A KVN-VERA Joint Imaging Observation of 44 GHz Methanol Maser toward G18.34+1.78

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Abstract

The world's first

VLBI imaging of 44GHz methanol maser!

- We conducted first time observations of 44GHz methanol maser with KVN+VERA.

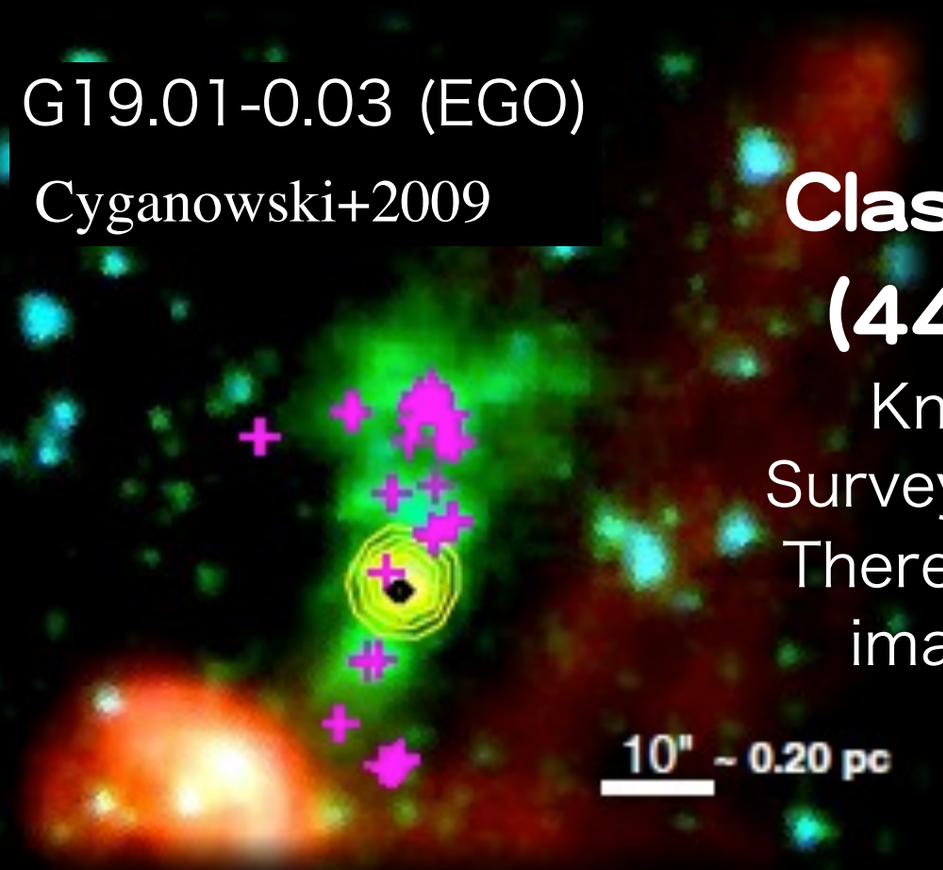
- Because of the extended distribution around 100 AU, it has been thought that detecting 44GHz methanol maser with VLBI is difficult so far.

- But, KVN+VERA array was able to detect 44GHz methanol maser toward G18.34+1.78 with short baselines and good UV-coverage/efficiency.

  →We were able to confirm the spot structure on images.

Intr.

Methanol maser around Massive star forming regions



Class I methanol maser
(44GHz 7_0-6_1A^+ etc.)

Known sources are limited.
Surveys are currently in progress.
There are dozens interferometer images, but no VLBI images.

Class II methanol maser
(6.7GHz 5_1-6_0A^+ etc.)

Over 1,000 sources have already detected by large survey projects.
There are some statistical study with VLBI imaging.

VLBI can detect proper motions and spacial distributions in circumstellar gases with few milli arc second scale.

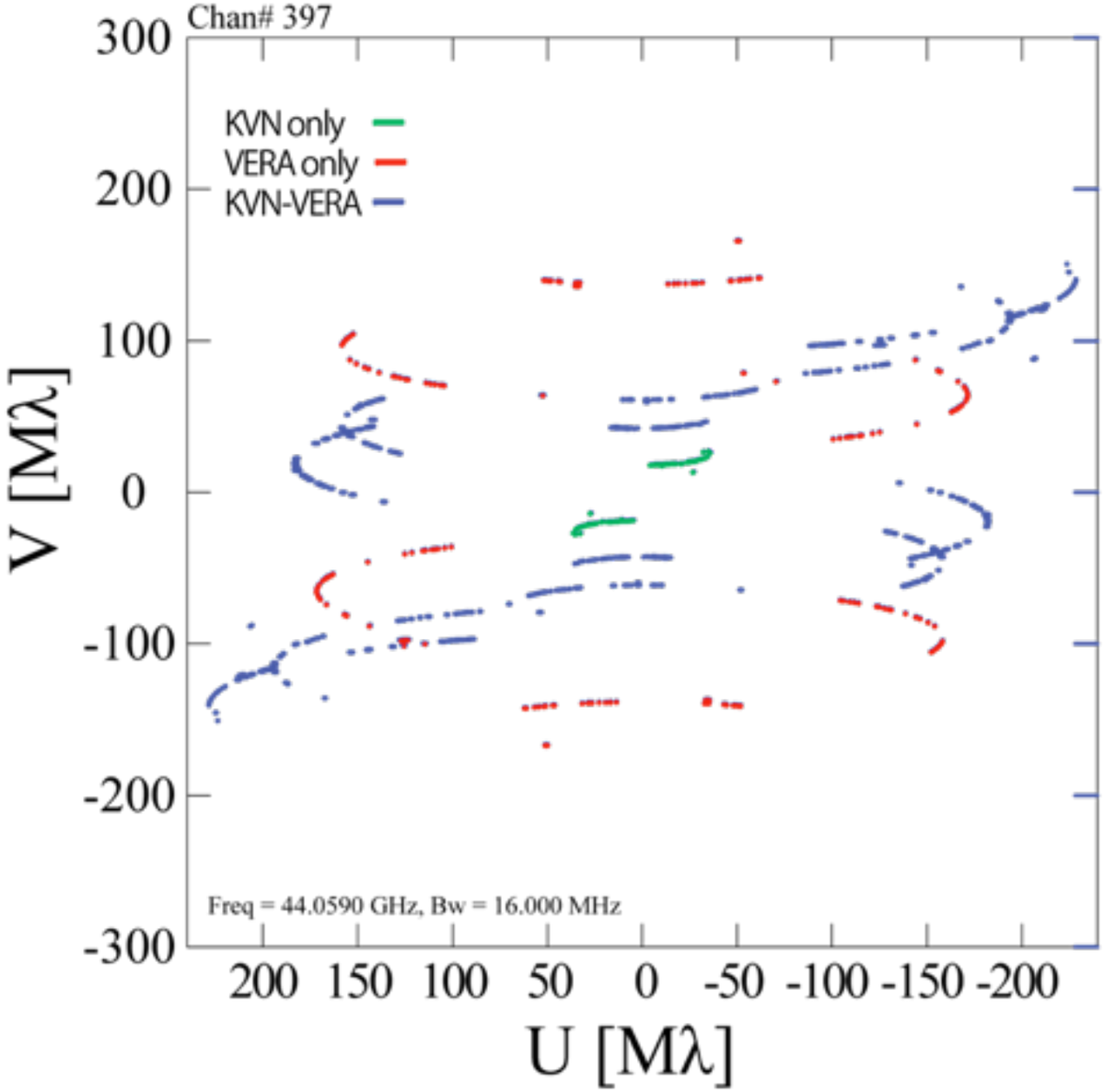
Obs.

1st imaging observations of 44GHz methanol maser sources with KVN+VERA

- Date : Apr. 8, 2012, UT 17h - 24h
- Line : 44GHz ClassI methanol maser
- Target : G18.34+1.78
- D_{kin} : ～2.7kpc
- Array: KVN(2)+VERA(3)
- Recording : DIR1000 128Mbps

Results

UV coverage is improved with KVN+VERA



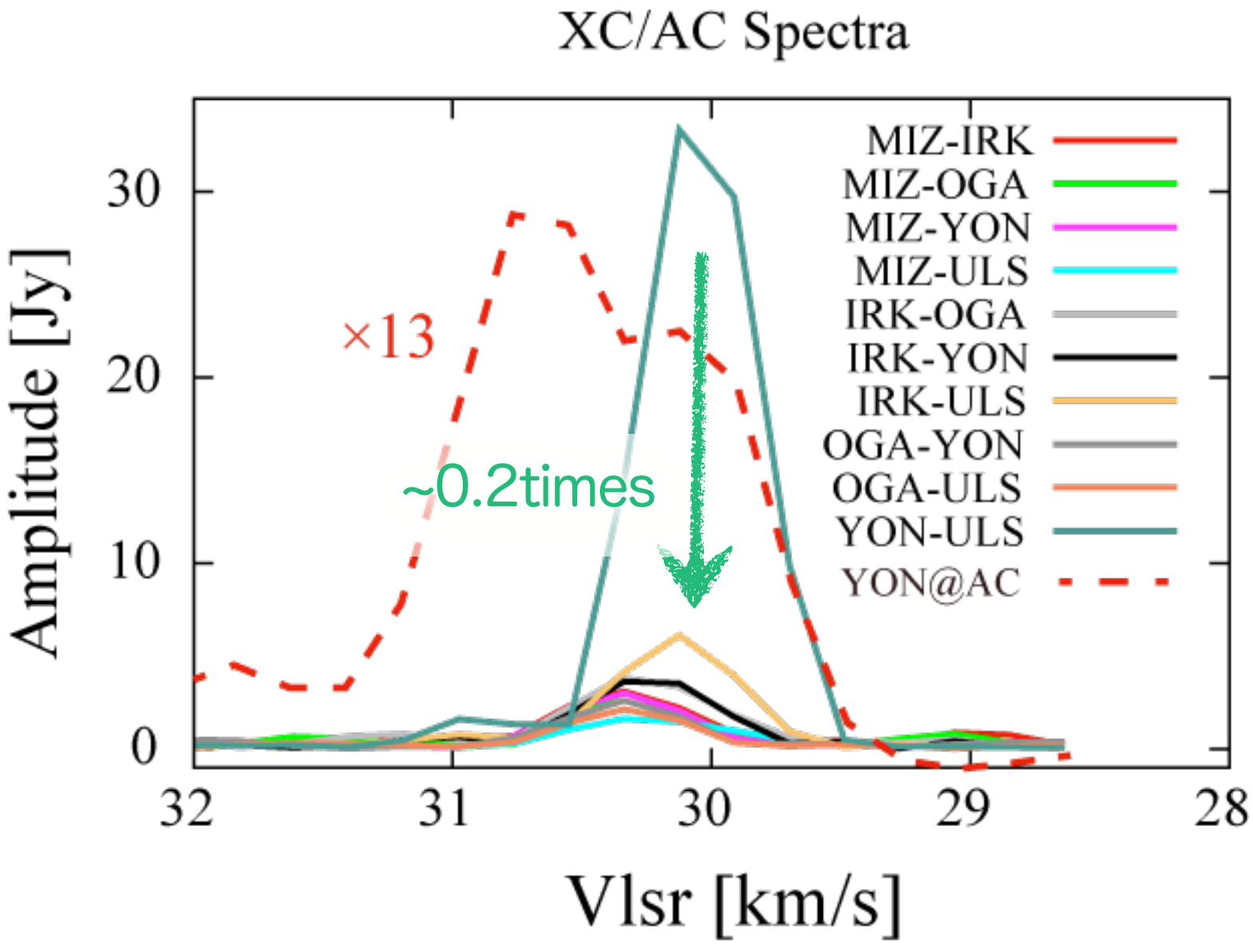
KVN+VERA observations produce a complementary effect.

We get a new window!!

Apr. 8, 2012
G18.34+1.78

Results

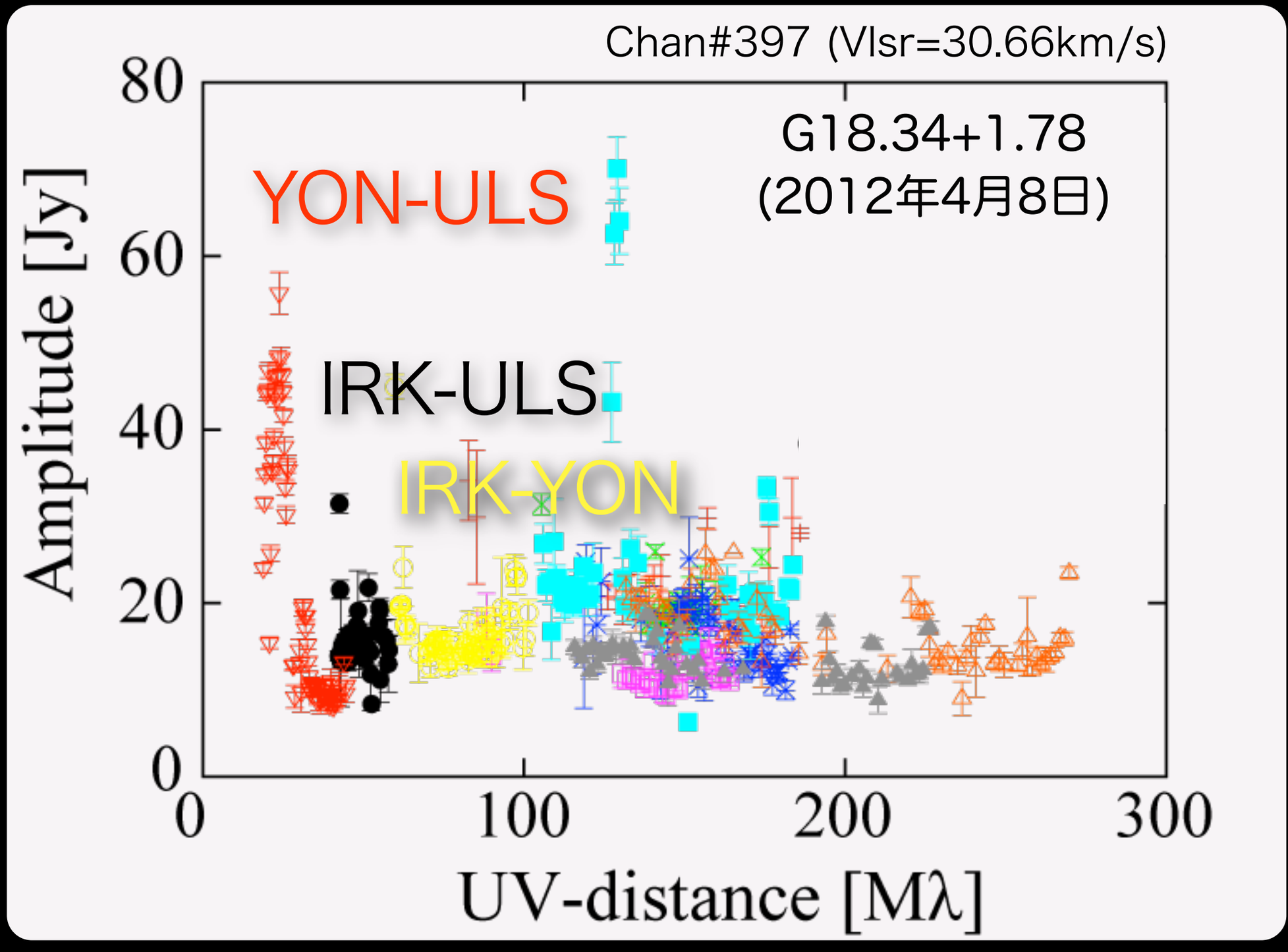
Highly resolved out



44GHz methanol maser toward G18.34+1.78
(Apr. 8, 2012)

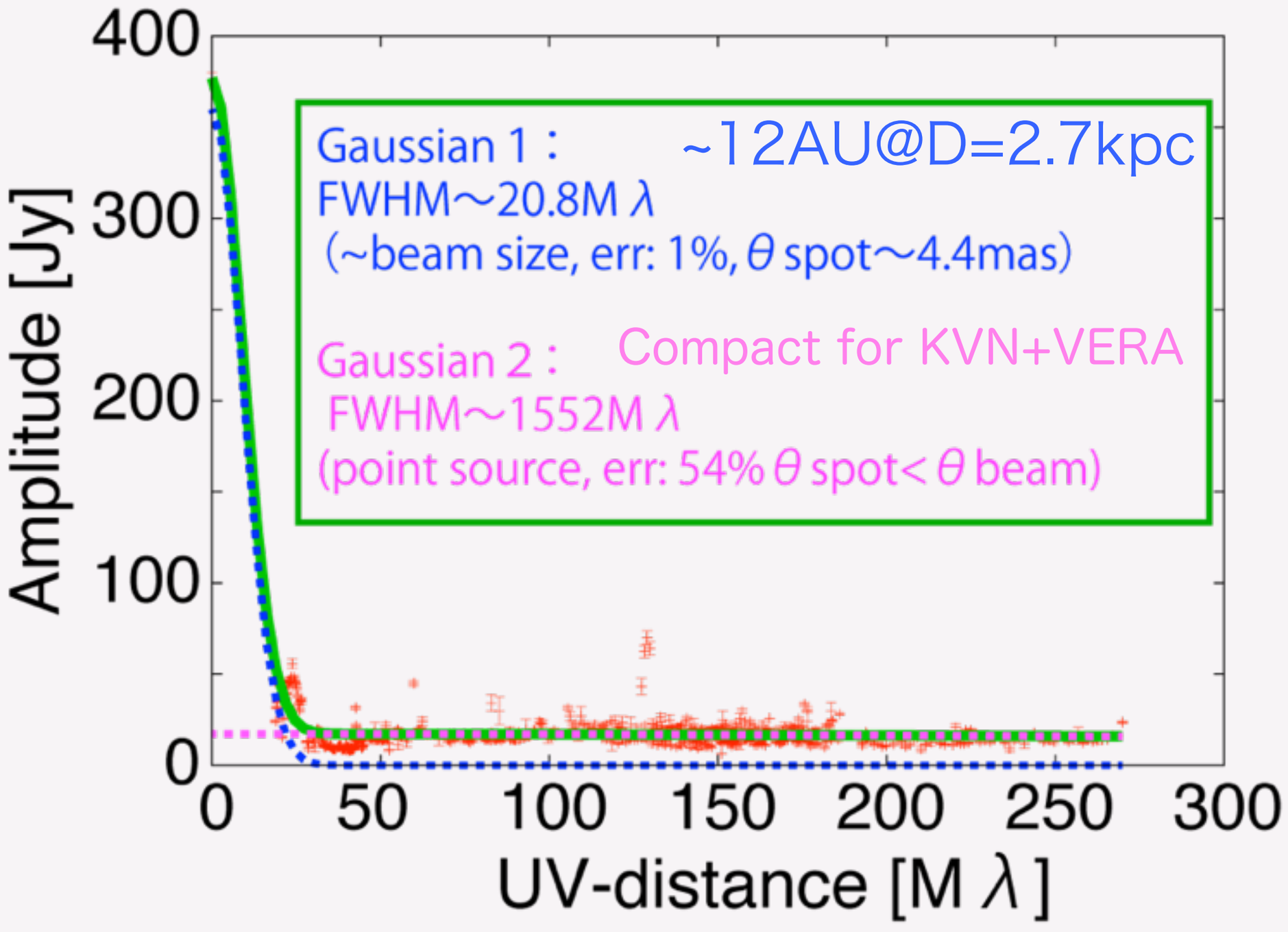
Results

Highly resolved out



Results

Spot size estimation

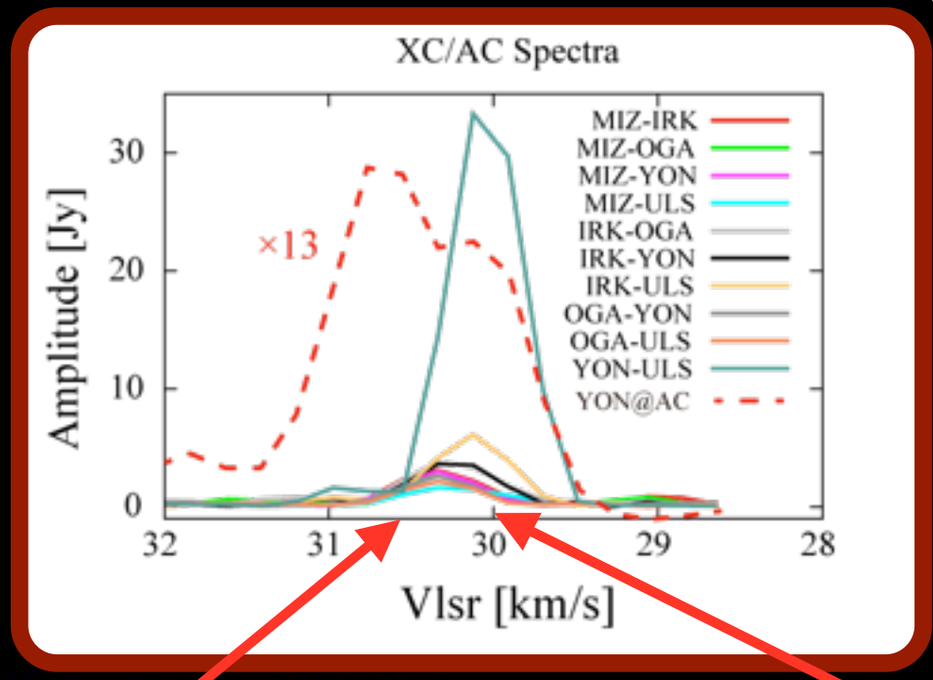


Suggests Compact + Extended component.

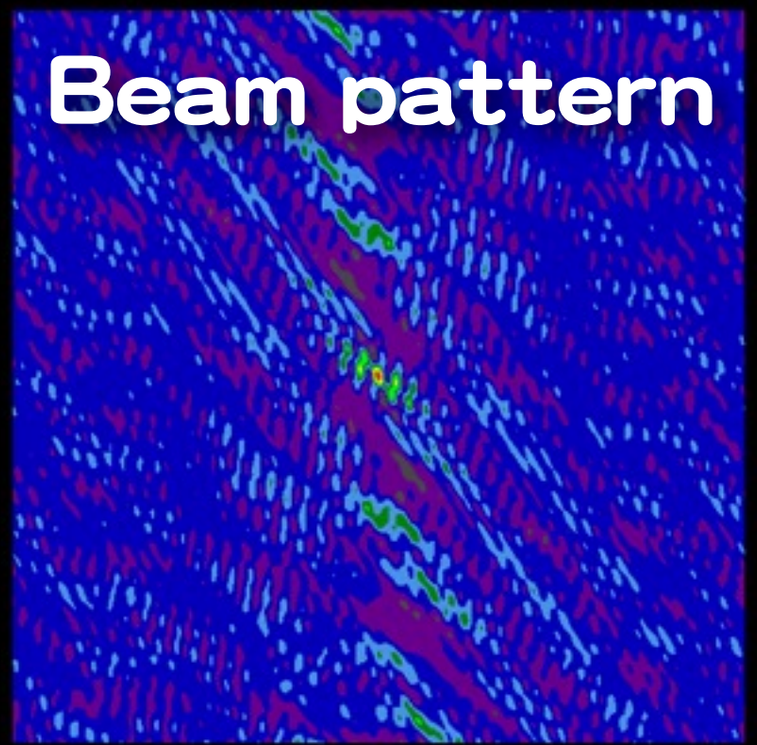
Results

The world's first

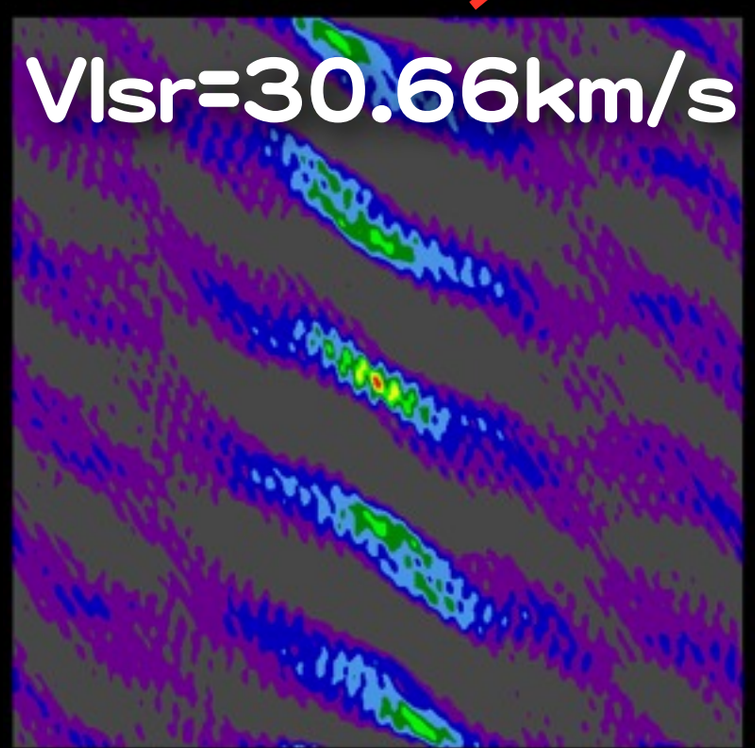
44GHz methanol VLBI maps



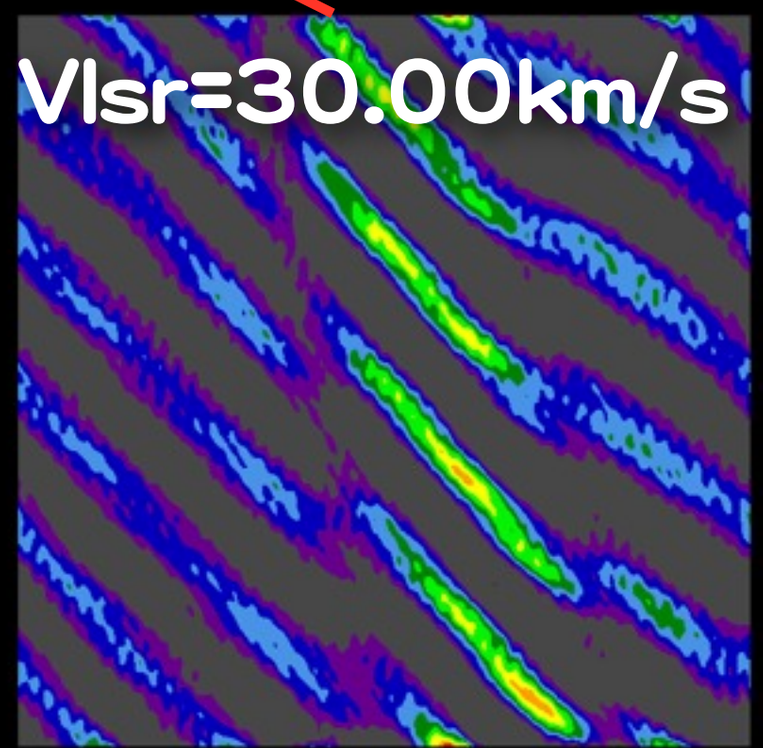
Beam pattern



Vlsr=30.66km/s



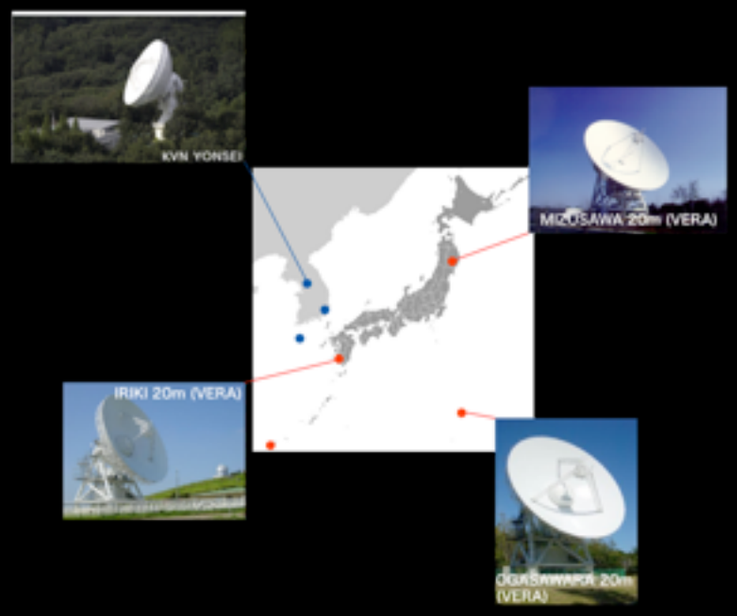
Vlsr=30.00km/s

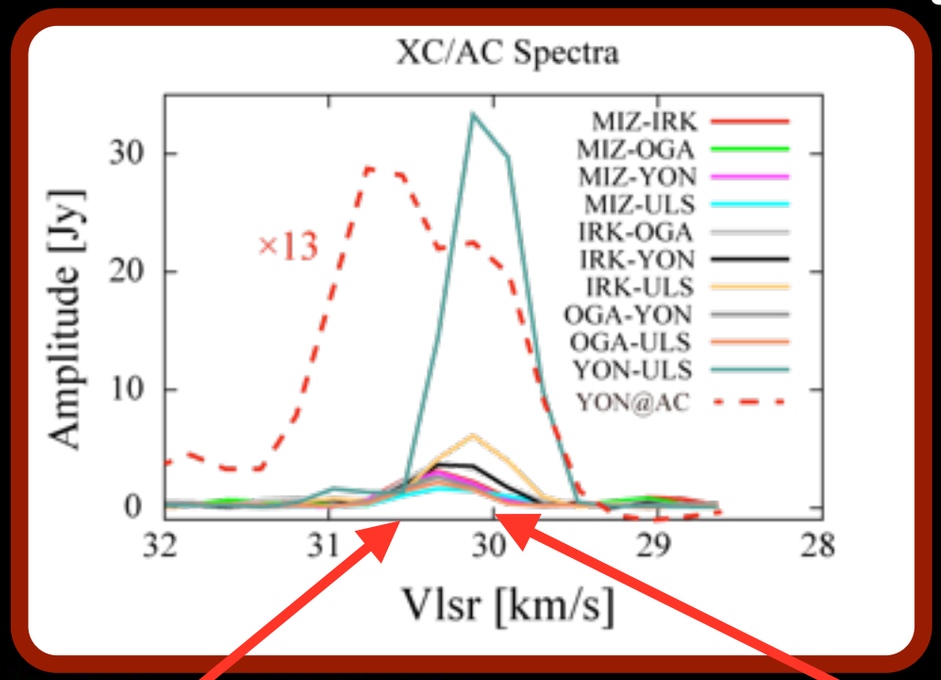


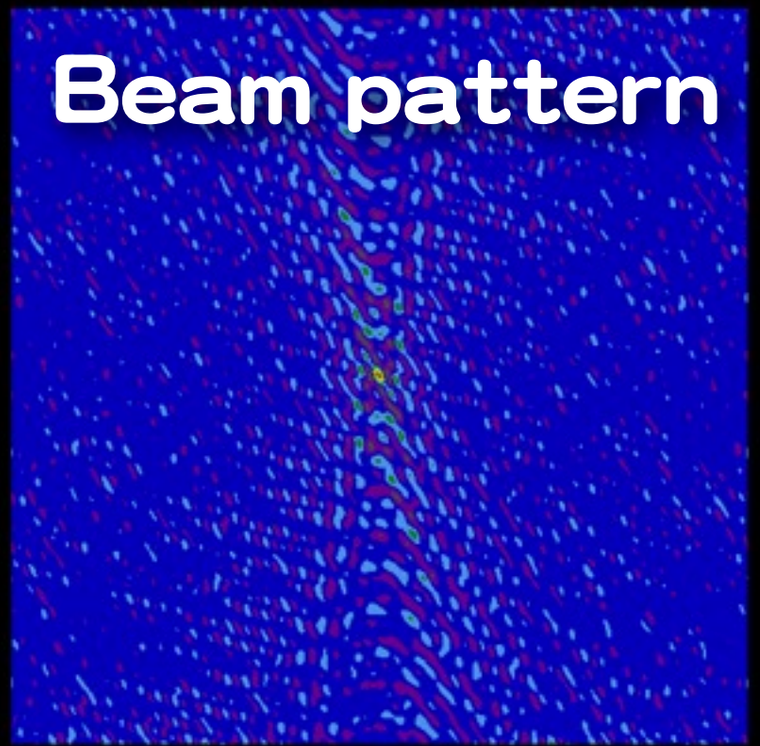
Results

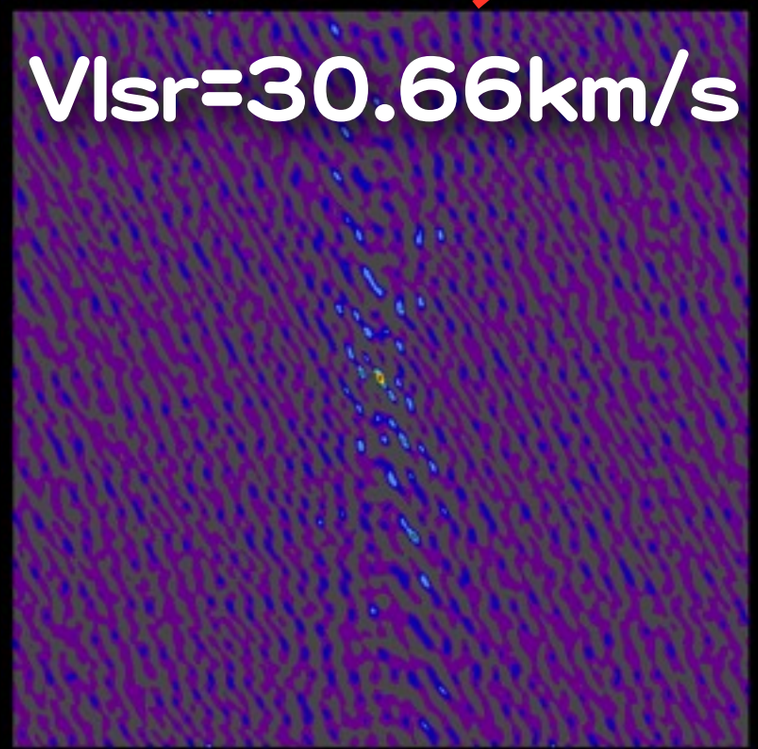
The world's first

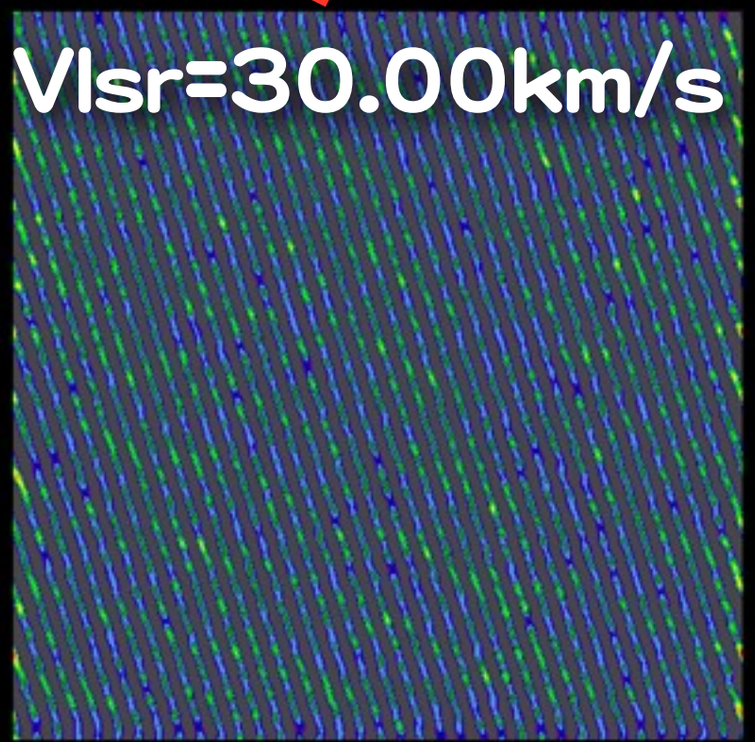
44GHz methanol VLBI maps







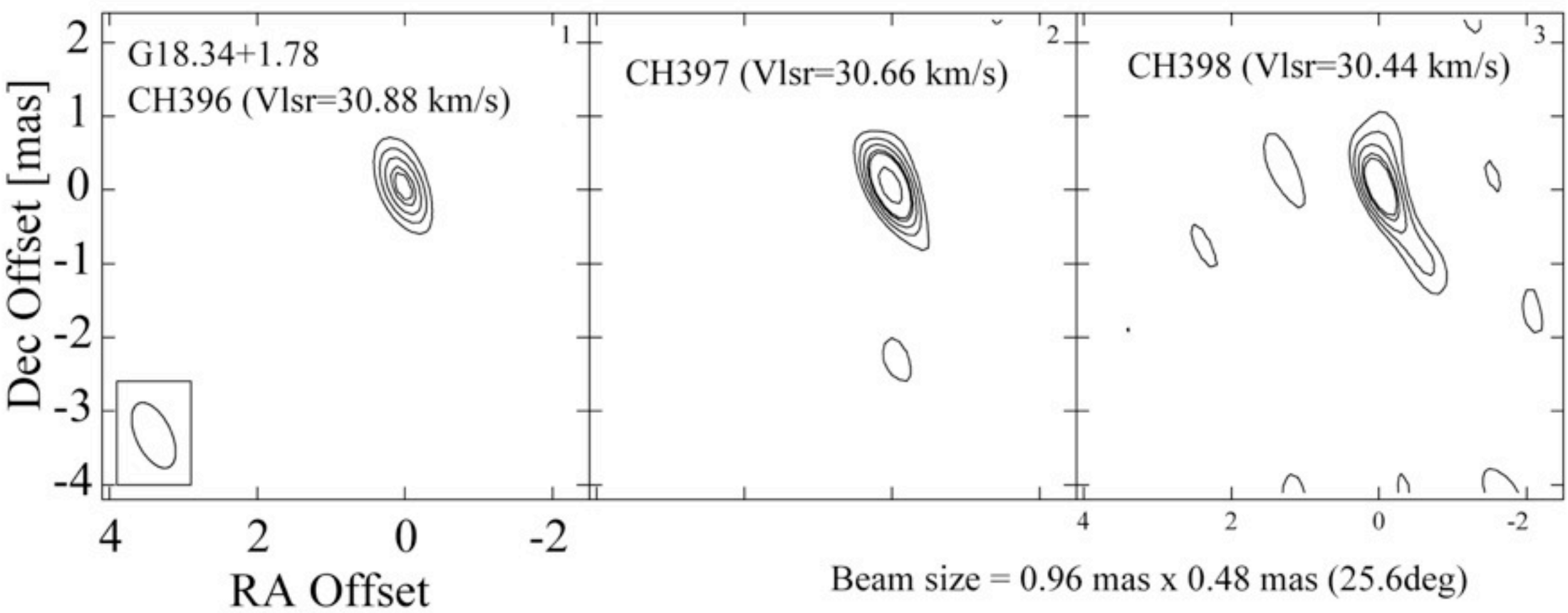




Results

The world's first

44GHz methanol VLBI maps



A compact component was detected in 3 channels.

Summary

- We conducted imaging observations of 44GHz methanol maser with KVN+VERA first time.

- KVN+VERA observations produce a complementary effect.

  ➡Antenna number, efficiency, baseline length, UV-coverage.

- KVN+VERA array was able to detect 44GHz methanol maser toward G18.34+1.74.
  - First image of 44GHz methanol maser spots.
  - Minimum limit of extended component is 4.4 mas(～12 AU)
  - Compact maser spots were imaged.

- Near future, we will get following informations for multiple sources.
  - Distributions, absolute positions, spot sizes, proper motions etc.

  ➡G44.9-0.39 (r12089c) is already imaged by Hirota-san yesterday.

Fin.