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Results from Space-VLBI Pre-Launch Surveys: H_2O Masers

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Abstract. We report on the first results of our ground-survey of H_2O masers to establish a list of suitable candidates for space-VLBI observations. Due to the large VSOP/HALCA baselines and its limited sensitivity only very strong and compact sources will be detected. The best candidates from this survey will be part of *The VSOP Survey* which intends to observe a large number of continuum and maser sources. This systematic and uniform survey, of a large number of sources, will be invaluable in determining the properties of the sub-milliarcsecond emission from maser sources.

1. Introduction

Between June and October 1996 we observed about 60 maser sources: 4 late-type stars, 27 star forming regions and 26 H II regions, with the VLBA. For about 30% of the sources this are the first interferometric observations of any kind. We only report on the June data here. The June data were observed with a 8 MHz BW and processed with 512 channels hence a spectral resolution of 15.6 KHz (0.21 km s^{-1}). The scans were 5 minutes long per source providing a sensitivity of 100 mJy $beam^{-1}$ and an angular resolution of 0.31 mas. The H_2O maser sources were mostly selected from published surveys by Brand et al. (1994) (and references therein) and Forster & Caswell (1989) with the following criteria: (1) low-mass protostars: sources with far-infrared luminosity less than 300 $L_\odot$, outflow sources or molecular cores with H_2O maser emission with a peak-flux greater than 15 Jy, (2) massive star forming regions: sources with far-infrared luminosity greater than 10000 $L_\odot$ and H_2O masers with a peak-flux greater than 120 Jy, and (3) evolved stars: H_2O masers with a peak-flux greater than 35 Jy.

The results of the June observations are summarized on Table 1. The table shows the IRAS and common names, the systematic velocity with respect to the local standard of rest and the correlated flux of the strongest spectral feature at 50 and 600 Mλ. Five of the sources were not detected but twelve sources meet the detection criteria for VSOP/HALCA ($\mathcal{S}_\nu \geq 12$ Jy). From these most exhibit only one component in the spectrum, and the fringe maps consist of one point less than 2 mas in extent, three sources show component separations of up to 10 arcseconds and the remaining sources reveal clumpy formations of a few milliarcseconds in size.

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This space-VLBI pre-launch survey for OH and H_2O masers is an ongoing project. The sources will be monitored during the life-span of the VSOP/HALCA mission to provide ground-baseline information for SVLBI observations, to study variability and possibly proper motions. It will also allow the study of their "global" high-spatial resolution properties and the statistical significance of any trends to be assessed.

Table 1. Summary of results for H_2O Masers

10.7 IRAS Name	Other Name	RA (1950.0) (h m s)	DEC (1950.0) (° ″ ′)	Radial Velocity ($km\ s^{-1}$)	Correlated[1] Amplitude (Jy) 50Mλ	600Mλ
00420+5530		00 42 05.3	+55 30 54.0	−45.8	0.5	–
02232+6138	W3−OH	02 23 17.3	+61 38 58.0	−48.8	5500	15*
03225+3034	L1448	03 22 30.8	+30 34 59.0	+2.7	–	–
05302−0537	OrionKL	05 32 47.0	−05 24 23.2	+7.5	1500	40*
06300+6058	IRC+60169	06 30 00.6	+60 58 49.9	−38.0	9	1
06579−0432	S287A	06 57 54.5	−04 32 22.0	+31.0	–	–
10580−1803	R CRT	10 58 06.0	−18 03 21.0	+3.7	60	16*
	NGC 6334(N)	17 17 32.3	−35 44 22.0	−10.0	300	40
	M16A	18 15 19.4	−13 46 30.0	−64.1	900	25
	W43S	18 43 24.6	−02 42 48.0	+96.7	50	5
	G34.26+0.15	18 50 46.3	+01 11 14.6	+56.0	110	58
	G40.50+2.54	18 53 47.0	+07 49 26.0	+31.7	18	5
	G35.20−0.74	18 55 41.0	+01 36 31.2	+36.6	22	6
	G35.20−1.74	18 59 13.1	+01 09 11.8	+32.1	15	6
	G45.47+0.13	19 11 46.2	+11 07 02.8	+62.6	–	–
20255+3712	S106FIR	20 25 32.5	+37 12 50.9	0.0	8	–
21007+4951	L998A	21 00 44.9	+49 51 13.0	+4.0	–	–
21144+5430		21 14 24.1	+54 30 57.0	−88.2	550	25
21246+5743	IC 1396(W)	21 24 38.7	+57 43 14.0	−11.0	–	–
21306+5540	09753+0319	21 30 37.0	+55 40 36.0	−70.8	3500	25
21381+5000	GL2789	21 38 10.6	+50 00 42.7	−46.1	48	26
21391+5802	IC 1396(N)	21 39 10.3	+58 02 29.0	−5.0	125	56
21418+6552	LKHα234	21 41 59.0	+65 52 48.0	−7.8	60	30
22142+5206		22 14 14.5	+52 06 32.9	−20.5	8	4
22198+6336	L1204A	22 19 50.7	+63 36 36.0	−22.0	32	–
23116+6111	S158	23 11 36.0	+61 11 49.0	−60.0	40	8
23139+5939	11126−0077	23 13 58.3	+59 39 06.0	−55.5	160	16

Notes: 1 flux measured from strongest spectral component (50 Mλ resolution is similar to VSOP/HALCA's orbit at perigee); * maximum baseline-length of 300 Mλ.

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References

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