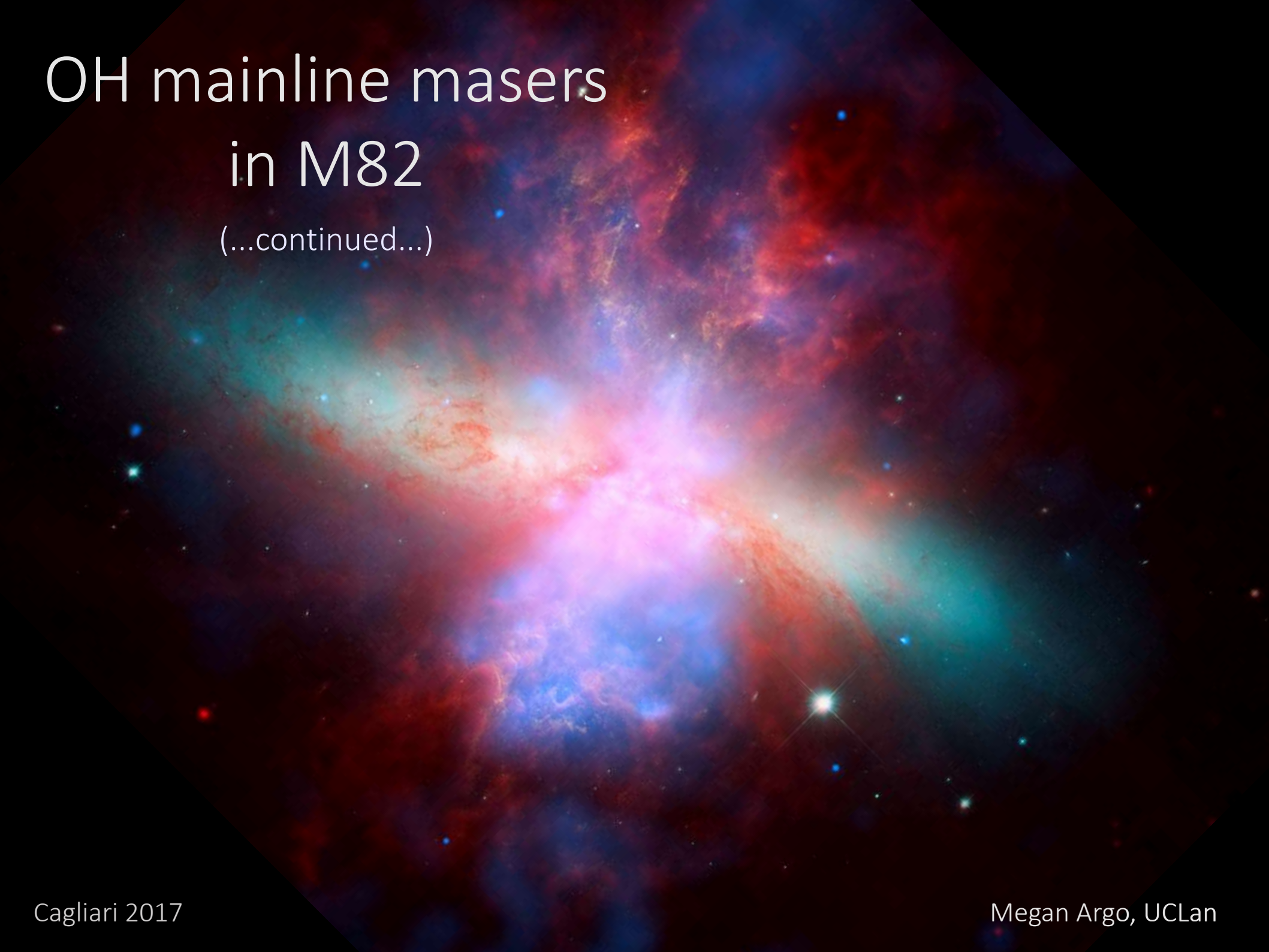
OH mainline masers in M82

(...continued...)

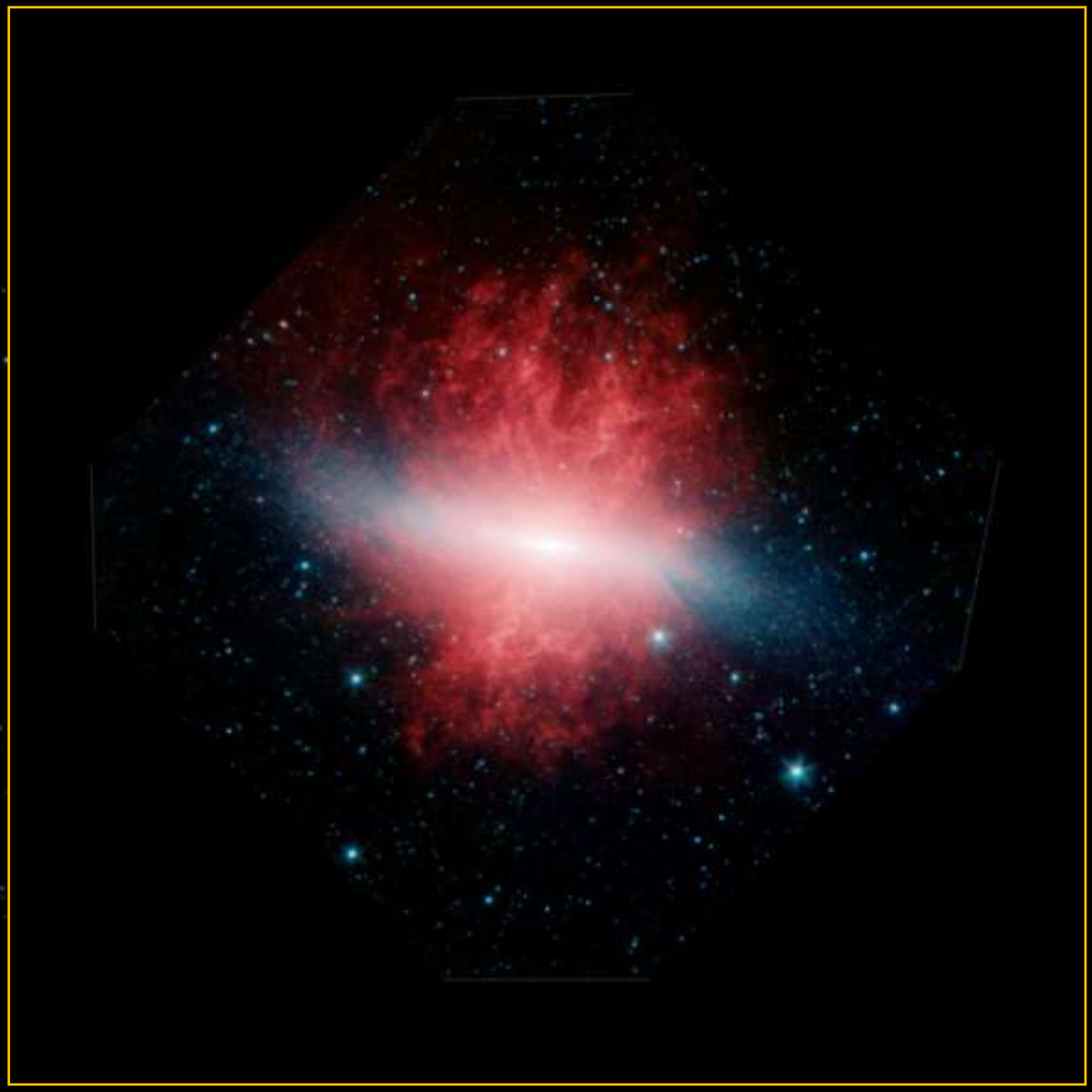


Cagliari 2017

Megan Argo, UCLan

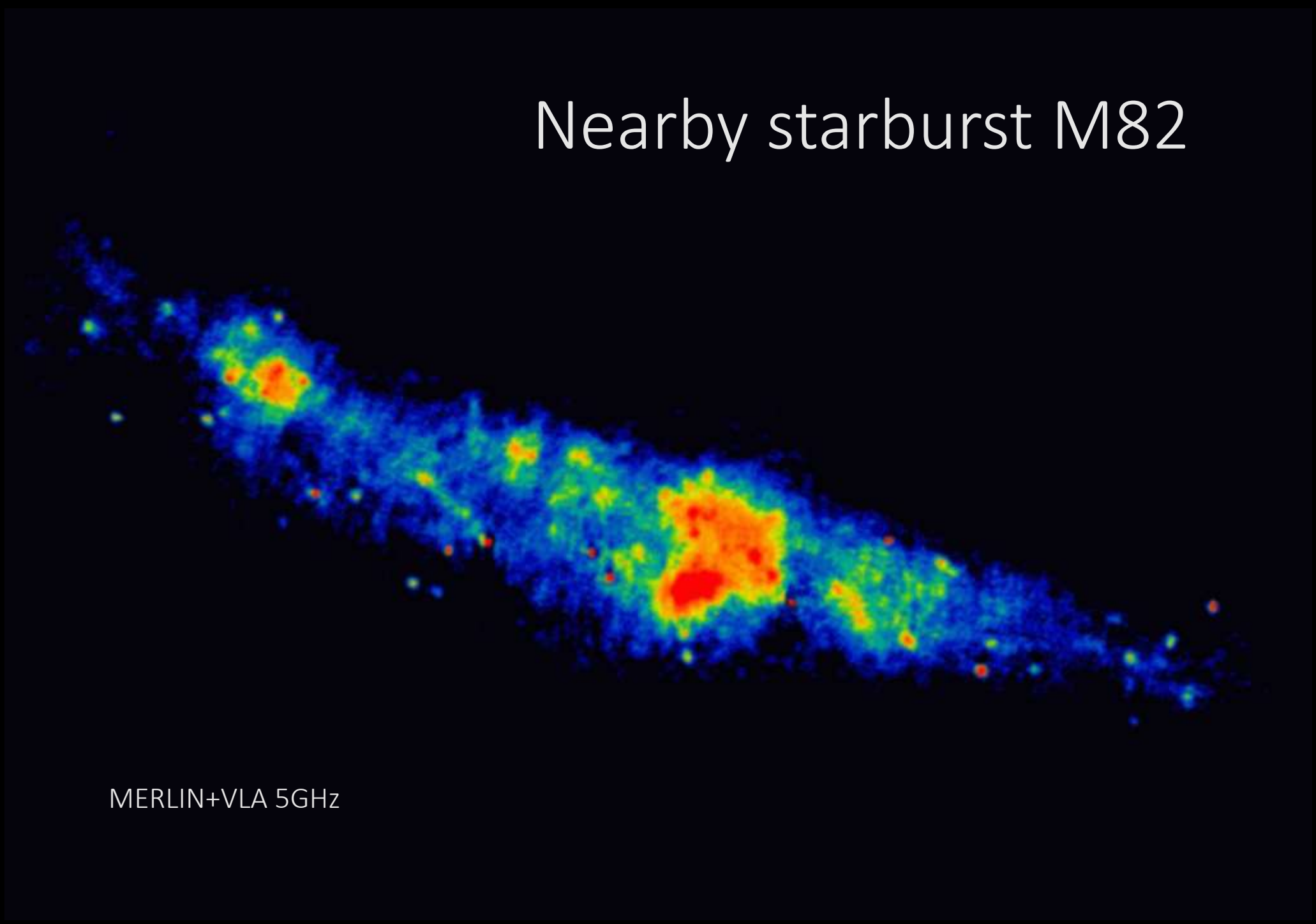
Outflowing SNe Plasma Superwinds in M82





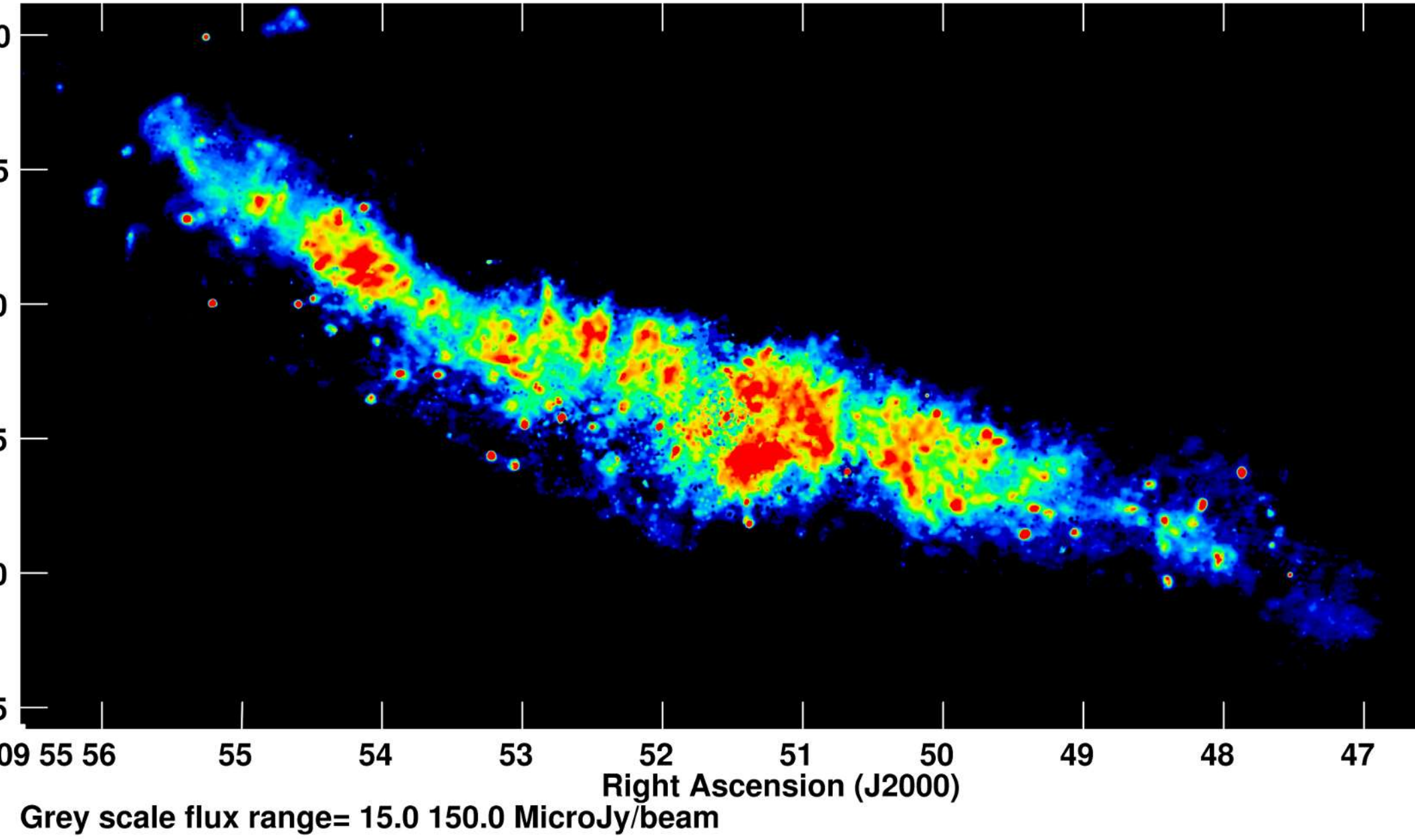
Subaru telescope image of M82 showing violent activity and superwind outflow

Nearby starburst M82



MERLIN+VLA 5GHz

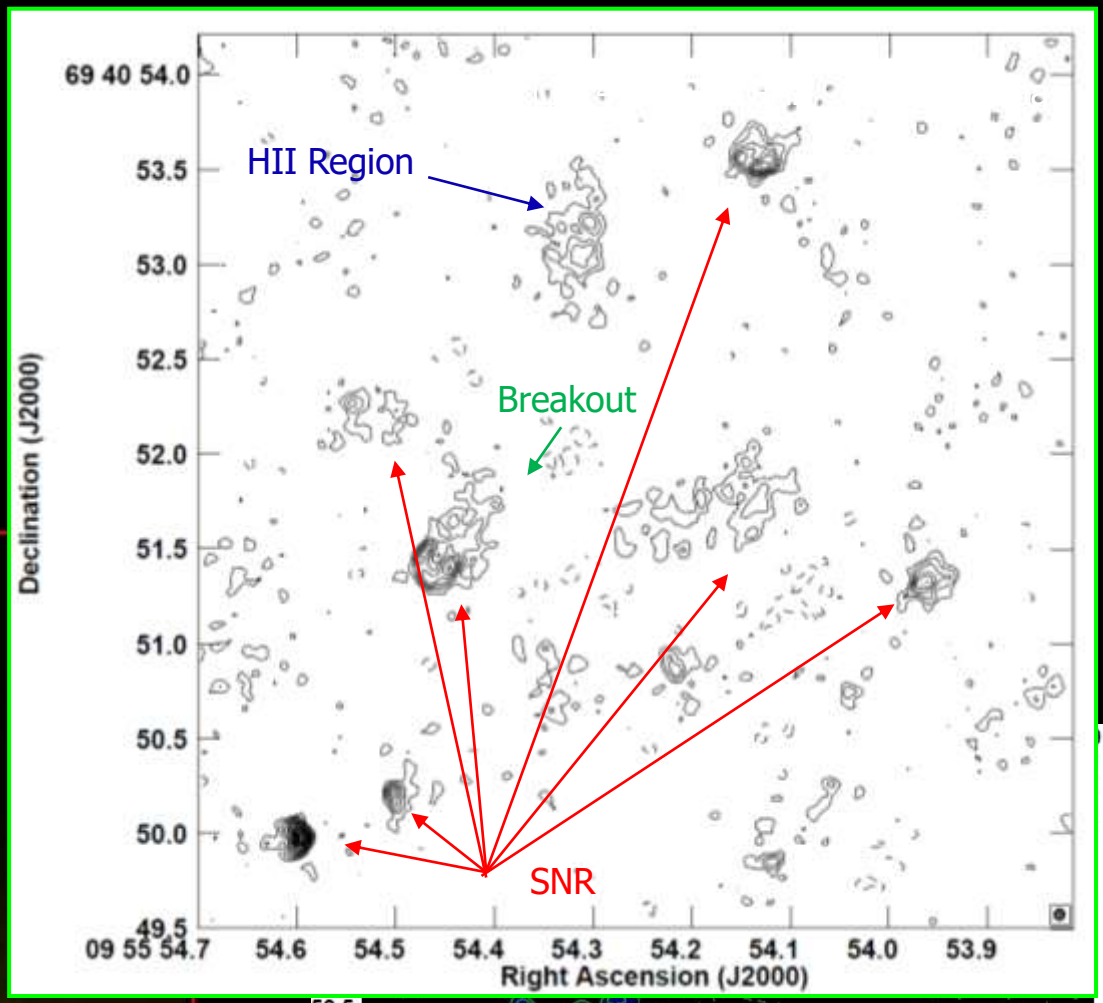
Megan Argo, UCLan

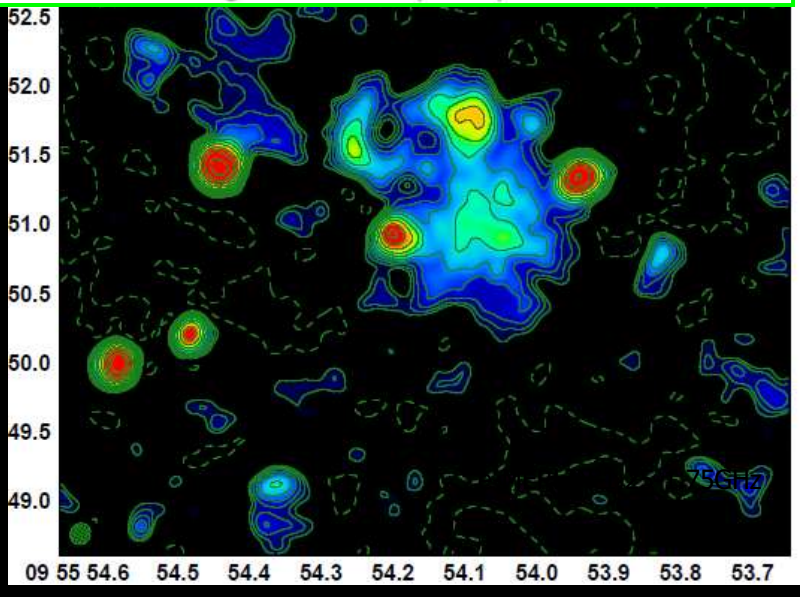

PLot file version 12 created 04-APR-2016 12:03:53
GREY: NONE IPOL 5498.593 MHz M82 V EM 16.BLANK.1
09 55 56
55
54
53
52
51
50
49
48
47
Right Ascension (J2000)
Grey scale flux range= 15.0 150.0 MicroJy/beam

M82 Starburst









Outflowing winds have low surface brightness –> JVLA

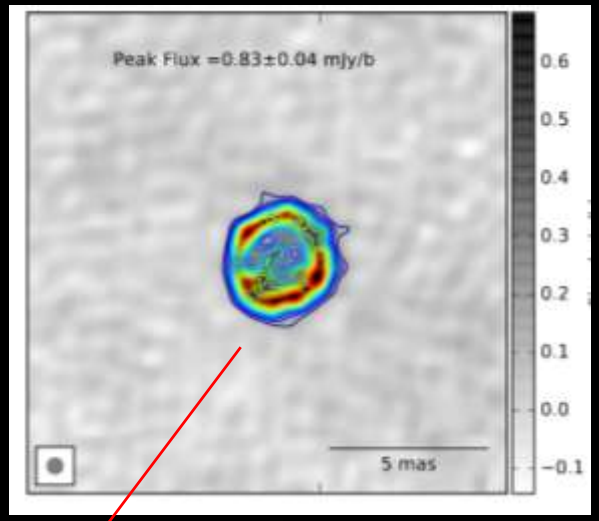
Detailed S-F activity –> e-MERLIN and the EVN

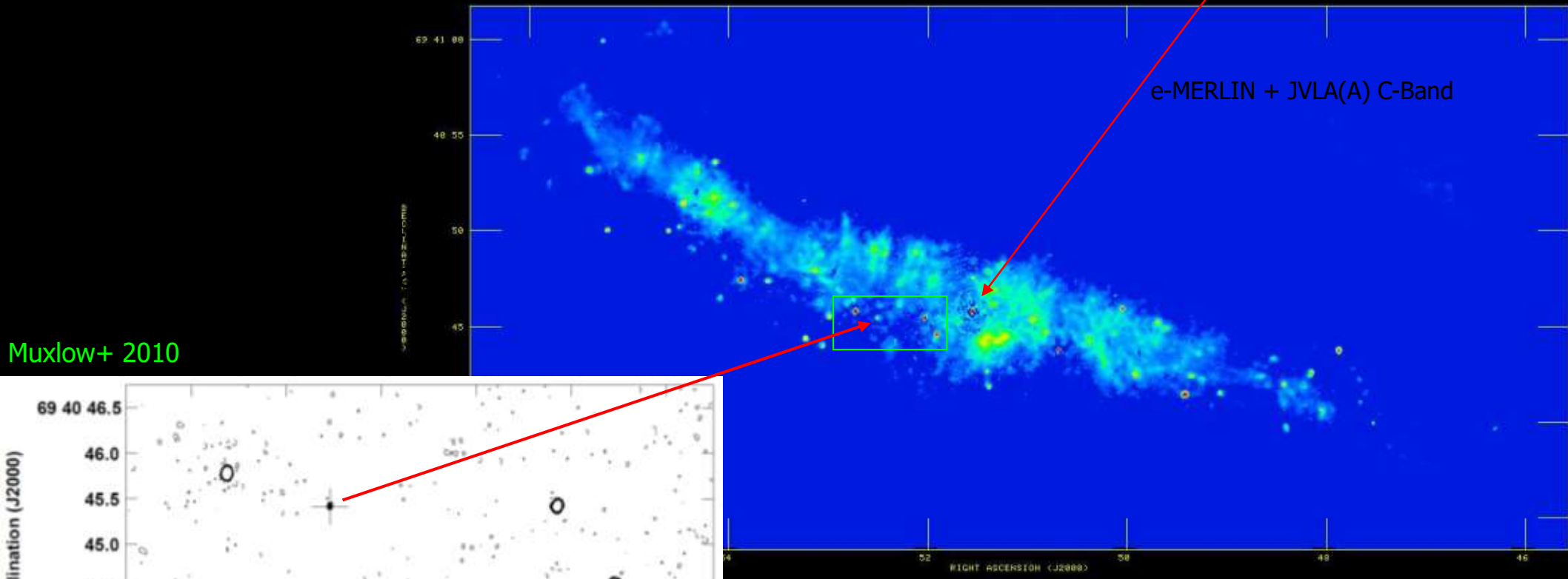
M82 Starburst



VLBI image of the expanding shell from SN2008iz on day 595 after the Sne explosion

Kimani et al 2016

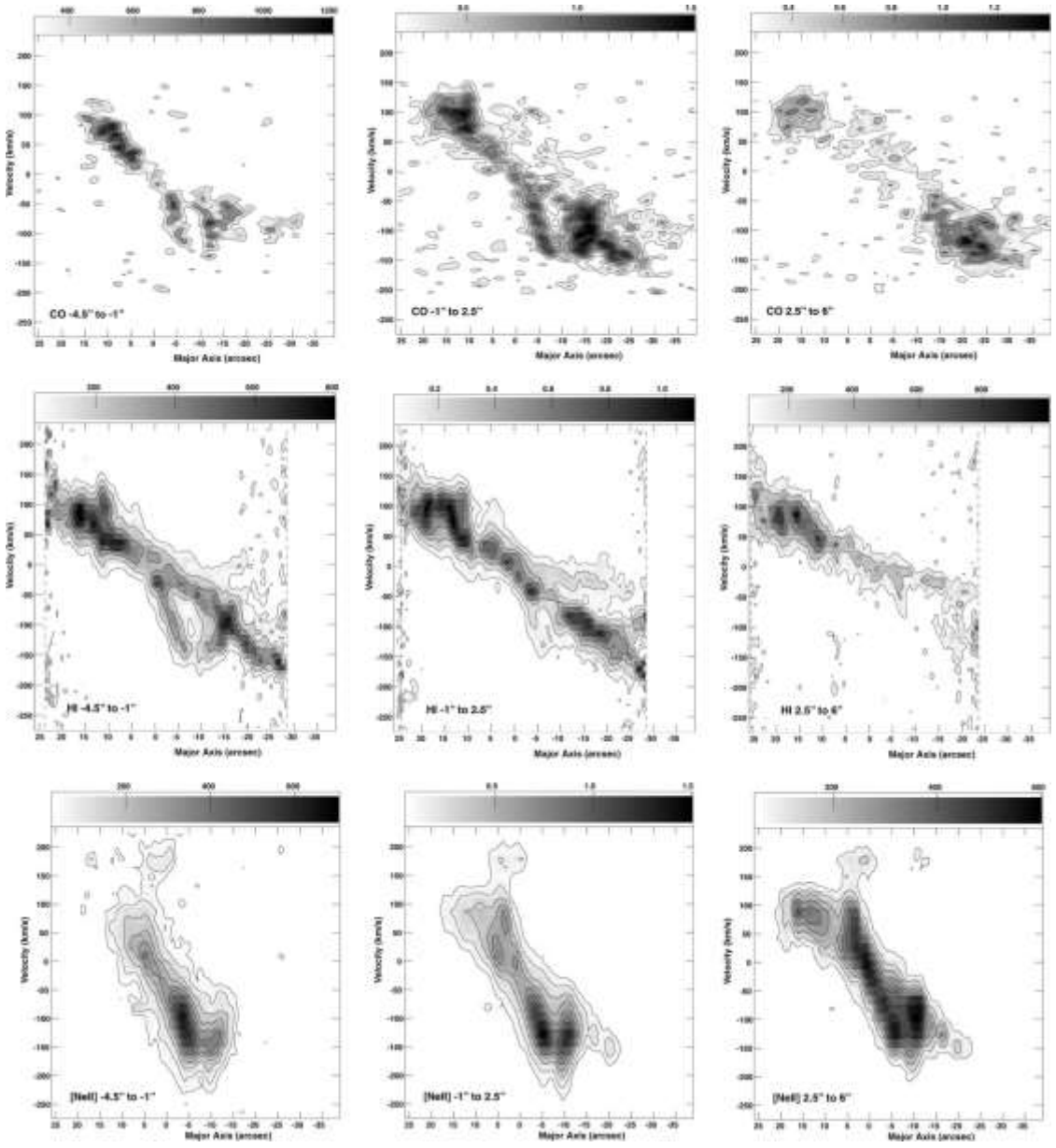




Muxlow+ 2010

Transient radio sources appear occasionally in M82

slow motion + variability timescale → IMBH system?



CO

HI

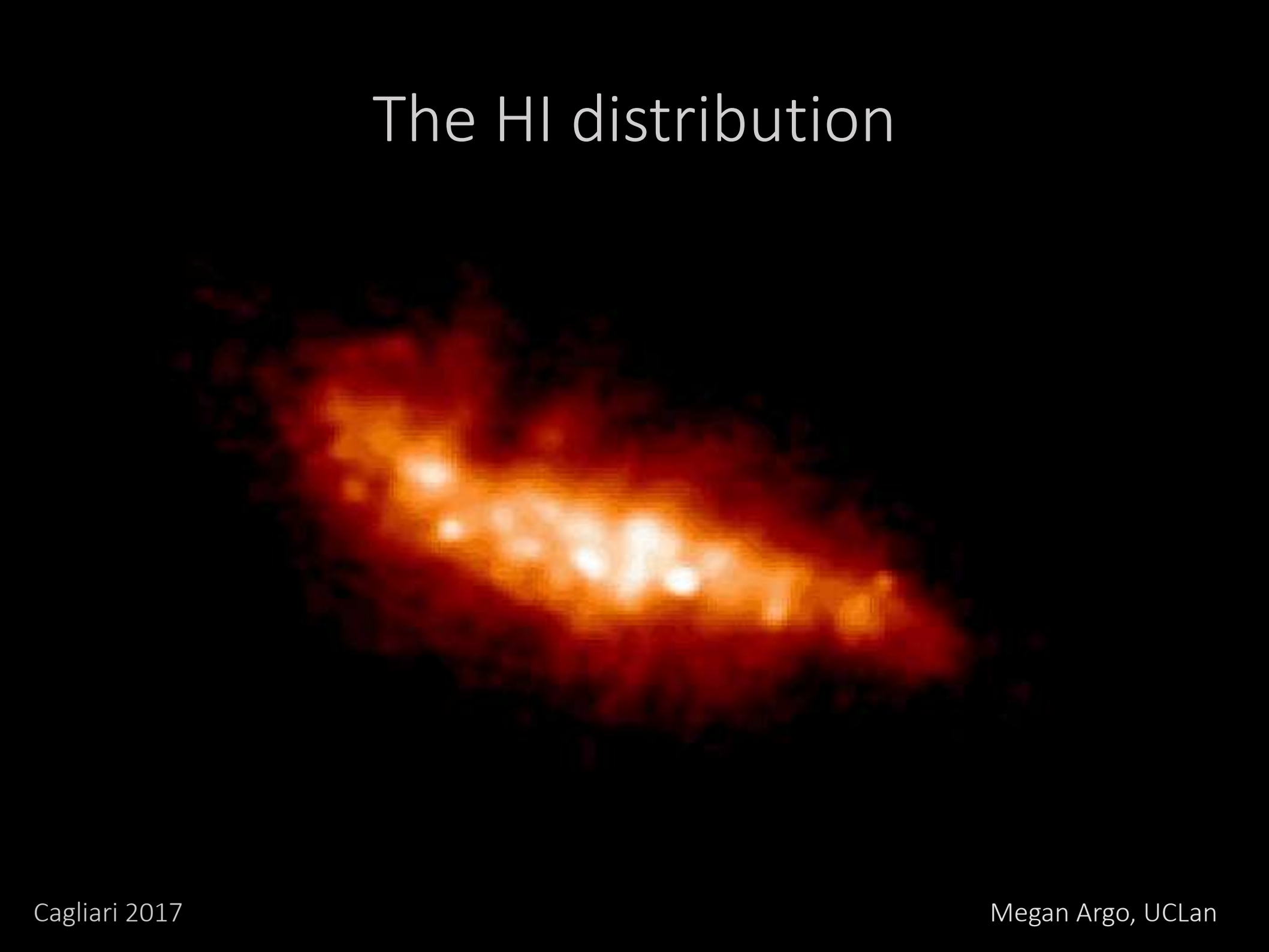
[NeII]

From: Modelling the bar in the centre of the starburst galaxy M82

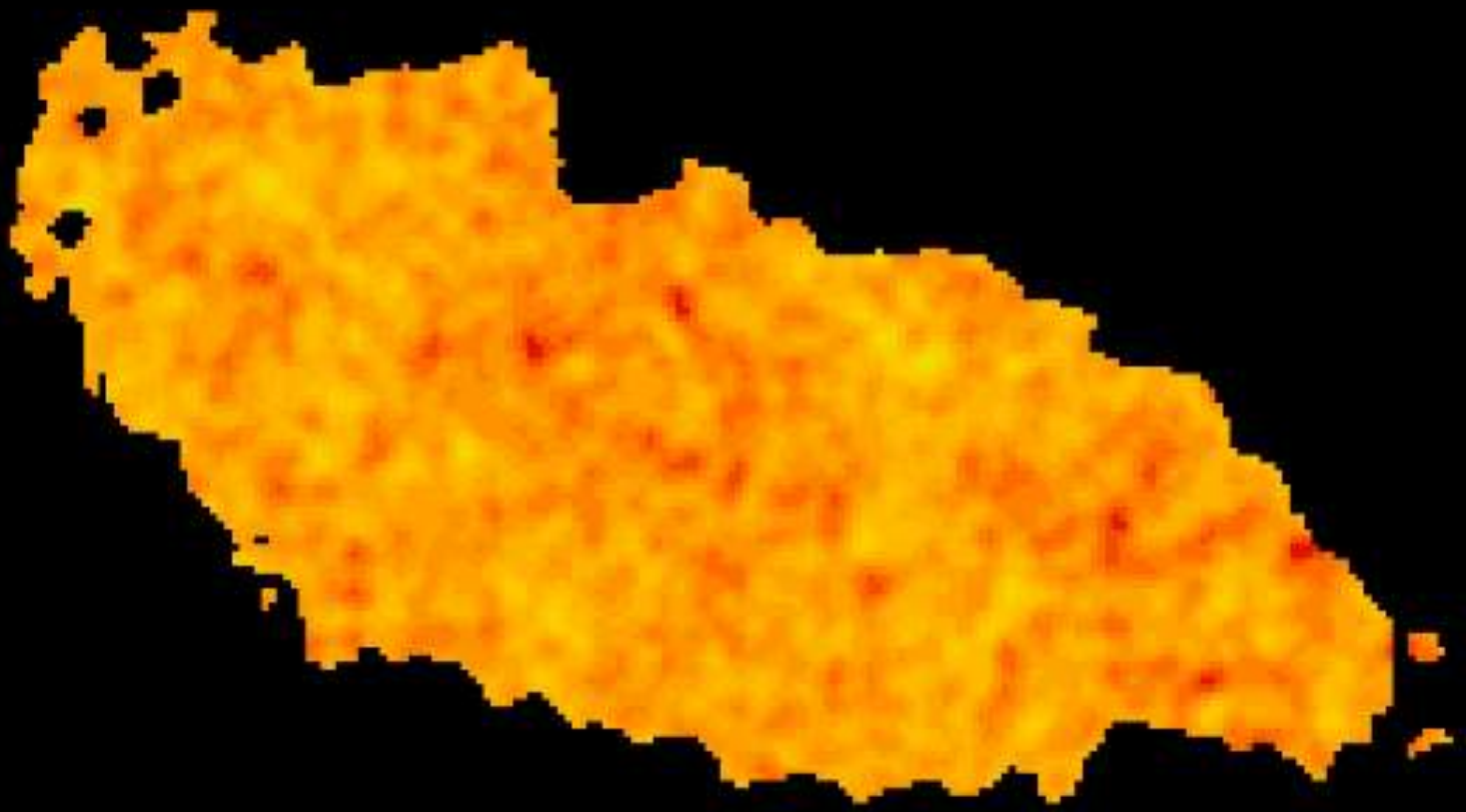
Mon Not R Astron Soc. 2000;316(1):33-48. doi:10.1046/j.1365-8711.2000.03490.x

Mon Not R Astron Soc | © 2000 RAS

The HI distribution



The OH distribution



What's next?

All three datasets have very different parameters → variability/morphological changes impossible to pin down

Second EVN epoch, eight years after the first, but with the same parameters

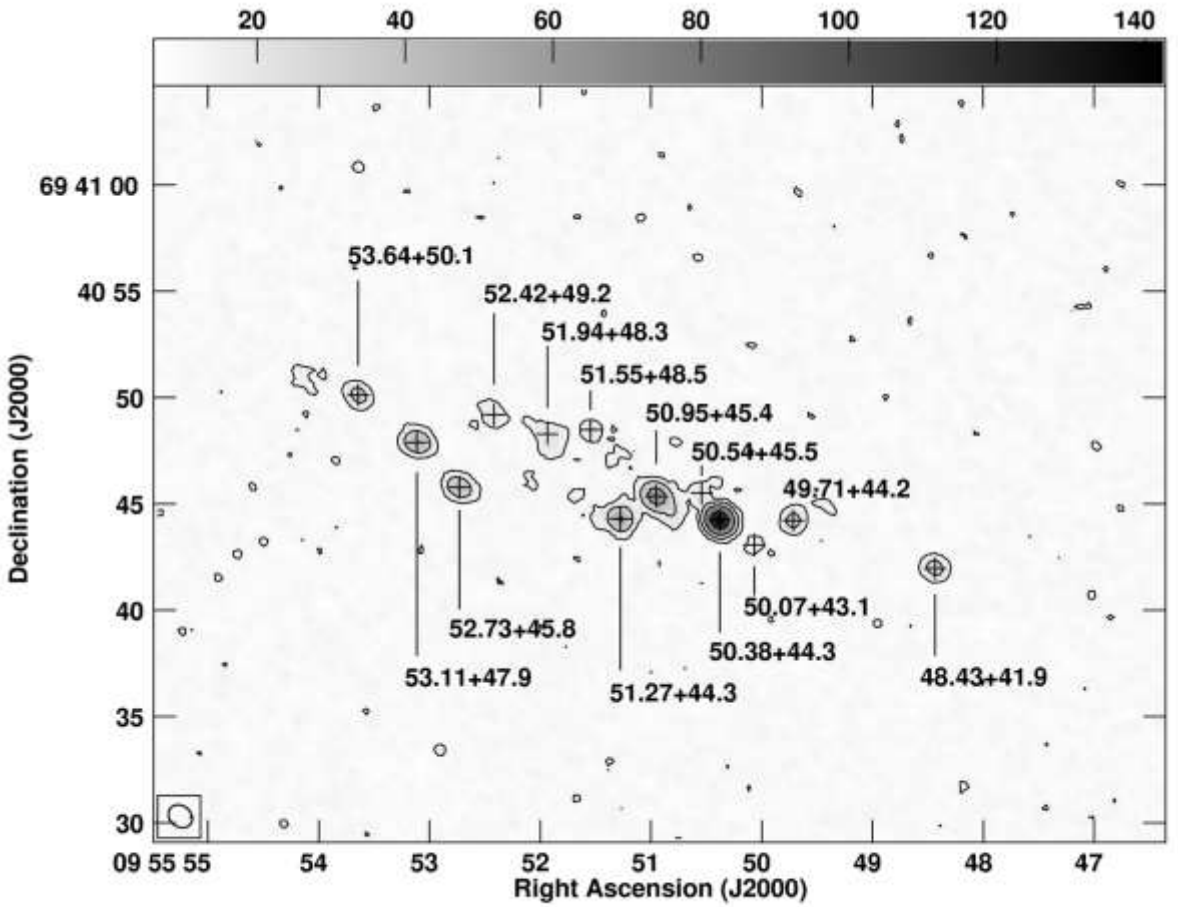
e-MERLIN observation at same spectral resolution

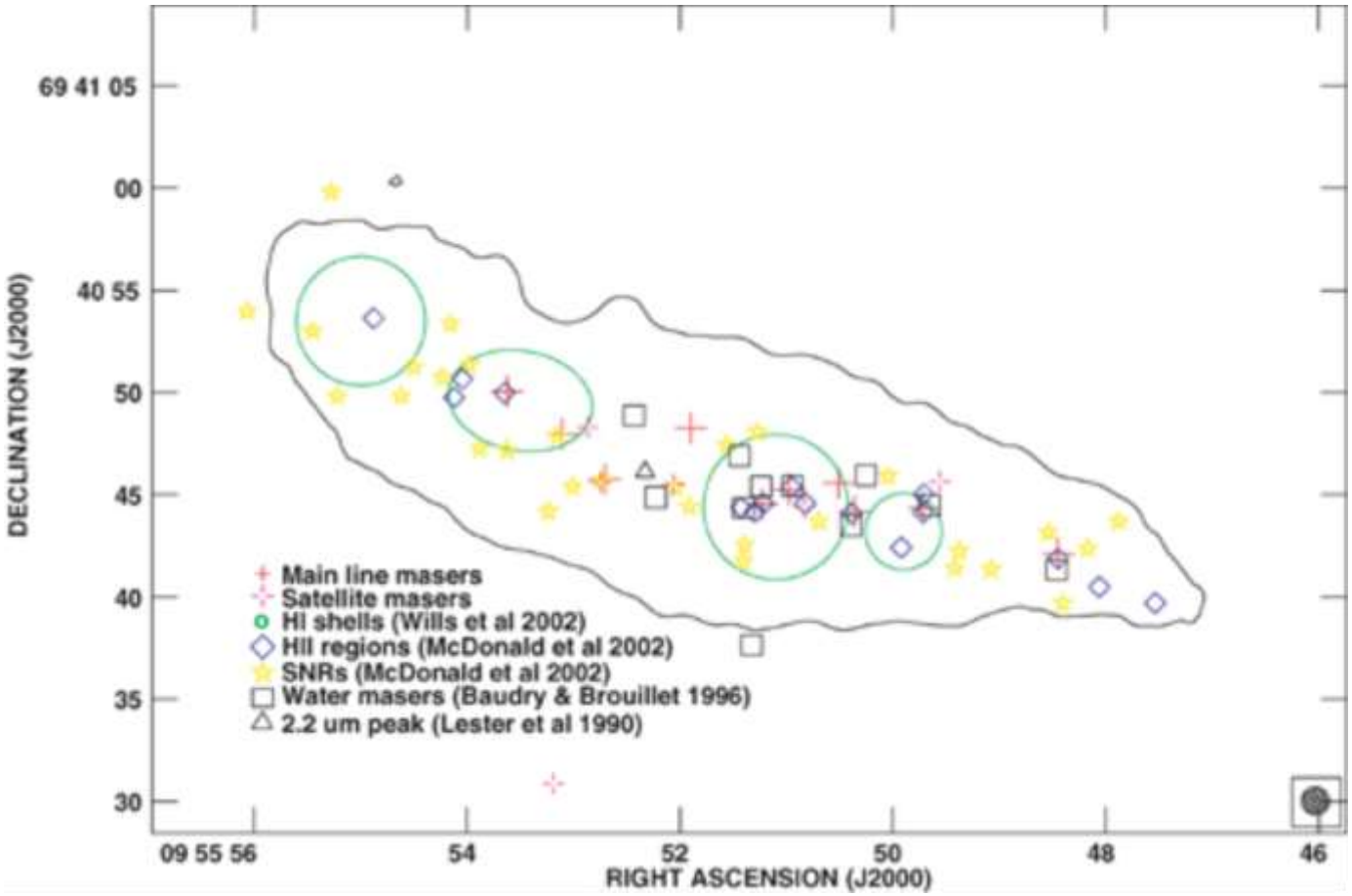
Observations

Year	Telescope	Spatial resolution	Velocity resolution	Notes
2002	VLA-A	1.4”	17 km/s	Argo et al 2007
2004	EVN	30 mas	1.4 km/s	Reduced
2006	VLA-A	1.4”	1.4 km/s	Argo et al 2010
2012	EVN	30 mas	1.4 km/s	Reduced
2017	e-MERLIN	150 mas	1.4 km/s	Part of LeMMINGs*

*LeMMINGS: Legacy e-MERLIN Multi-band Imaging of Nearby Galaxies Survey

Maser positions - VLA 2006



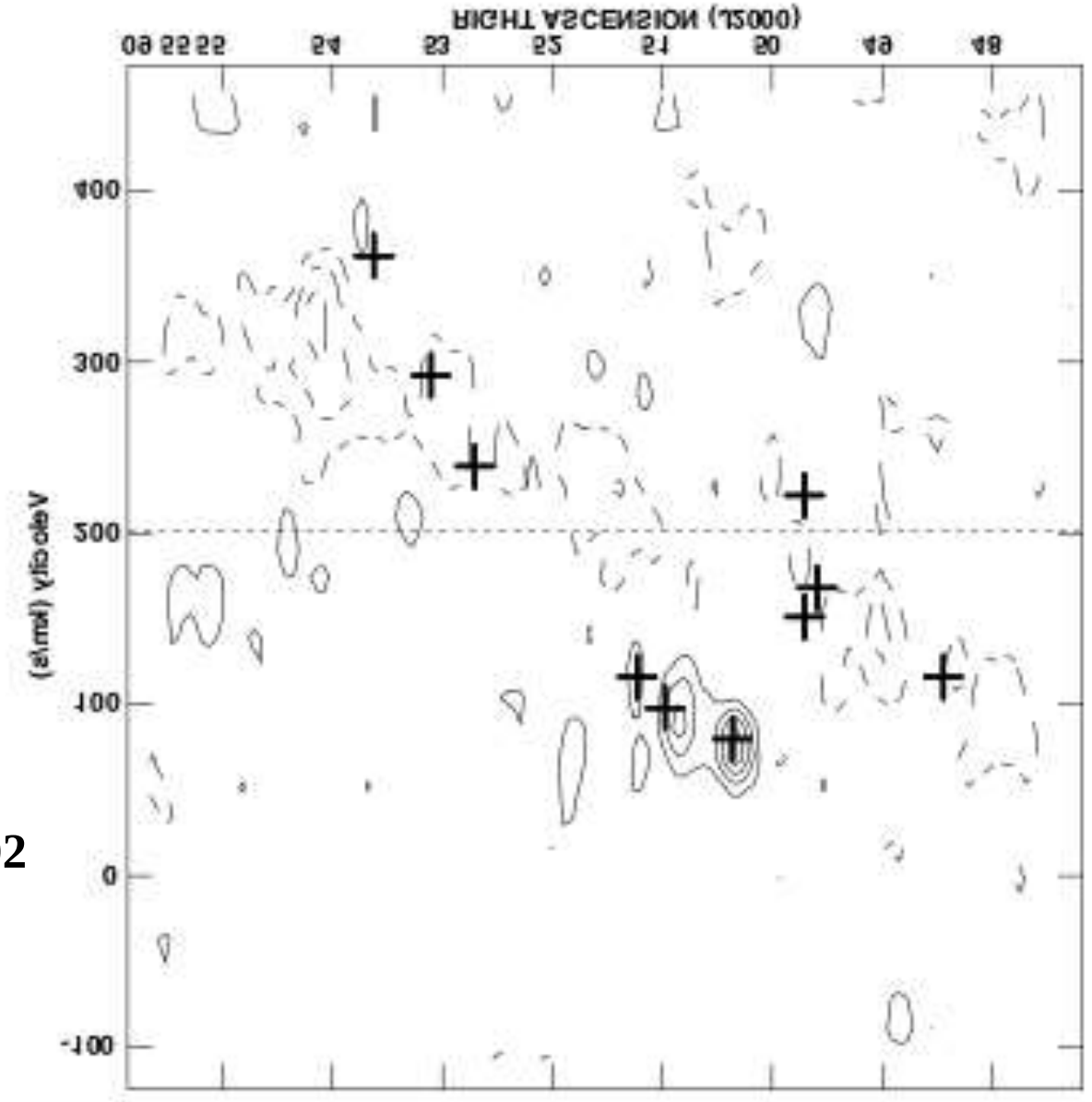


From: OH main line masers in the M82 starburst

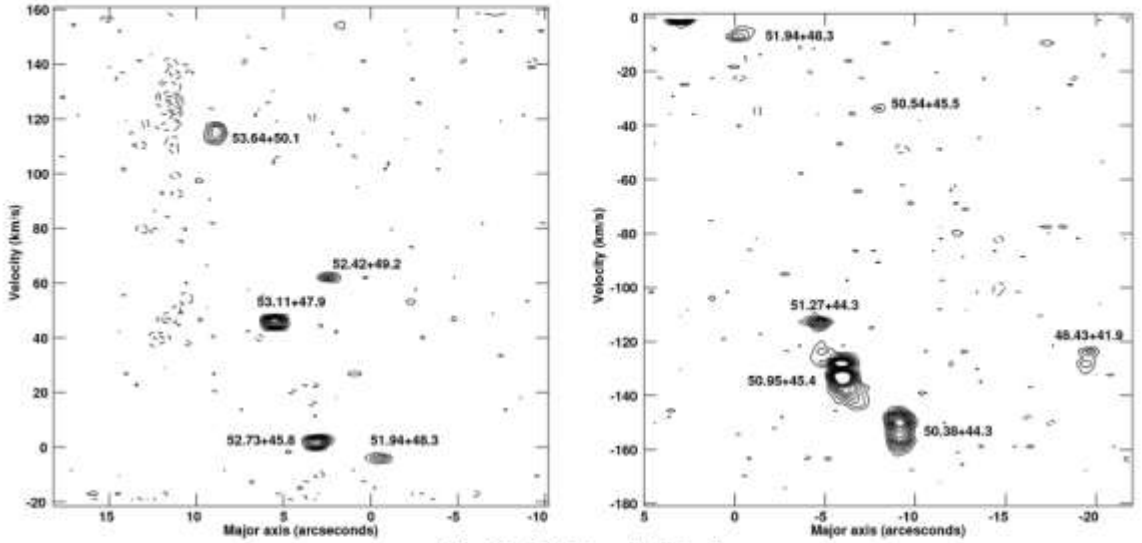
Mon Not R Astron Soc. 2007;380(2):596-608. doi:10.1111/j.1365-2966.2007.12088.x

Mon Not R Astron Soc | © 2007 The Authors. Journal compilation © 2007 RAS

Position-velocity distribution

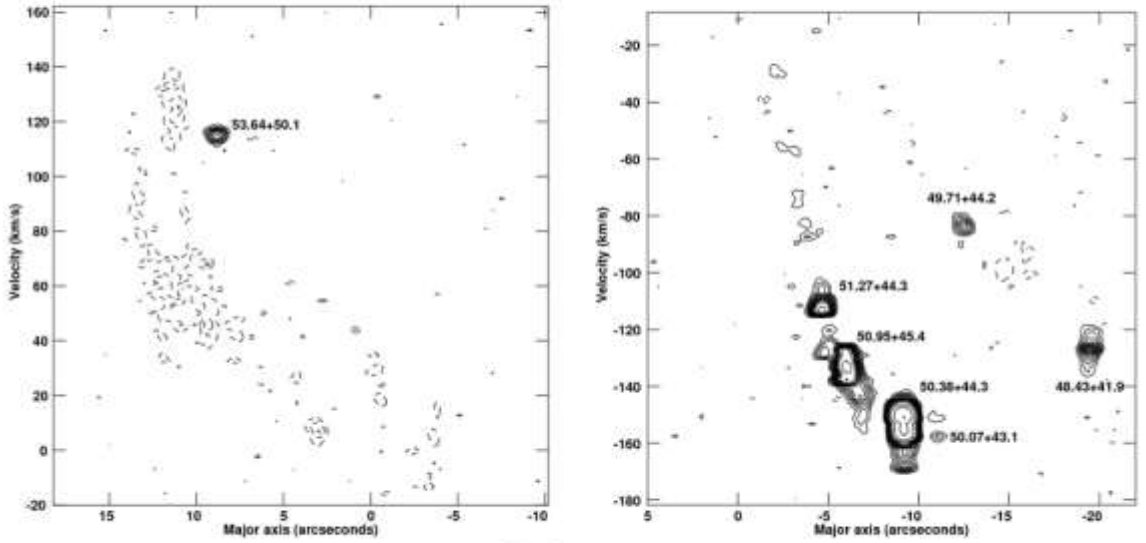


VLA 2002



1665 MHz

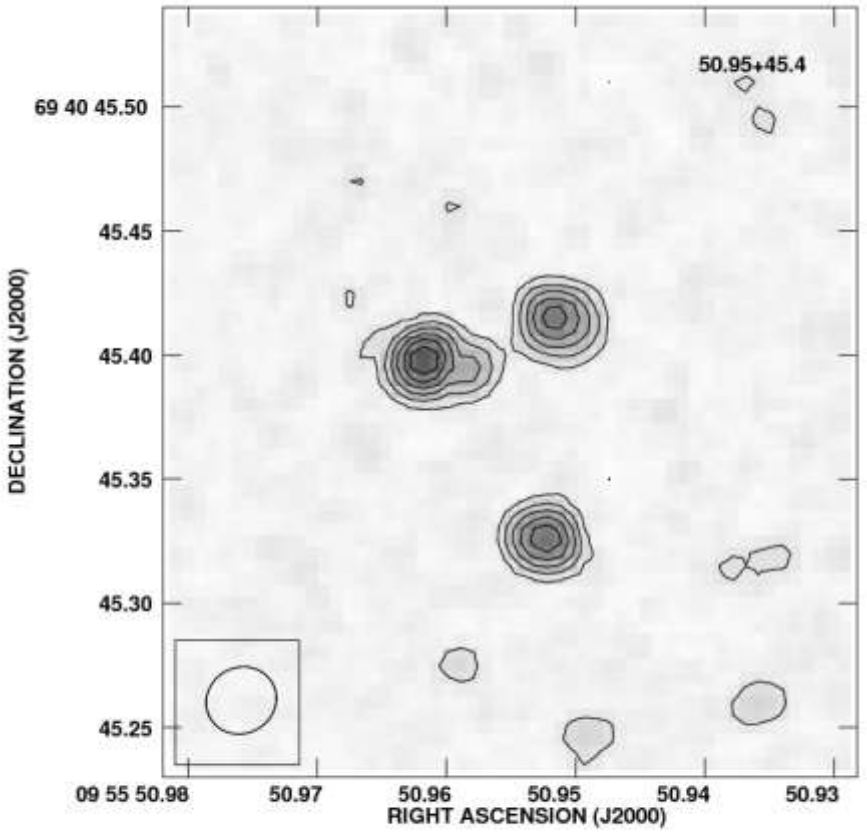
VLA 2006

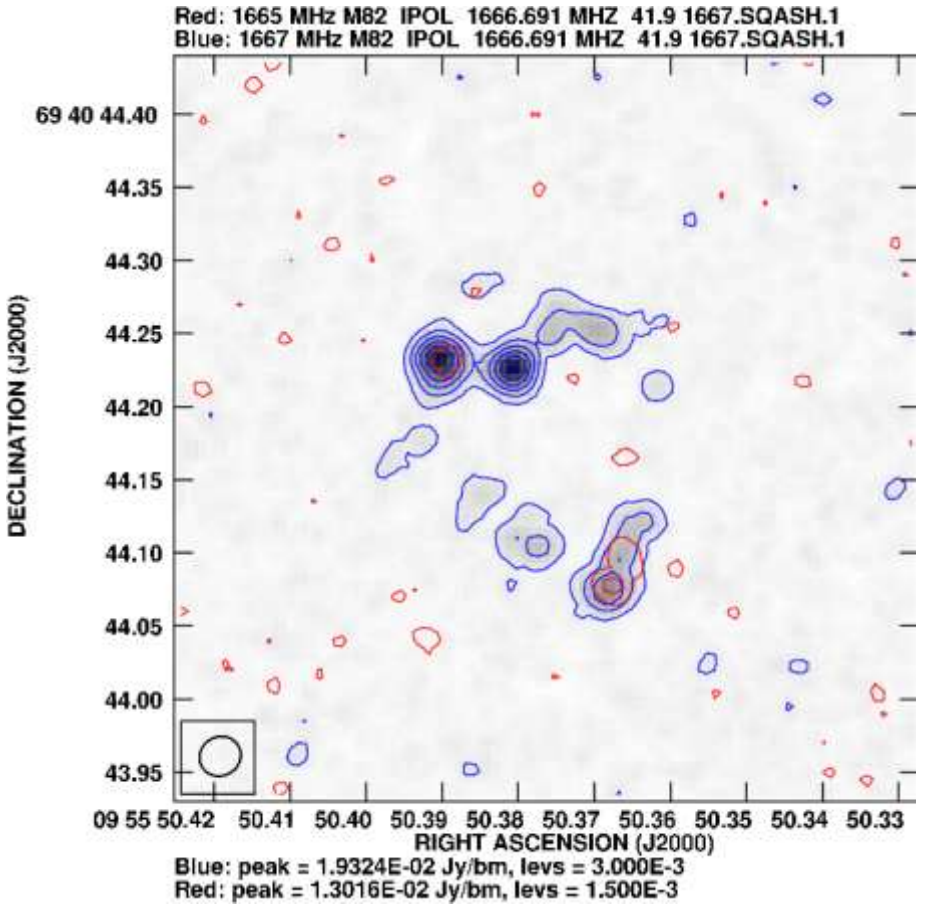


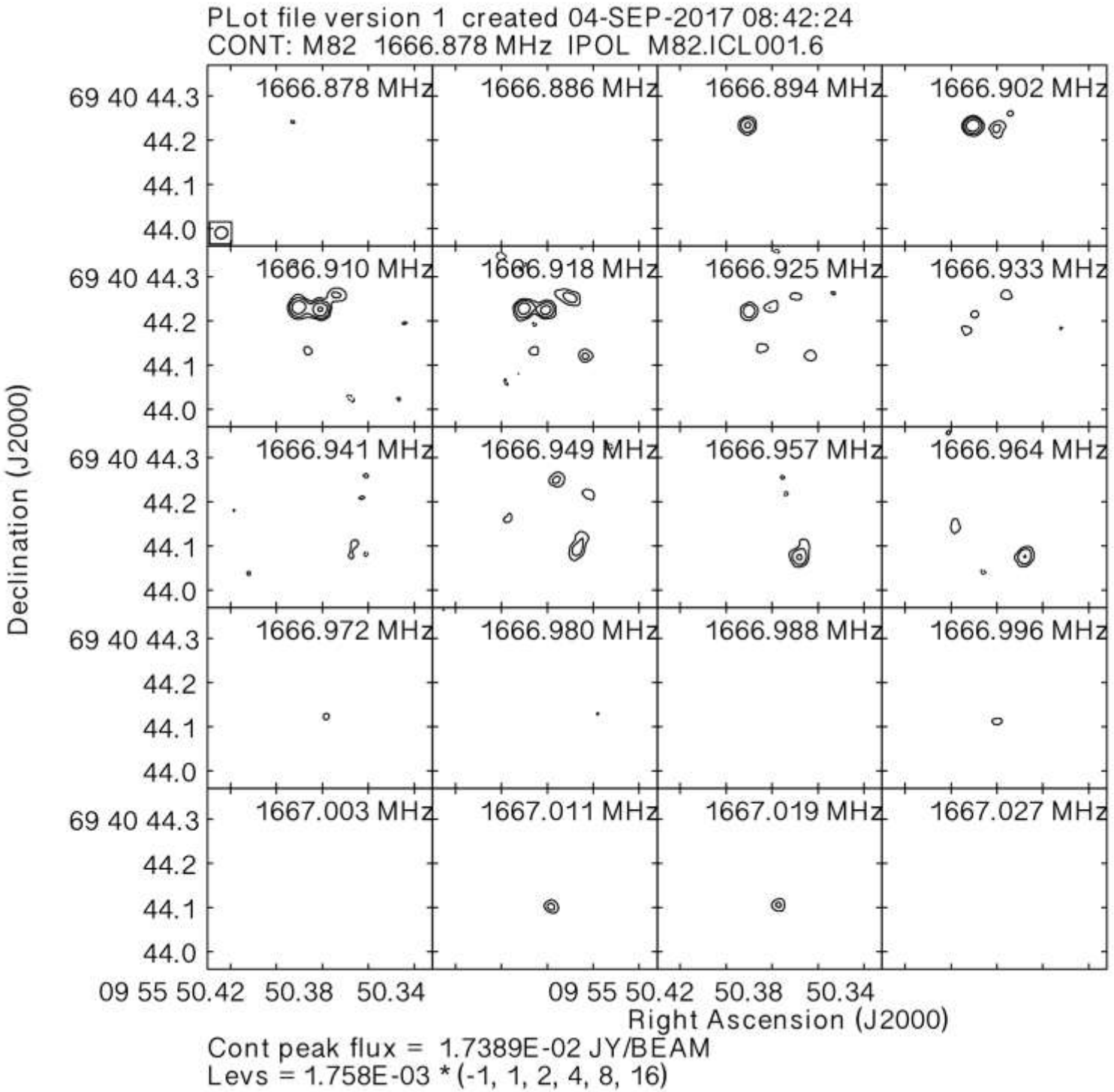
1667 MHz

EVN images of (selected) masers

(the rest are point-like)






PLot file version 1 created 04-SEP-2017 08:42:24
CONT: M82 1666.878 MHz IPOL M82.ICL001.6
1666.878 MHz
1666.886 MHz
1666.894 MHz
1666.902 MHz
1666.910 MHz
1666.918 MHz
1666.925 MHz
1666.933 MHz
1666.941 MHz
1666.949 MHz
1666.957 MHz
1666.964 MHz
1666.972 MHz
1666.980 MHz
1666.988 MHz
1666.996 MHz
1667.003 MHz
1667.011 MHz
1667.019 MHz
1667.027 MHz
69 40 44.3
44.2
44.1
44.0
09 55 50.42 50.38 50.34
Declination (J2000)
Right Ascension (J2000)
Cont peak flux = 1.7389E-02 JY/BEAM
Levs = 1.758E-03 * (-1, 1, 2, 4, 8, 16)

Continuum associations?

Here an HII region

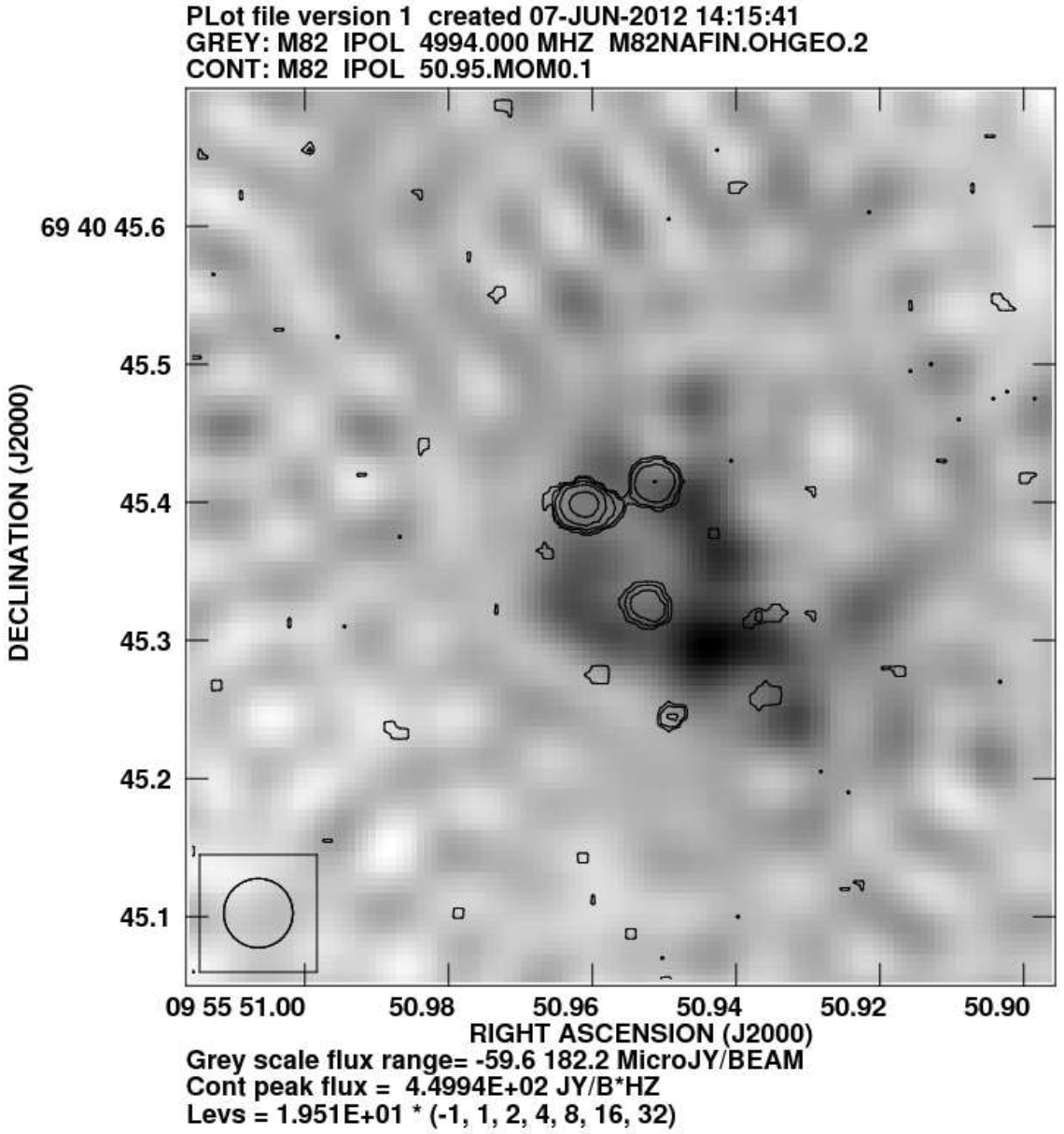
(note: continuum from 5GHz gVLBI)

Registration problems?

(gVLBI data was self-calibrated)

Limits on amplification:

Between 40 and 224



What's next?

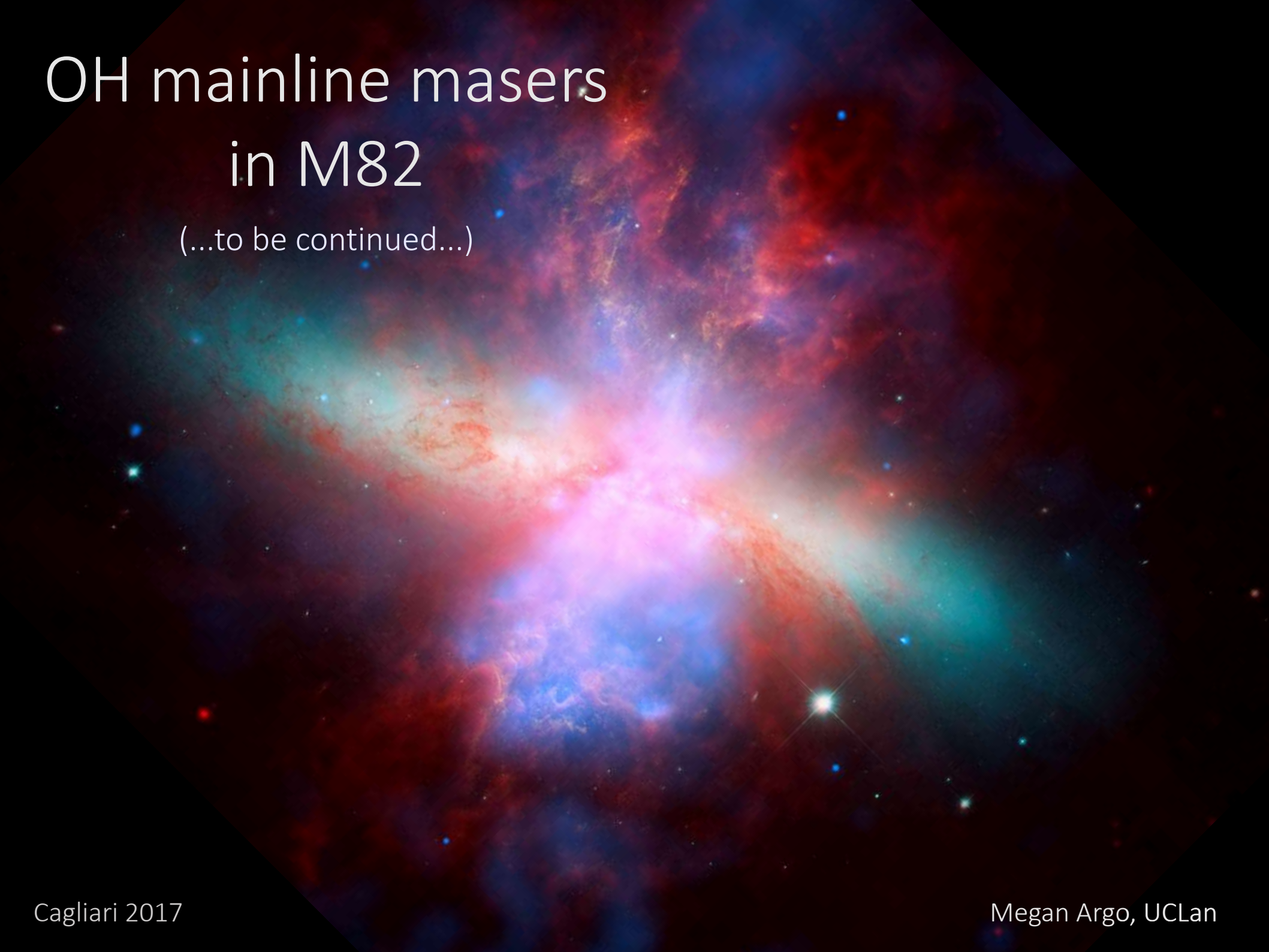
Careful comparison with continuum datasets using similar resolution – Danielle Fenech's global VLBI maps -> amplification factors.

Imaging second EVN epoch with same uv-coverage as the first (current MSc project) -> variability?

Re-observe e-MERLIN programme -> diffuse component?

OH mainline masers in M82

(...to be continued...)



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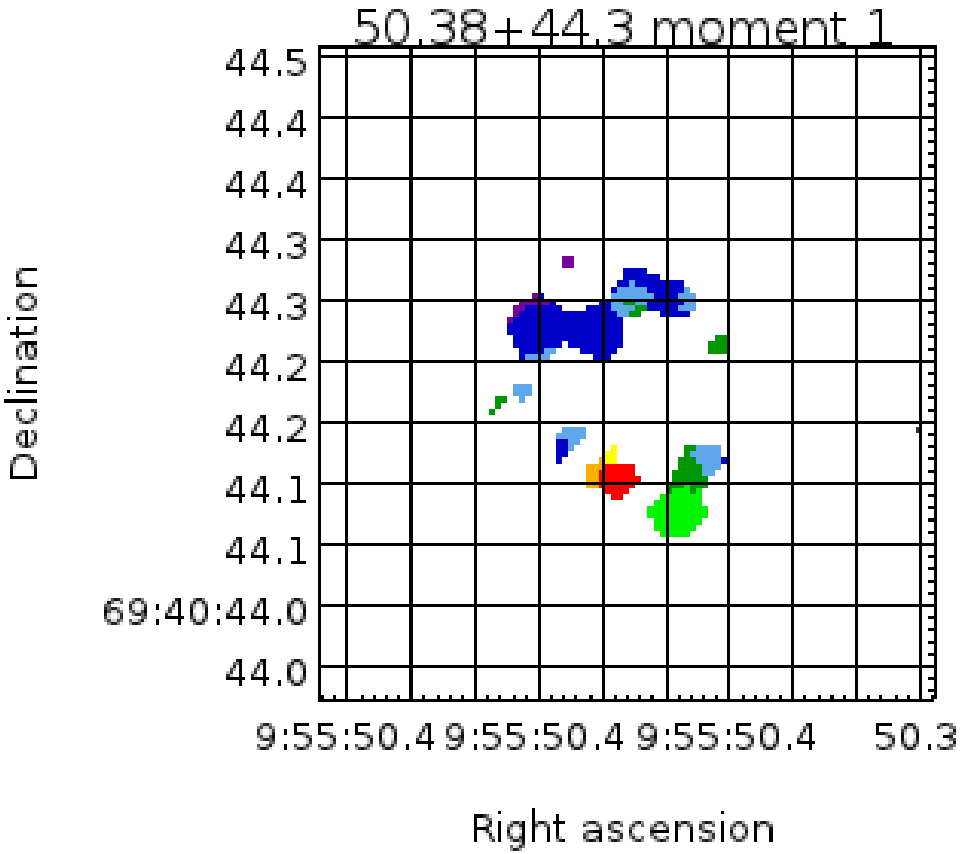
Moment map of 50.38



HI optical depth

