

M2O Telecom Agenda, No. 14

The main news items this month:

1. G359.617-0.251:

Flare monitored by M2O Single dish and observed by ATCA (PI Gabor Orosz and Tieghe McCarthy)

2. G358.93-0.03: Interesting maser structure in the final VLBI epoch

3. Restructured SamePage: Basic changes to avoid duplication. Feedback welcome.

1 Activity since the previous Newsletter

- **SamePage:** +0, total 64 members
- **Papers accepted:** +0; Total: 14
- **Papers under review:**
- **Updates on papers in prep:**
 - Bayandina et al., VLA masers in G358. Images circulated during the prev. telecom.
 - Burns et al., 6.7 GHz VLBI movie in G358. Images circulated during the prev. telecom.
 - Burns et al., VLBI maps of rare maser lines in G358. Images circulated during the prev. telecom.
 - Orosz et al., 7.6 and 7.8 GHz methanol masers in G358, aiming for ApJL submission in August.
 - Hirota et al., ALMA follow-up observations of G24.33+0.14 in pre- and post- maser flare phases.
 - Olech et al., VLBI images of G24.33 during its maser flare.

- **M2O targets:**

Name	Maser [GHz]	Pre-burst Flux [Jy]	Max Flux [Jy]	Current Flux [Jy]	Reported by	Reobserved by	Status
G359.617-0.251	6.7	120	200	200	Yonekura	Ib, Hh,	rising
Orion S6	6.7	3.1	9	9	Yonekura	Ib, Tr, Sz, Hh	rising
G85.411+0.002	6.7	12	95	95	Yonekura	Ib, Ef, Sz, Tr, Hh, Ky, Vs	rising
G33.641-0.228	6.7	-	236	236	Bringfried	Hh, Ib, Vs	active
IRAS 16293-2422	22	-	30k	24k	Sunada, Mc	Vr, Mc, Hh, Sz, Ib	active
NGC2071	22	1k	7k	920	Sunada, Hh	Vr, Hh, Sz, Ib	post-burst
G53.22-0.08	22	3	800	30	Sunada	Vr, Hh, Ib	post-burst
G358.93-0.03	6.7	5	1000	40	Yonekura	Hh, Ib	post-burst
G24.33+0.14	6.7	-	800	8	Torun	Hh, Ib, Vs	post-burst
G25.65+1.05	22	-	60k	2150	-	Hh, Sz	post-burst

(Ib = Ibaraki) (Tr = Torun) (Sz = Simeiz) (Hh = HartRAO) (Ef = Effelsberg) (Ky = KVN Yonsei) (Vs = Ventspils) (Vr = VERA stations) (Mc = Medicina)

- **Follow-up observations conducted this month (see Record Keeping for details):**
ATCA follow-up of several methanol maser lines in the newly flaring source G359.617-0.251
- **New observing proposals:**
H₂CO maser in accretion burst of high-mass star formation - VLA - Chen et al.
- **Active trigger proposals:**

Array	Code	Grade	Hours granted	Hours remaining	Active period	Resubmit deadline
EVN	RB007	1.3 / 5.0 (0 is best)	96	96	15/SEP/19 - 15/SEP/20	01/JUN/20
KaVA	EAVN20A-160	7.3 / 10.0 (10 is best)	48	24	01/FEB/20 - 01/JUL/20	15/JUN/20
LBA	V581	4.0 / 5.0 (5 is best)	96	88	01/OCT/19 - 01/OCT/20	16/JUN/20
VLBA	BB418	1.82 / 10.0 (0 is best)	48	48	01/AUG/20 - 01/AUG/21	01/FEB/21
Subaru	S20B0051N	accepted	0.5*2 or 1 night	0.5*2 or 1 night	01/AUG/20 - 01/JAN/21	-

Next Newsletter / Telecom: 31th Aug 2020, 18:00 JST

2 Reports

Short reports on specific activities, please send me an email (ross.burns@nao.ac.jp) in advance if you have something to report in an upcoming telecom.

Brief discussion on G359.617-0.251: Gabor Orosz, presented by Ross Burns

- The 6.7 GHz methanol maser showed a flux increase in one spectral feature, rising from 120 Jy to around 200 Jy.
- ATCA observations were triggered to search for activity in maser lines that have been seen in previous accretion burst -type events. No such emission has been confirmed.
- The flux increase in one spectral feature of the 6.7 GHz maser in G359.617-0.251 appears not to be caused by a global change in the radiation environment. Therefore we should consider other explanations. This is a similar story to G24.33+0.14.
- There are plans for the joint publication of ATCA data for G359 and G24 in a paper lead by Tiede McCarthy (UTAS).

Interesting structure in G358 methanol masers: Ross Burns

The final VLBI epoch of 6.7 GHz emission in G358 revealed an interesting velocity structure resembling a compact spiral. I would like to briefly report about it and discuss its possible significance.

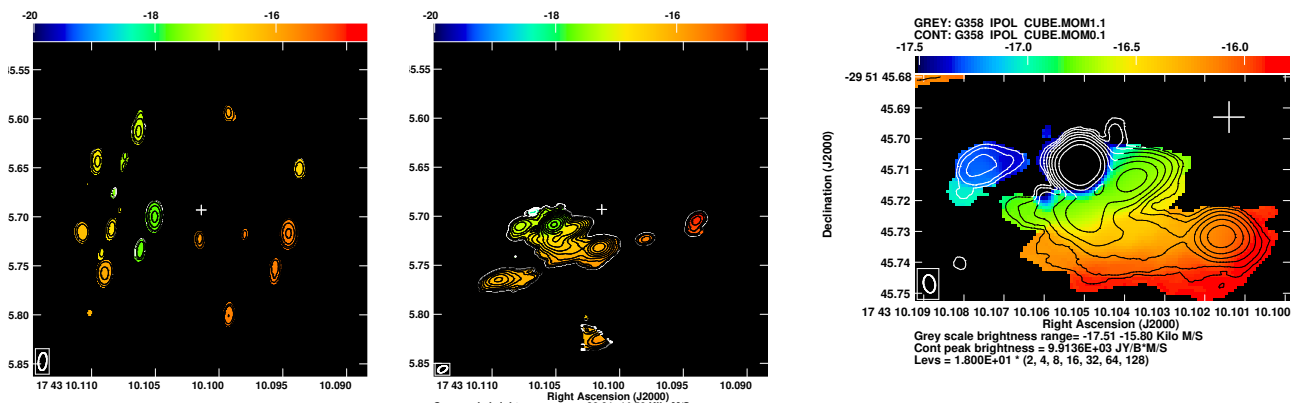


Figure 1: Left and middle are the 6.7 GHz methanol maser emission in G358 from the 7th of June and 28th of September 2019 (almost 4 months apart) plotted with the same spatial and velocity scales. Right is a zoom in spatial and velocity scale to an interesting structure within the usual emission seen in G358.

Record keeping

3 M2O Publications

No.	Target	Facility	Author	Frequency (GHz)	Status	Ref	Journal
1	W49N	Sm, Tr	Volvach+	22.2	Published	(1)	MNRAS_L
2	W49N	Sm, Tr, Mc, Ef	Volvach+	22.2	Published	(2)	A&A
3	W49N	Sm, Tr, Mc, Ef, Kvazar	Volvach+	22.2	Published	(3)	Ast.Rep.
4	W49N	Sm	Volvach+	22.2	published	(4)	MNRAS
5	G25	VLA	Bayandina+	6.7, 12.2, 22	Published	(5)	ApJ
6	G25	Sim/Hh/Tr	Volvach+	22	Published	(6)	MNRAS_L
7	G25	KVASAR	Volvach+	22	Published	(7)	Ast.Rep.
8	G25	EVN	Burns+	22	Published	(8)	MNRAS
9	G25		Aberfelds+	6.7	in prep		-
10	G25		Bayandina+	12.2, 23.1	in prep		-
11	G25		MacCleod+	6.7, 22	in prep		-
12	G358	ATCA	Breen+	mm	Published	(9)	ApJ
13	G358	ALMA-SMA	Brogan+	mm	Published	(10)	ApJL
14	G358	Hh	MacCleod+	New Methanol masers	Published	(11)	MNRAS
15	G358	LBA	Burns+	6.7	Published	(12)	Nat.Ast.
16	G358	Various VLBI	Burns+	6.7 movie	in prep		-
17	G358	Various VLBI	Burns+	Maps of rare masers	in prep		-
18	G358	VLBA	Burns+	6.7 and 12.18	in prep		-
19	G358	Asia-Pacific VLBI	Orosz+	7.6, 7.8	in prep.		ApJL
20	G358	VLA	Chen+	multiple lines methanol	Published	(13)	ApJL
21	G358	VLA	Chen+	Methanol	published	(15)	Nat. Ast.
22	G358		MacCleod+	6.7 GHz monitoring	in prep		-
23	G358		MacCleod+	6.2, 12.2, 20.3, 20.9	in prep		-
24	G358	VLA	Bayandina+	6.7, 12.2, 22.2	in prep		-
25	G358	SOFIA	Stecklum+	FIR	in prep		A&A_L
26	G358	Sm and Hh	Volvach+	19.9, 20.9	Published	(14)	MNRASL
27	G358	ATCA	Breen+	Rare transitions	in prep		-
28	G24.33	EVN, VLBA	Olech+	6.7, 12.2, 22.2	in prep		-
29	G24.33	Tr	Olech+	OH, Meth	in prep		-
30	G24.33	Hh	v. d. Heever+		in prep		-
31	G24.33	ALMA	Hirota+	Thermal and maser	in prep		-

References

- [1] Volvach, L. N., Volvach, A. E., Larionov, M. G., MacLeod, G. C. & Wolak, P. Unusual flare activity in the extreme-velocity 81 kms⁻¹ water-maser feature in W49N. *Monthly Notices of the Royal Astronomical Society: Letters* **487**, L77–L80 (2019). URL <https://doi.org/10.1093/mnrasl/slz088>. <http://oup.prod.sis.lan/mnrasl/article-pdf/487/1/L77/28864243/slz088.pdf>.
- [2] Volvach, L. N. *et al.* Flaring water masers associated with W49N. *A&A* **628**, A89 (2019).
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- [10] Brogan, C. L. *et al.* Sub-arcsecond (Sub)millimeter Imaging of the Massive Protocluster G358.93–0.03: Discovery of 14 New Methanol Maser Lines Associated with a Hot Core. *ApJL* **881**, L39 (2019). [1907.02470](https://arxiv.org/abs/1907.02470).
- [11] MacLeod, G. C. *et al.* Detection of new methanol maser transitions associated with G358.93-0.03. *MNRAS* **489**, 3981–3989 (2019). [1910.00685](https://arxiv.org/abs/1910.00685).
- [12] Burns, R. A. *et al.* A heatwave of accretion energy traced by masers in the G358-MM1 high-mass protostar. *Nature Astronomy* **10** (2020).
- [13] Chen, X. *et al.* ¹³CH₃OH Masers Associated With a Transient Phenomenon in a High-mass Young Stellar Object. *ApJL* **890**, L22 (2020).
- [14] Volvach, A. E. *et al.* Monitoring a methanol maser flare associated with the massive star-forming region G358.93-0.03. *MNRAS* **494**, L59–L63 (2020).

M2O follow-up data

No.	Target	Facility	Date	Frequency (GHz)	Code	PI/comment
1	G25	VLA	Oct 2017	6.7, 12.2, 22	17B-408	OB / Reduced
2	G25+W49N	EVN	Oct 2017	22	RB004	RB / Reduced
3	G25+W49N	KaVA	Oct 2017	22	K17RB01A	RB / Reduced
4	G25+W49N	VLBA	Oct 2017	22	BO058	GO / Reduced
5	G25	VERA	2007-2013	22, 16 x epochs	[archival]	K. Motogi / mostly Reduced
6	G358	VERA	31 Jan 2019	6.7	-	SY / Reduced
7	G358	VERA	3 Mar 2019	6.7	-	SY / Reduced
8	G358	VERA	1 Apr 2019	6.7	-	SY / Reduced
9	G358	VERA	3 May 2019	6.7	-	SY / Reduced
10	G358	LBA	2 Feb 2019	6.7	vc026a	RB / Reduced
11	G358	LBA	3 Feb 2019	23.1	vc026b	GO / Abandoned
12	G358	LBA	28 Feb 2019	6.7	vc026c	RB / Reduced
13	G358	EVN	13 Mar 2019	6.7, 6.18	RB005	RB / Reduced
14	G358	KVN	25 Mar 2019	22, 44, 95, 120	n19rb01a	RB / Reduced
15	G358	VLBA	19 May 2019	6.7, 12.2, 23.1	BB414	RB / QuickLook
16	G358	VLBA	7 Jun 2019	6.7, 12.2, 20.7	BB412	RB / Reduced
17	G358	LBA+E.Asia	17 May 2019	7.6, 7.8	vx028a	GO,SE / QuickLook
18	G358	LBA	8 Sep 2019	6.7	vc026d	RB / Processing
19	G358	LBA+AusSCOPE	28 Sep 2019	6.7	v581a	RB / Processing
20	G358	SOFIA	30 April 2019	50...120 μ m		BS,JE
21	G358	GROND	8 Feb 2019	NIR		HL,BS,AC
22	G358	SMA	several 2019	mm		THunter,CB
23	G358	ALMA	several 2019	Bands 5,6,7		CB
24	G358	VLA	2019	GHz	-	OB
25	G358	VLA	2019	GHz	-	OB
26	G358	VLA	2019	HNCO	-	XC,AS
27	G24	LBA	8 Sep 2019	6.7	vx026d	RB,MO / not correlated
28	G24	LBA	13 Sep 2019	6.7	s002a	RB,MO / not correlated
29	G24	LBA	28 Sep 2019	6.7	v581a	RB,MO / not correlated
30	G24	EVN	22 Sep 2019	22	RB006A	RB,MO / QuickLook
31	G24	EVN+Merlin	7 Oct 2019	6.7	RB006B	RB,MO / QuickLook
32	G24	EVN+Merlin	17 Nov 2019	1.667	RB007	RB,MO / correlated
33	G24	VLBA	27 Sep 2019	6.7, 12.2, 22	BB416A	RB,MO / QuickLook 1,0,1
34	G24	VLBA	27 Oct 2019	6.7, 12.2, 22	BB416B	RB,MO / correlated
35	G24	VLBA	02 Dec 2019	6.7, 12.2, 22	BB416C	RB,MO / correlated
36	G24	ALMA	26 Sep 2019	Band6	-	THirota / QuickLook
37	G24	SOFIA	25 Oct 2019	FIR		BS,JE
38	G24	ATCA	26 Nov 2019	K-band	C3321	GO,SB
39	G24	ATCA	27 Nov 2019	C-band	C3321	GO,SB
40	NGC2071, Ori-S6	KaVA	13 Mar 2020	22/44/95/130	a20d3a	RB / QuickLook
41	NGC2071, Ori-S6	KaVA	16 Apr 2020	22/44/95/130	a20d3b	RB / QuickLook
42	NGC2071, Ori-S6	KaVA	11 May 2020	22/44/95/130	a20d3c	RB / not correlated
43	G85	VLBA	24/Apr/2020	L/C/Ku/K	BB421B	RB / QuickLook
44	G85	VLBA	22/May/2020	L/C/Ku/K	BB421A	RB / QuickLook
45	G85	VLBA	22/June/2020	L/C/Ku/K	BB421C	RB / correlated
46	G359.617-0.251	ATCA	25-26/July/2020	6-10 GHz		GO / processing

Reminder:

All **G358 papers** should include a member from the [Ibaraki](#) team in the author list and an acknowledgement of their funding.

All **G24.33 papers** should include a member from the [Torun](#) team in the author list and an acknowledgement of their funding.

All **Orion-S6 papers** should include a member from the [Ibaraki](#) team in the author list and an acknowledgement of their funding.

All **NGC2071 papers** should include a member from the [VERA / Sunada](#) team in the author list and an acknowledgement of their funding.

All **G85 papers** should include a member from the [Ibaraki](#) team in the author list and an acknowledgement of their funding. All **G359 papers** should include a member from the [Ibaraki](#) team in the author list and an acknowledgement of their funding.