

Contents

Preface	xiii
Participants	xiv
Conference Photograph	xix
Part 1. Star Formation	
<i>Star formation: relationship between the maser species</i>	1
J. L. Caswell	
<i>Dust, HII and molecules toward OH and H₂O masers</i>	14
J. R. Forster	
<i>The relationship between masers and massive star formation: what can be learned from the infrared?</i>	18
J.M. De Buizer	
<i>Imaging of 2-mm dust continuum emission towards S106 FIR and its spectral energy distribution</i>	22
R. S. Furuya, Y. Kitamura, A. Wootten, M.J. Claussen and R. Kawabe	
<i>Water masers and the near-stellar environment in YSOs</i>	27
M.J. Claussen	
<i>Multi-epoch water maser survey towards low-mass YSOs</i>	35
R.S. Furuya, Y. Kitamura, A. Wootten, M.J. Claussen and R. Kawabe	
<i>Observations of water maser sources at Arcetri</i>	39
G. Comoretto, R. Valdettaro, F. Palla, J. Brand, R. Cesaroni, M. Felli, E. Natale, F. Palagi, D. Panella and G. Tofani	
<i>Time variations of water masers</i>	43
T. Liljeström and C.R. Gwinn	
<i>Long-term variability of H₂O masers in YSOs</i>	51
R. Valdettaro, F. Palla, J. Brand, R. Cesaroni, G. Comoretto, M. Felli and F. Palagi	

<i>First detection of vibrationally excited water masers toward embedded young stellar objects</i>	55
T. Liljeström, A. Winnberg and R. Booth	
<i>VLA observations of H₂O maser emission associated with SVS 13</i>	59
L.F. Rodríguez, G. Anglada, J.M. Torrelles, J.E. Mendoza-Torres, A.D. Haschick and P.T.P. Ho	
<i>Preliminary observations of water masers associated with IRAS4A and IRAS4B</i>	63
K. Marvel, M. Claussen and A. Wootten	
<i>Observations of H₂O maser and continuum emission in AFGL 2591</i>	68
M.A. Trinidad, S. Curiel, J. Cantó, J.M. Torrelles, L.F. Rodríguez, J.F. Gómez and P.T.P. Ho	
<i>H₂O maser emission from bright rimmed globules</i>	72
R. Valdettaro, F. Palla, R. Cesaroni, L. Testi and G. Tofani	
<i>VLBI observations of H₂O masers in the LkHa 234 star-forming region</i>	76
T. Umemoto, H. Imai, R.S. Furuya, Y. Kitamura and R. Kawabe	
<i>A collimated molecular jet in W 43A traced by water maser emission</i>	80
H. Imai, T. Sasao, K. Obara, T. Omodaka and P. J. Diamond	
<i>VLBA multi-epoch water maser observations towards Cepheus A</i>	84
J. M. Torrelles, N. A. Patel, J. F. Gómez, P. T. P. Ho, L. F. Rodríguez, G. Anglada, G. Garay, L. Greenhill, S. Curiel and J. Cantó	
<i>Proper motions of water masers: W51 North, Main and South</i>	88
H. Imai, T. Sasao, O. Kameya, T. Watanabe, T. Omodaka, M. Nishio, Y. Asaki and J. Nakajima	
<i>Highly polarized burst of a water maser in Orion-KL</i>	92
S. Horiuchi and O. Kameya	
<i>Dynamics of the superfine structure of the Orion KL jet</i>	96
L.I. Matveyenko, P.J. Diamond and D. A. Graham	
<i>Proper motion of water masers near NGC1333-SVS13</i>	100
A. Wootten, M. Claussen, K. Marvel and B. Wilking	
<i>Space-VLBI observations of OH masers</i>	105
V.I. Slysh, M.A. Voronkov, I.E. Val'tts, V. Migenes, K.M. Shibata, T. Umemoto, and M. Inoue	
<i>Detection of new sources of 4765 MHz OH masers</i>	112
R.G. Dodson and S.P. Ellingsen	
<i>OH masers associated with IRAS point sources</i>	116
M.R.W. Masheder, R.J. Cohen and N.L. Martin-Hernandez	

<i>Multiwavelength OH observations of Mon R2 during 4765 MHz OH maser flaring</i>	120
D.P. Smits	
<i>Interstellar methanol masers</i>	125
K. Menten	
<i>Methanol maser monitoring at 6.7 and 12.2 GHz</i>	127
M.J. Gaylard, S. Goedhart and D. Dlamini	
<i>Variability studies of 6.7 GHz methanol masers at HartRAO</i>	131
S. Goedhart, M.J. Gaylard and D.J. van der Walt	
<i>Statistics of the 6.7 GHz methanol maser variability from the Toruń survey</i>	135
A. Niezurawska, M. Szymczak, G. Hrynek and A. J. Kus	
<i>The Onsala blind 6.7 GHz survey of the galactic plane: new methanol masers in the northern hemisphere</i>	139
M. Pestalozzi, V. Minier, R. Booth and J. Conway	
<i>A blind survey of the 6.7 GHz methanol maser line</i>	143
M. Szymczak, A. J. Kus, and G. Hrynek	
<i>Methanol masers: Evolutionary and kinematic tracers of massive star formation</i>	147
V. Minier, R. Booth, J. Conway and M. Pestalozzi	
<i>Polarization properties of 6.7 GHz methanol masers in NGC6334F</i>	151
S.P. Ellingsen	
<i>G305.20+0.21: A very young class II methanol maser source</i>	155
A. J. Walsh	
<i>Masers in G34.3+0.2: What more can 6.7-GHz methanol masers tell us?</i>	159
Jiyune Yi, C.J. Phillips and R.S. Booth	
<i>Milliarcsecond structure of methanol masers in L1206 and GL2789</i>	163
M.A. Voronkov and V.I. Slysh	
<i>Unusual properties of the methanol maser emission in W48</i>	167
I.E. Val'tts and S. Yu. Lyubchenko	
<i>The circumstellar environment of methanol masers</i>	171
C. Phillips, D. Bock, H. J. van Langevelde and V. Minier	
<i>H₂ and methanol masers - outflow from the earliest stages of high-mass star formation?</i>	175
J.-K. Lee, A.J. Walsh and M.G. Burton	
<i>Models of class II methanol masers</i>	179
A.M. Sobolev, A.B. Ostrovskii, A.V. Malyshev, D.M. Cragg, P.D. Godfrey, E.C. Sutton, W.D. Watson, S.P. Ellingsen and J.L. Caswell	

<i>Influence of dust parameters on class II methanol maser pumping</i>	183
A.B. Ostrovskii and A.M. Sobolev	
<i>Mass estimates for the objects related to class II methanol masers with linear position-velocity structure</i>	187
G.M. Gos'kov and A.M. Sobolev	
<i>Maser and thermal methanol emission in the millimeter wave range: new masers at 1.3mm and 2.8 mm</i>	191
S.V. Kalenskii, V.I. Slysh and I. E. Val'tts	
<i>The detection of new methanol masers in the 5-1-40 E line</i>	195
S.V. Kalenskii, V.I. Slysh, I.E. Val'tts, A. Winnberg and L.E.B. Johansson	
<i>The fine spatial structure of methanol masers as evidence in support of their connection with bipolar outflows</i>	199
V.I. Slysh, I.E. Val'tts and S.V. Kalenskii	
<i>Supernova remnants and OH (1720 MHz) masers</i>	204
A. J. Green	
<i>Supernova OH (1720 MHz) masers in Sgr A East, W28 and G359.1-0.5</i>	212
F. Yusef-Zadeh, D.A. Roberts, G. Bower, M. Wardle and W.M. Goss	
<i>Magnetic fields in supernova remnants from OH (1720 MHz) masers</i>	217
C. L. Brogan, M.J. Claussen and W. M. Goss	
<i>CO J=2-1 observations toward the OH 1720 MHz maser in Kes 69</i>	221
E.M. Reynoso and J.G. Mangum	
<i>Recombination line masers in YSOs</i>	226
J. Martín-Pintado	
<i>Maser effects in the recombination lines of Eta Carinae</i>	234
Z. Abraham, A. Damineli, P. Durouchoux, L. Nyman and F. McAuliffe	
<i>Physical conditions in the NGC 6334 molecular cloud derived from non-LTE NH₃(J,K)=(1,1) transitions</i>	240
A. Caproni, Z. Abraham and J.W.S. Vilas-Boas	
<i>NLTE NH₃(J,K)=(1,1) observations towards southern hemisphere compact regions</i>	244
A. Roman Lopes, Z. Abraham, A. Caproni, J.R.D. Lépine and J.W.S. Vilas-Boas	
<i>CO observations as a diagnostic of possible environmental effects</i>	248
M.A.G. Maia, D. de Mello and T. Wiklind	

Part 2. Stellar Masers	
<i>Stellar masers: a review</i>	253
P.J. Diamond	
<i>SiO masers in red giants</i>	266
E.M.L. Humphreys	
<i>VLBA observations of the 7mm SiO masers in TX Cam and R Cas</i>	274
Jiyune Yi, R.S. Booth, J.E. Conway, A. Winnberg and P.J. Diamond	
<i>Highly polarized SiO v=0 emission from late-type stars</i>	278
H. Shinnaga, M. Tsuboi and T. Kasuga	
<i>86 GHz SiO masers in late-type galactic bulge stars</i>	282
M. Messineo, H. Habing, L. Sjouwerman, A. Omont and K. Menten	
<i>mm-VLBI observations of SiO masers: Further support for radiative pumping and rotation of the inner shell</i>	286
J.-F. Desmurs, V. Bujarrabal, F. Colomer and J. Alcolea	
<i>Structure of SiO masers in Orion-KL</i>	290
S. Doeleman, C. Lonsdale, P. Kondratko, W. Raas and C. R. Predmore	
<i>A 3mm SiO maser survey in the galactic bulge region</i>	294
E. Lüdke, V. Migenes, R. Balasubramanyam and N. C. Cassol	
<i>The H₂O maser proper motions of RT Vir and VX Sgr</i>	298
J.A. Yates, A.M.S. Richards and M.D. Gray	
<i>The dynamics of red supergiant winds</i>	306
A.M.S. Richards, R.J. Cohen, M.D. Gray, K. Murakawa, J.A. Yates, M. Szymczak, J.D. Monnier, M.R.W. Masheder, and H. J. van Langevelde	
<i>A study of the H₂O maser emission from R Cas</i>	310
J. Brand, L. Baldacci and D. Engels	
<i>New detections of 321 GHz water masers toward late-type stars</i>	314
T. Liljeström, A. Winnberg and R. Booth	
<i>OH masers in oxygen-rich late-type stars</i>	319
S. Etoka and A.M. Le Squeren	
<i>OH masers in semiregular variables: Insights from long-term monitoring</i>	323
L. Blaszkiewicz, M. Szymczak, S. Etoka and A.M. Le Squeren	
<i>Six years of astrometric monitoring of the OH maser in U Herculis</i>	327
W. Vlemmings, H. J. van Langevelde and P. J. Diamond	
<i>The ATCA/VLA OH 1612 MHz survey: identification of post-AGB stars</i>	331
J. Chapman and M. Sevenster	

<i>The OH/IR star population at the centre of the Galaxy</i>	335
<i>R. Ortiz, A. Omont, M. Schultheis, E. Copet, H.J. Habing, M. Messineo, S. Ganesh and J.A.D.L. Blommaert</i>	
<i>HCN (J=1-0) maser emission in the bright carbon star Y CVn</i>	340
<i>Dinh-V-Trung, J.R. Forster and Nguyen-Q-Rieu</i>	
 Part 3. Protoplanetary Nebulae	
<i>Detection of an inner torus in the protoplanetary nebulae OH231.8+4.2</i>	344
<i>J.-F. Desmurs, C. Sánchez Contreras, V. Bujarrabal, F. Colomer and J. Alcolea</i>	
<i>VLA observations of H₂O and OH (1612 MHz) maser emission towards OH 231.8+4.2</i>	348
<i>Y. Gómez and L.F. Rodríguez</i>	
<i>Interferometric observations of OH and H₂O masers in protoplanetary nebulae imaged with HST - A unique diagnostic of their spatial-kinematic structure</i>	352
<i>R. Sahai, M. J. Claussen and M. Morris</i>	
 Part 4. Polarization and Magnetic Fields	
<i>Observational studies of maser polarization</i>	359
<i>A. Kemball</i>	
<i>Full-polarization maps of OH main-line masers in the W51 and G351.78-0.54 star-forming regions</i>	367
<i>A.L. Argon, M.J. Reid and K.M. Menten</i>	
<i>Zeeman splitting of OH masers and the galactic magnetic field</i>	371
<i>V. L. Fish, M.J. Reid, A.L. Argon and K.M. Menten</i>	
<i>First detection of Zeeman splitting of water masers in circumstellar shells</i>	375
<i>W. Vlemmings, P. Diamond and H.J. van Langevelde</i>	
 Part 5. Extragalactic Nuclear Masers	
<i>Extragalactic H₂O Masers</i>	381
<i>L. Greenhill</i>	
<i>Monitoring of extragalactic water masers with MPIfR 100-m telescope</i>	392
<i>Y. Hagiwara, C. Henkel, and W. A. Sherwood</i>	
<i>Testing extragalactic H₂O masers against the thin disk model: the present and the future</i>	396
<i>J. Braatz</i>	

<i>H₂O maser emission from the Seyfert 2 galaxy IC 2560: evidence for a super-massive black hole and a probe for mass-accretion rate</i>	400
Y. Ishihara, N. Nakai, N. Iyomoto, K. Makishima, P.J. Diamond and P. Hall	
<i>Proper motion of nuclear jet relative to a maser feature in NGC 3079</i>	404
S. Sawada-Satoh, M. Inoue, K.M. Shibata, S. Kameno, N. Nakai, V. Migenes and P.J. Diamond	
<i>IR properties of H₂O megamaser galaxies, pumping mechanisms, and central sources</i>	408
Yu Zhi-yao	
<i>OH megamasers</i>	413
C.J. Lonsdale	
<i>EVN and MERLIN observations of an OH maser ring and a starburst continuum in III Zw 35</i>	426
Y.M. Pihlström, J.E. Conway and R.S. Booth	
<i>EVN Observations of the OH megamaser galaxies Mrk 231 and IC 694</i>	430
H.R. Klöckner and W.A. Baan	
<i>A flaring megamaser in Mrk 348</i>	434
A.B. Peck, H. Falcke, C. Henkel, K.M. Menten, Y. Hagiwara, J.F. Gallimore and J.S. Ulvestad	
<i>Merlin water maser observations of the Seyfert 2 galaxy Mrk 348</i>	438
E. Xanthopoulos, A.M.S. Richards and P.J. Diamond	
Part 6. Comets	
<i>Maser emissions from comets</i>	443
P. Colom, D. Bockelée-Morvan, J. Crovisier and E. Gérard	
Part 7. Maser Theory	
<i>Topics in basic maser theory</i>	452
M. Elitzur	
<i>Theory and extragalactic masers</i>	464
W.D. Watson	
<i>The puzzle of natural lasers</i>	479
V. Strelnitski	
<i>OH inversions in star-forming regions and ALI radiation transfer</i>	482
M.D. Gray	

<i>Diffuse OH in the Milky Way</i>	487
M.D. Gray and M.R.W. Masheder	
<i>Chaotic temporal variations in cosmic masers</i>	492
A. C.-L. Chian, E. L. Rempel and F.A. Borotto	
 Part 8. Telescopes, Observatories and Projects	
<i>The EVN MkIV recording system and the EVN Data Processor at JIVE</i>	497
H.J. van Langevelde, C. Phillips and the EVN/JIVE staff	
<i>The VERA project</i>	501
M. Honma	
 Part 9. Conference Summary	
<i>Masers, from protostars to black holes: conference summary</i>	506
M.J. Reid	
<i>Author Index</i>	520
<i>Subject Index</i>	523
<i>Object Index</i>	529