-ray quiet AGN/X-ray jet	YES
PKS 1104−445		γ-ray quiet AGN	YES
PKS 1127−145		EGRET-identified AGN?	YES
PKS 1322−427	Cen A	low z FR-I radio galaxy	NO
PKS 1424−418		EGRET-identified AGN	NO
PKS 1514−241	AP Lib	low z BL Lac	NO
PKS 1610−771		γ-ray quiet AGN	YES
PKS 1622−253		EGRET-identified AGN	NO
PKS 1622−297		EGRET-identified AGN	NO
PKS 1718−649	NGC 6328	low z GPS source	YES
PKS 1730−130	NRAO 530	EGRET-identified AGN	NO
PKS 1908−201		EGRET-identified AGN	NO
PKS 2052−474		EGRET-identified AGN	NO
PKS 2106−413		γ-ray quiet AGN	NO
PKS 2152−699		low z FR-II radio galaxy	YES
PKS 2204−540		γ-ray quiet AGN	NO
PKS 2255−282		EGRET-identified AGN	YES
PKS 2355−534		γ-ray quiet AGN	YES

The brightness temperature results tabulated below in Table 2 have been derived using Gaussian model components. In general we cannot distinguish between Gaussian, optically thin or optically thick sphere models. The Gaussian, as the most centrally concentrated surface brightness profile of the three, yields the highest estimated brightness temperatures. Brightness temperatures corresponding to optically thin spheres are a factor of 1.5 less than for Gaussians and corresponding to optically

thick spheres are a factor of 1.8 less.

Source	S	R	θ°	a	b/a	ϕ°	$T_{b-co,G}$
PKS 0208−512	0.4±0.1	1.0	90	$0.4\pm^{0.2}_{0.3}$	$0.5\pm^{0.1}_{0.4}$	50	$0.6\pm^{50.0}_{0.4}$
PKS 0438−436	0.94	0.0	0	0.3	0.6	−42	3.5
PKS 0537−441	$0.7\pm^{0.1}_{0.2}$	1.0	180	0.3±0.1	$0.8\pm^{0.2}_{0.3}$	−67	$0.9\pm^{3.0}_{0.6}$
PKS 0637−752	$0.9\pm^{0.5}_{0.1}$	0.5	90	$0.6\pm^{0.3}_{0.1}$	0.3±0.1	73	$0.7\pm^{1.6}_{0.5}$
PKS 1104−445	0.7	0.0	0.0	0.4	0.8	−67	0.8
PKS 1127−145	0.9	3.7	−99	0.4	0.5	73	1.1
PKS 1610−771	na	na	na	na	na	na	na
PKS 1718−649	0.9	0.0	0.0	1.0	0.4	−62	0.1
	0.8	6.7	135	1.3	0.4	−49	0.06
PKS 2152−699	0.2	0.0	0.0	0.9	0.2	42	0.06
PKS 2255−282	2.7	0.0	0.0	0.3	0.4	27	7.1
PKS 2355−534	0.2	0.0	0.0	0.3	0.0	49	na

Table 2: Best fit core quantities for the VSOP data: *Column 1*, Source name. *Columns 2 to 7*, The best fit parameters derived for the component, as described in Difmap. *Column 8*, $T_{b-co,G}$, the source frame brightness temperature of the component, in units of 10^{12} K. Note: na denotes that the quantity could not be measured.

3 ATCA Lightcurves

The Australia Telescope Compact Array (ATCA) was used at 1.4, 2.3, 4.9, and 8.6 GHz to monitor 206/221 VSOP survey sources below a declination of $+10^\circ$, including most of the sources listed above that have been observed using VSOP GOT.

4 Conclusions

We have successfully used the Southern Hemisphere VLBI array, in conjunction with HALCA, and occasionally the VLBA, to produce the highest resolution images of these Southern Hemisphere compact radio sources to date.

Sources of several different classifications have been detected and imaged, including core dominated BL Lac objects and quasars, but also low brightness temperature sources such as radio galaxies and GHz-Peaked-Spectrum objects. The core-dominated sources have signific-

antly higher brightness temperatures than the radio galaxy and the GPS source but there is no evidence that γ-ray AGN have higher brightness temperatures than γ-ray quiet AGN, as some people expect from the suggestion that the γ-ray AGN may be more highly beamed than the γ-ray quiet AGN. However, a full error analysis of all sources needs to be undertaken before this conclusion can be quantified further.

The three most variable sources at 5 GHz are γ-ray AGN. Results for more sources are required to confirm this.

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References

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