

Report on Activities at the SMA

by

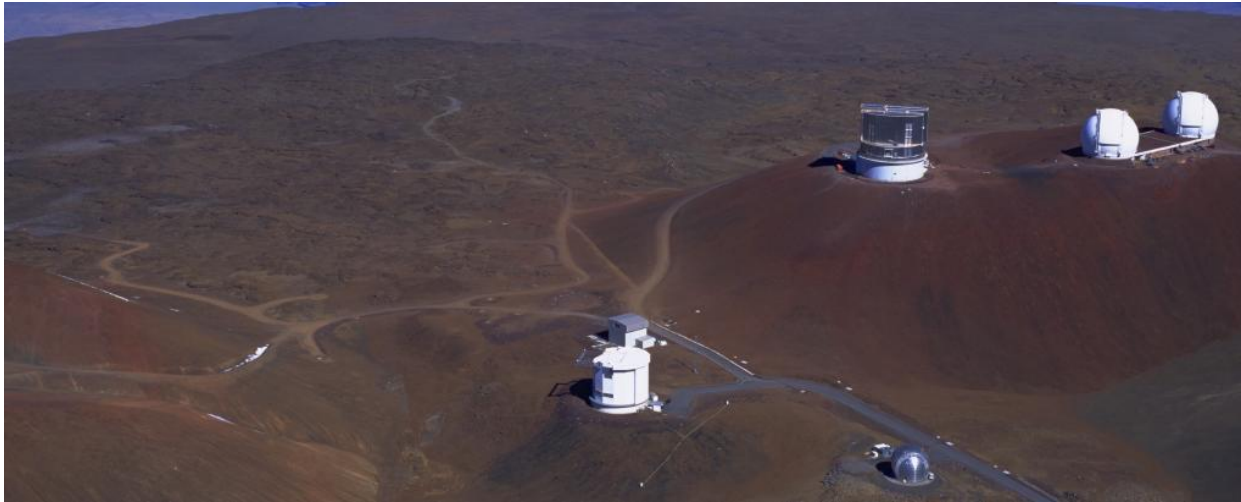
Jim Moran

Director, SMA, through Friday

Mauna Kea Users' Meeting

September 29, 2005

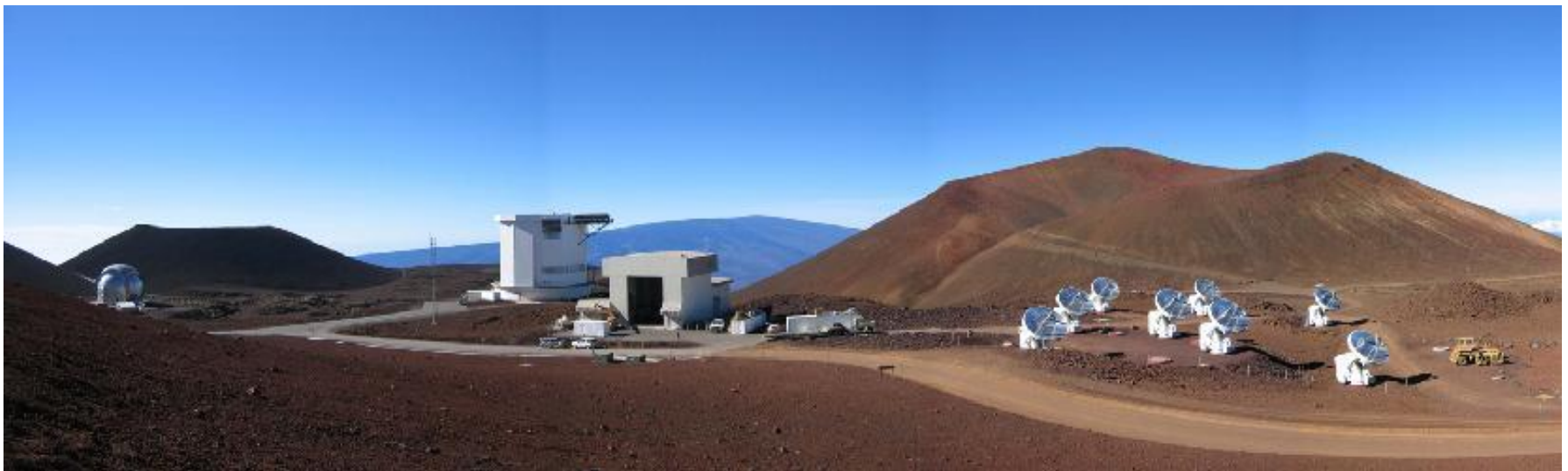
Mauna Kea: Submillimeter Valley



1998

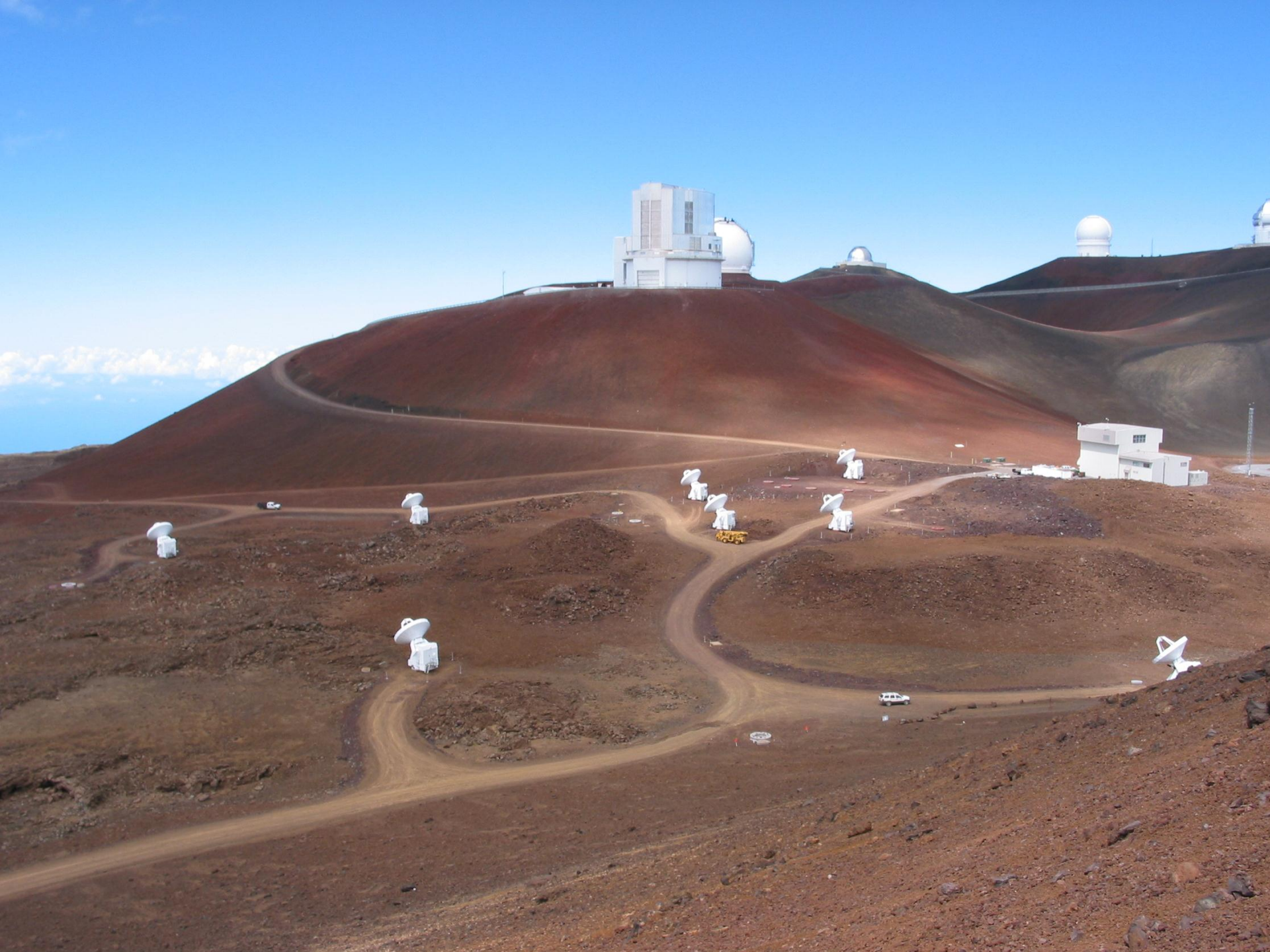


SMA Dedication
November 2003



SMA Extended Configuration March 2004





SMA Very Extended Configuration May 2005



Capabilities

Antennas: 8 antennas of 6 m diameter, 12 μm rms surface

Configurations: 24 pads in four rings
baseline lengths 8 - 508 m,

Receivers: max 8 per antenna; 2 simultaneously

177-256 GHz (8 in operation)

256-360 GHz (8 in operation)

320-420 GHz (start May 2005)

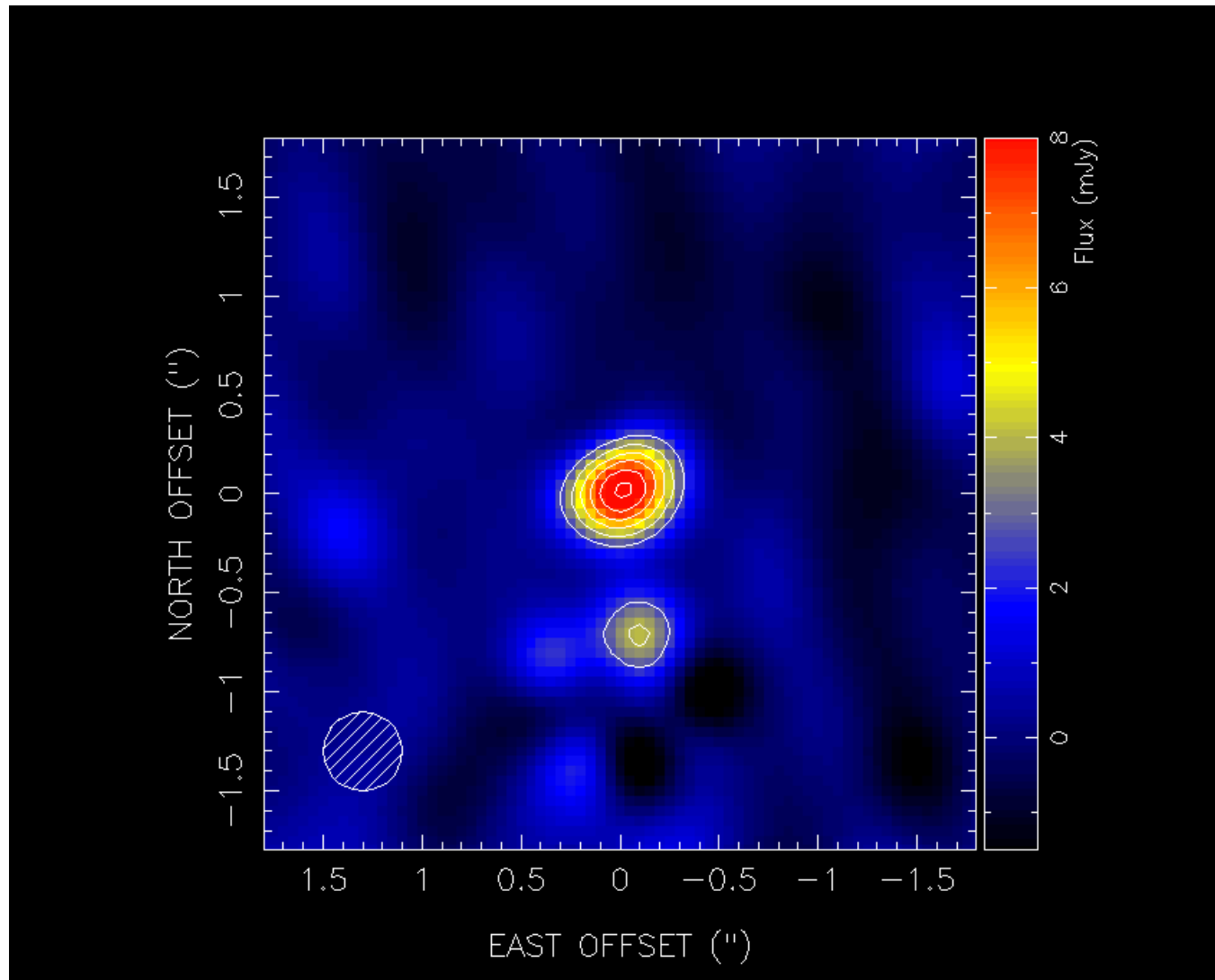
420-520 GHz (future)

600-720 GHz (6 in operation, 2 more in Dec 2005)

780-920 GHz (future)

Correlator: 2 GHz bandwidth, 1 MHz resolution at full bw/2rcvrs

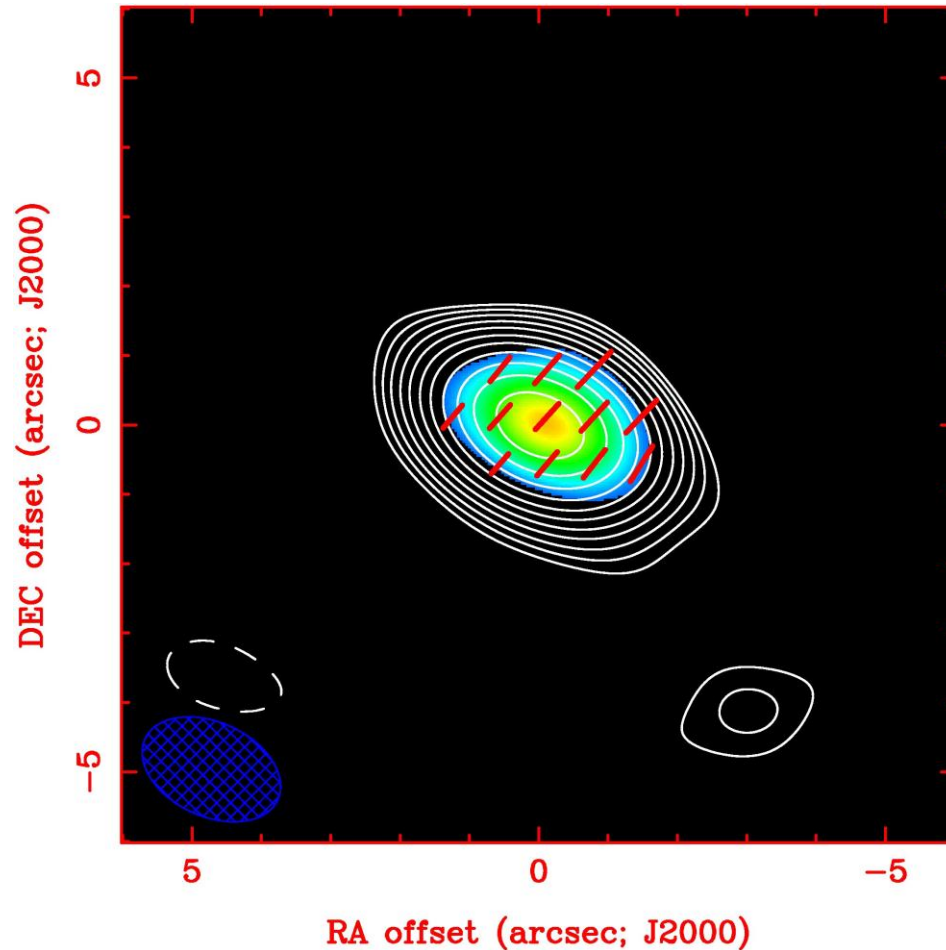
PLUTO and CHARON



SMA/VE configuration, 220 GHz, May 2005

Gurwell &
Butler, 2005

SMA Observations of Sgr A*



Instrumental PhD
Project of Harvard
Student Dan Marrone

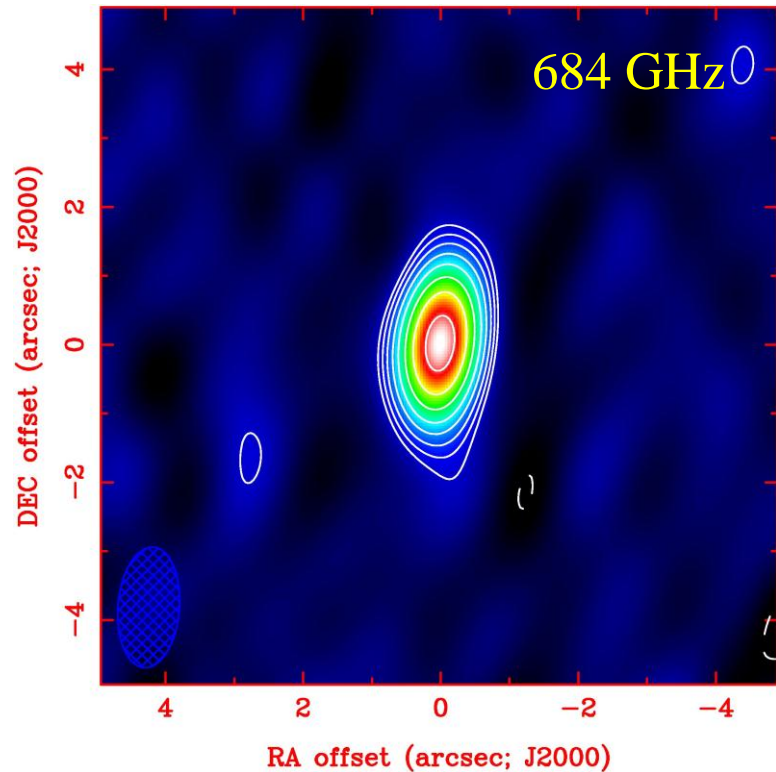
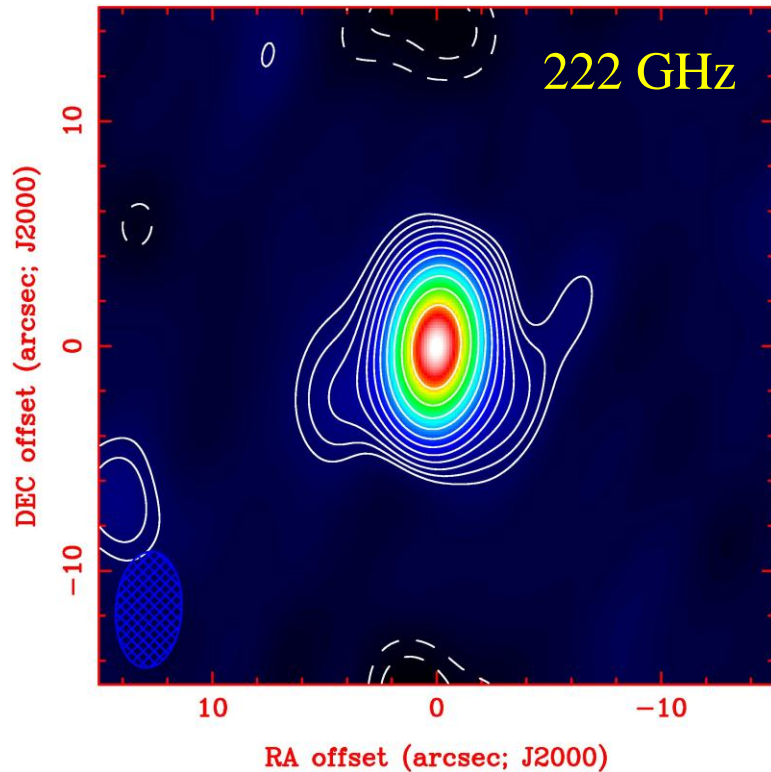
Marrone et al
2005

Polarization at 334 GHz, measured on May 25, 2004

Lack of rotation of polarization angle puts a limit on Faraday rotation

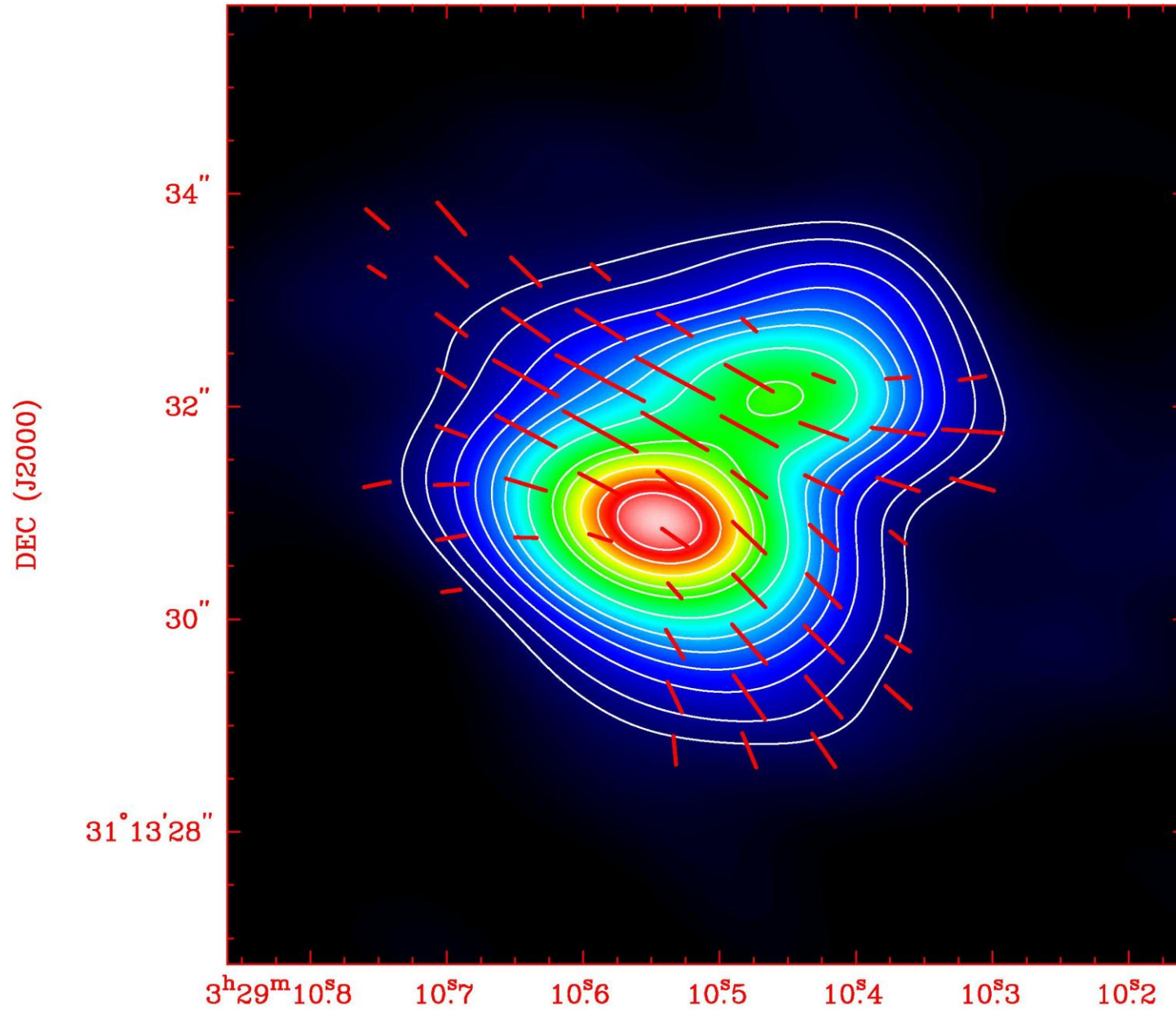
Mass accretion rate less than 10^{-6} solar masses/year

Sgr A* continuum 222/684 GHz

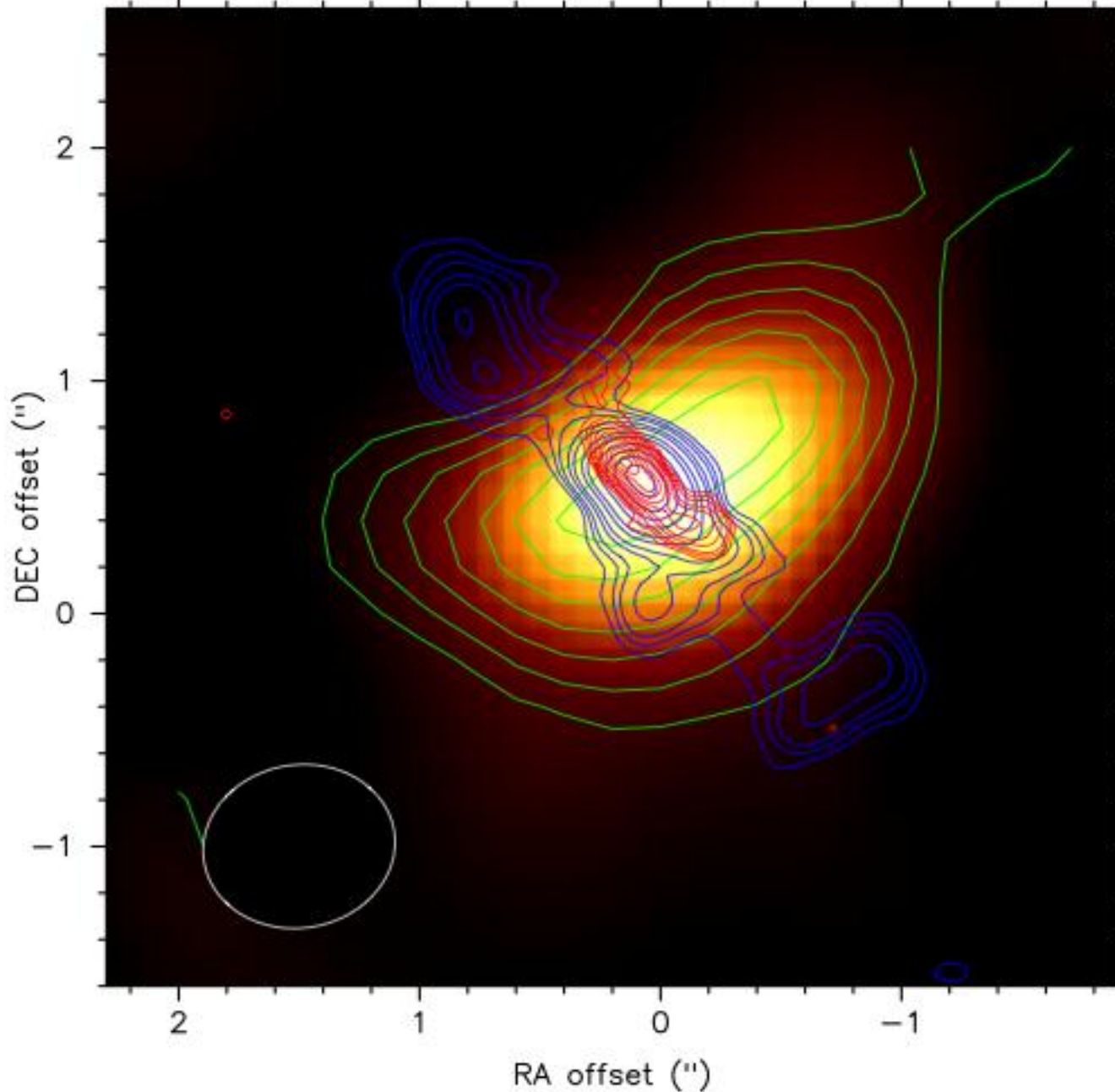


Marrone, Moran, Zhao & Rao, 2005

NGC1333/IRAS4A 345 GHz Total Intensity and linear polarization (B field)



Cepheus A/ HW 2 12 Solar Mass Protostar



VLA 8 GHz

VLA 22 GHz

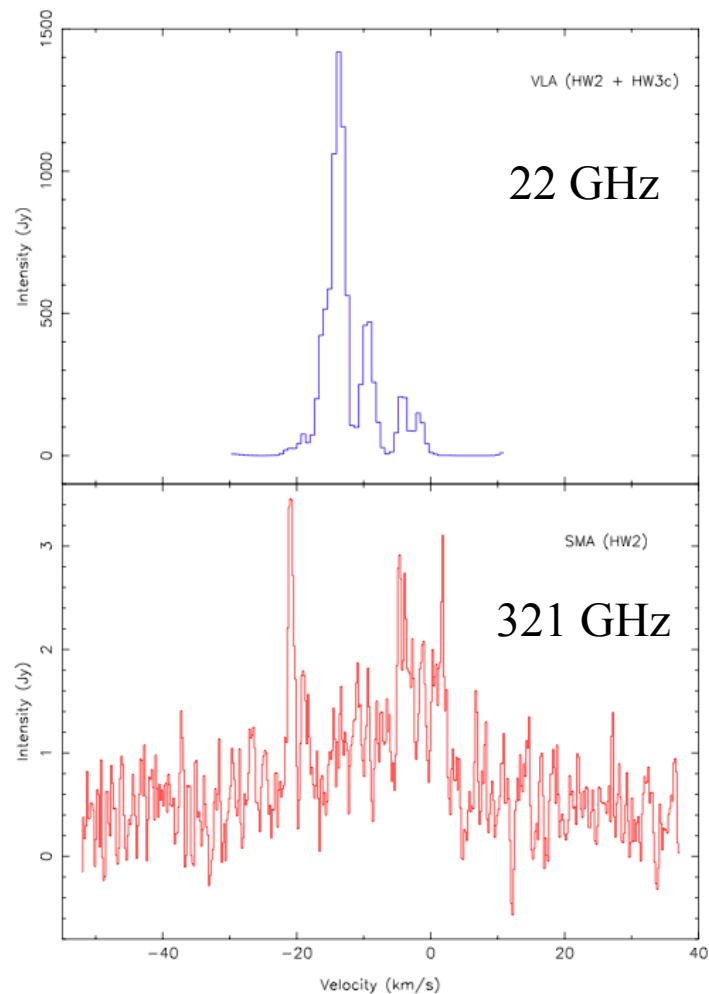
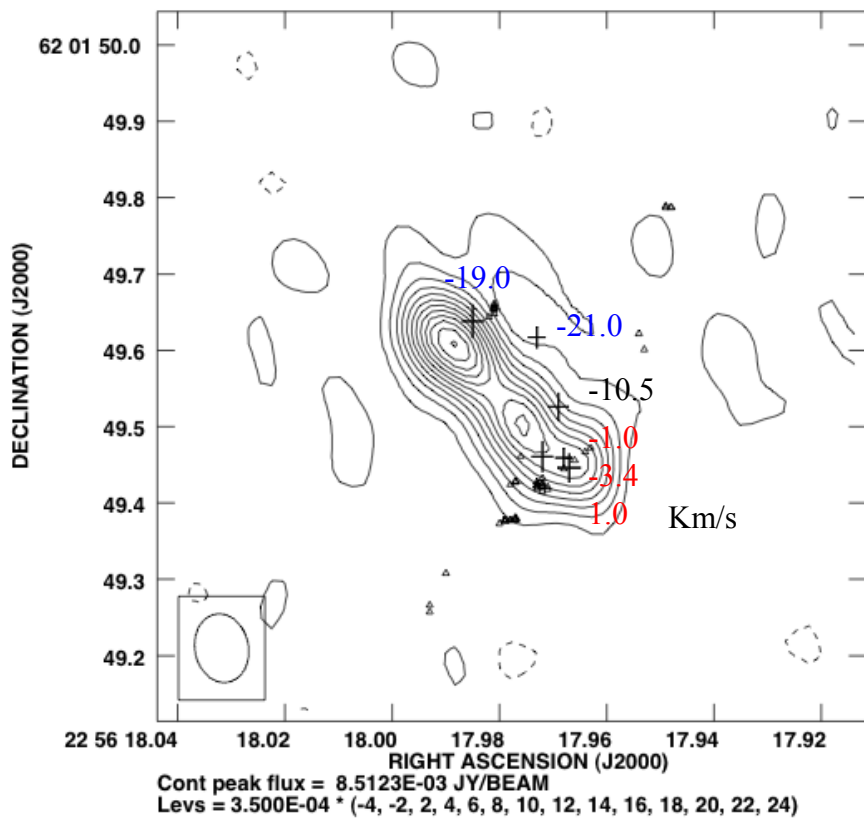
Color Image
SMA 327 GHz

Contours
CH₃CN
J=18-17

Patel et al
2005

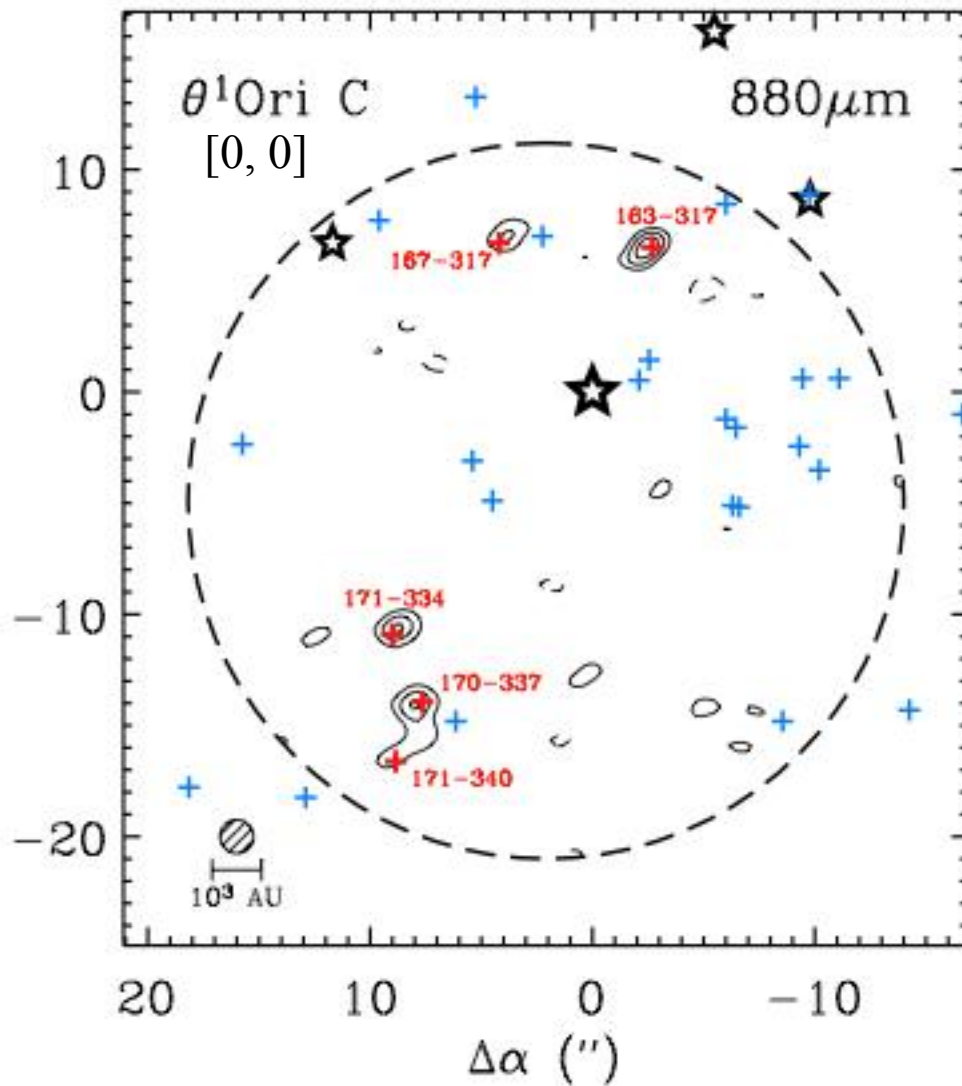
Cepheus A/HW 2

321 GHz and 22 GHz water masers

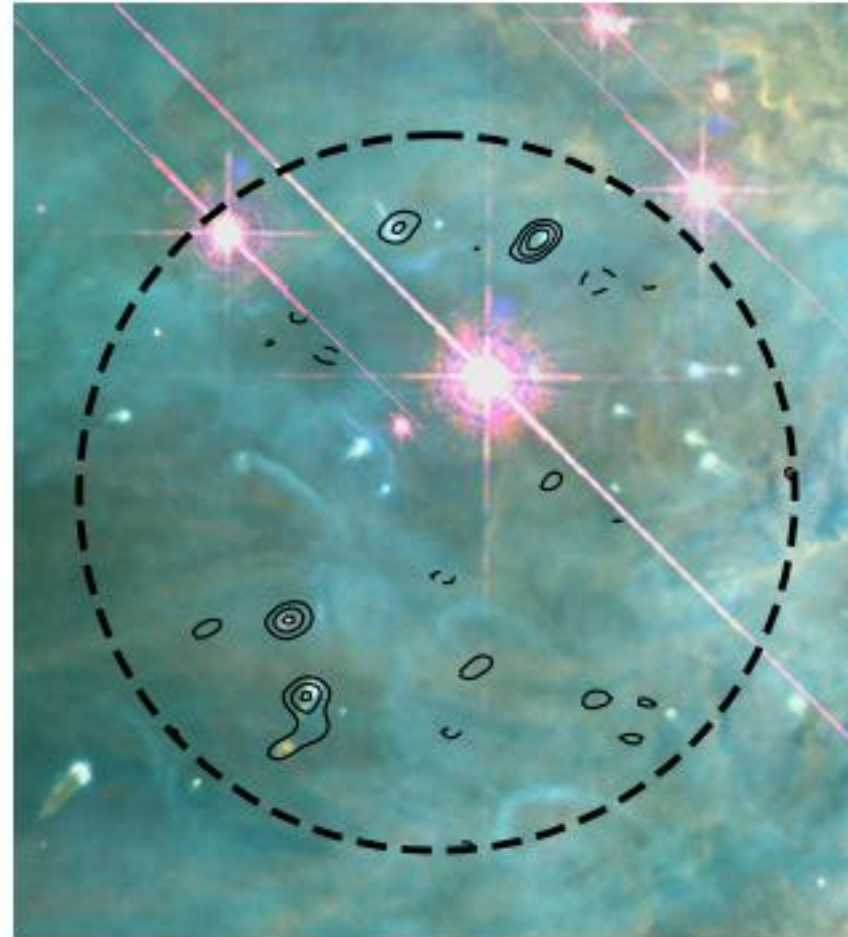


Patel et al., 2005

SMA at 340 GHz



HST

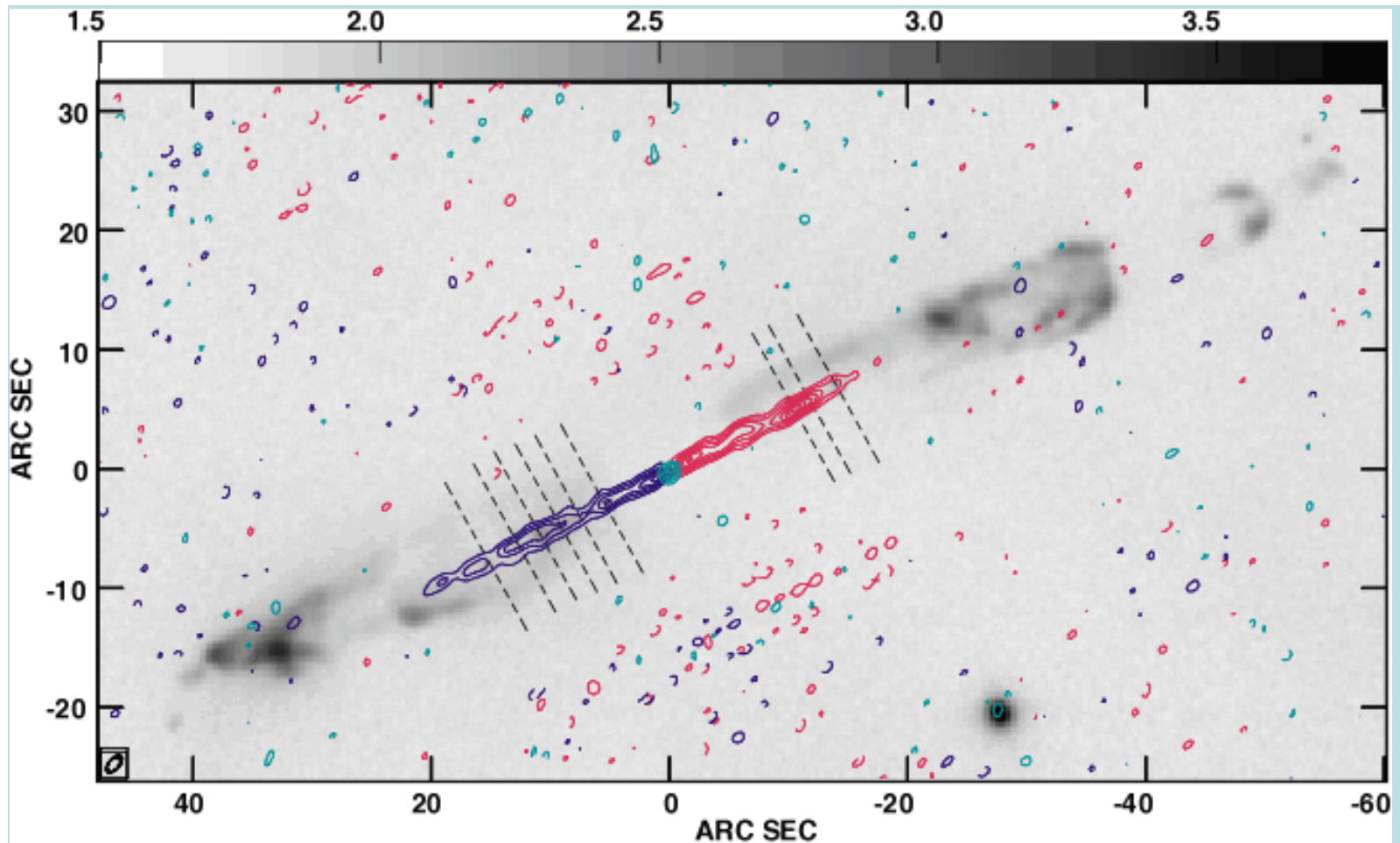


Mass of 5 proplyds from SED: ~ 0.02 s.m.

Stellar masses: 1-2 solar masses

Williams, S.M. Andrews & Wilner, 2005

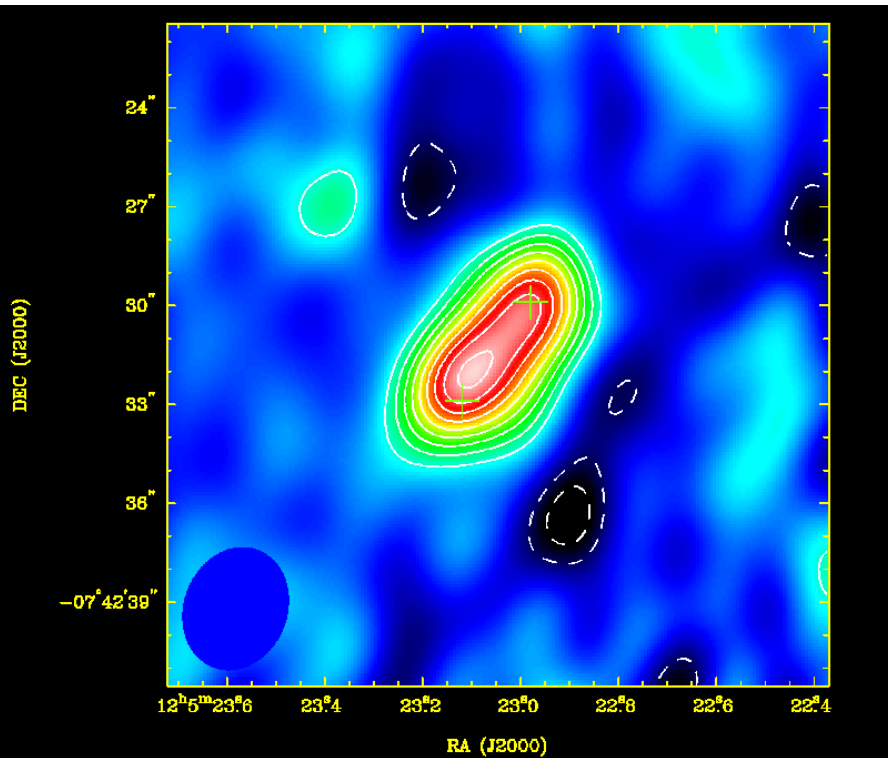
SMA Image of SiO (5-4) in HH211



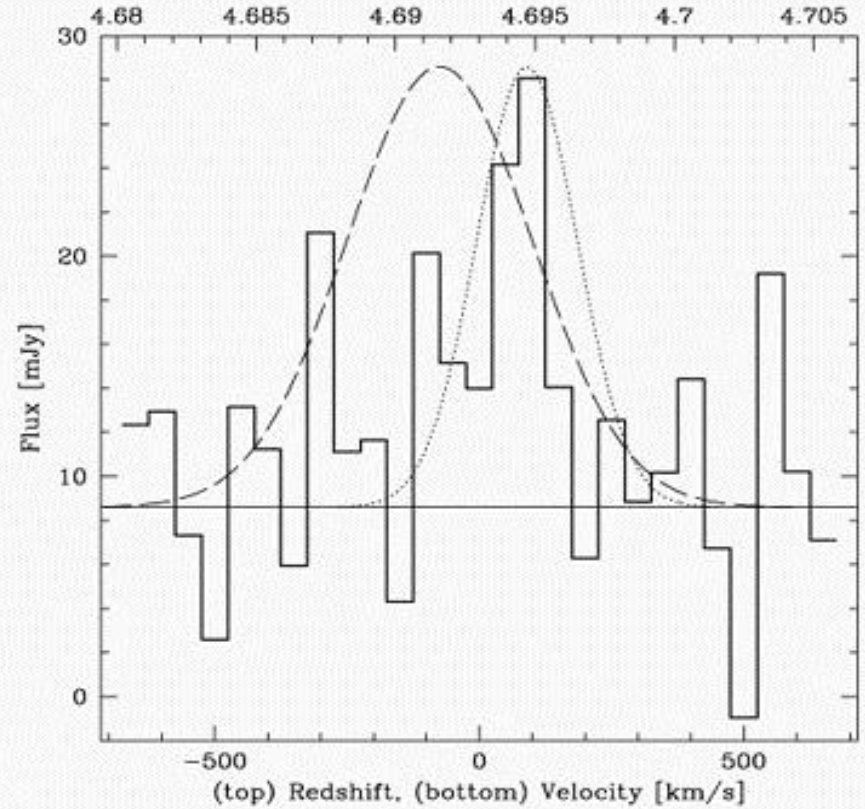
beam: $1.60'' \times 0.88''$ P.A. -40.7 deg.

CII line at $z = 4.7$ in BR1202-0725 (334 GHz)

Continuum image (900 microns)



Red shift



SMA Projects for FY 06

1. Move pads 13 & 17 away from Pu'uli'ahu
2. 500 KW Emergency Generator
3. O₂ Enhancement System: 21 → 26%
4. All 350 GHz Receivers to $T_R < 85K$
5. Bring Antenna 7 & 8 up to Specification
6. Commission 320 - 420 GHz Receivers
7. Pilot Program of eSMA (SMA + JCMT + CSO)
~ June 2006 at 345 GHz
8. VLBI capability
9. Active Phase Correction System

Proposals Received by SAO TAC for next semester (Nov 2005-Apr 2006)

	CfA	ext	total
• Star Formation	17	14	31
• Extragalactic	14	10	24
• Stellar	6	3	9
• Planetary	2	0	2
• Galactic Center	1	0	1
• Other	0	1	1
• Total	40	28	68

Papers submitted to refereed journals in FY2005: 22

DEC (J2000)

-07°42'39"

24"

27"

30"

33"

36"

12^h5^m23^s.6

23^s.4

23^s.2

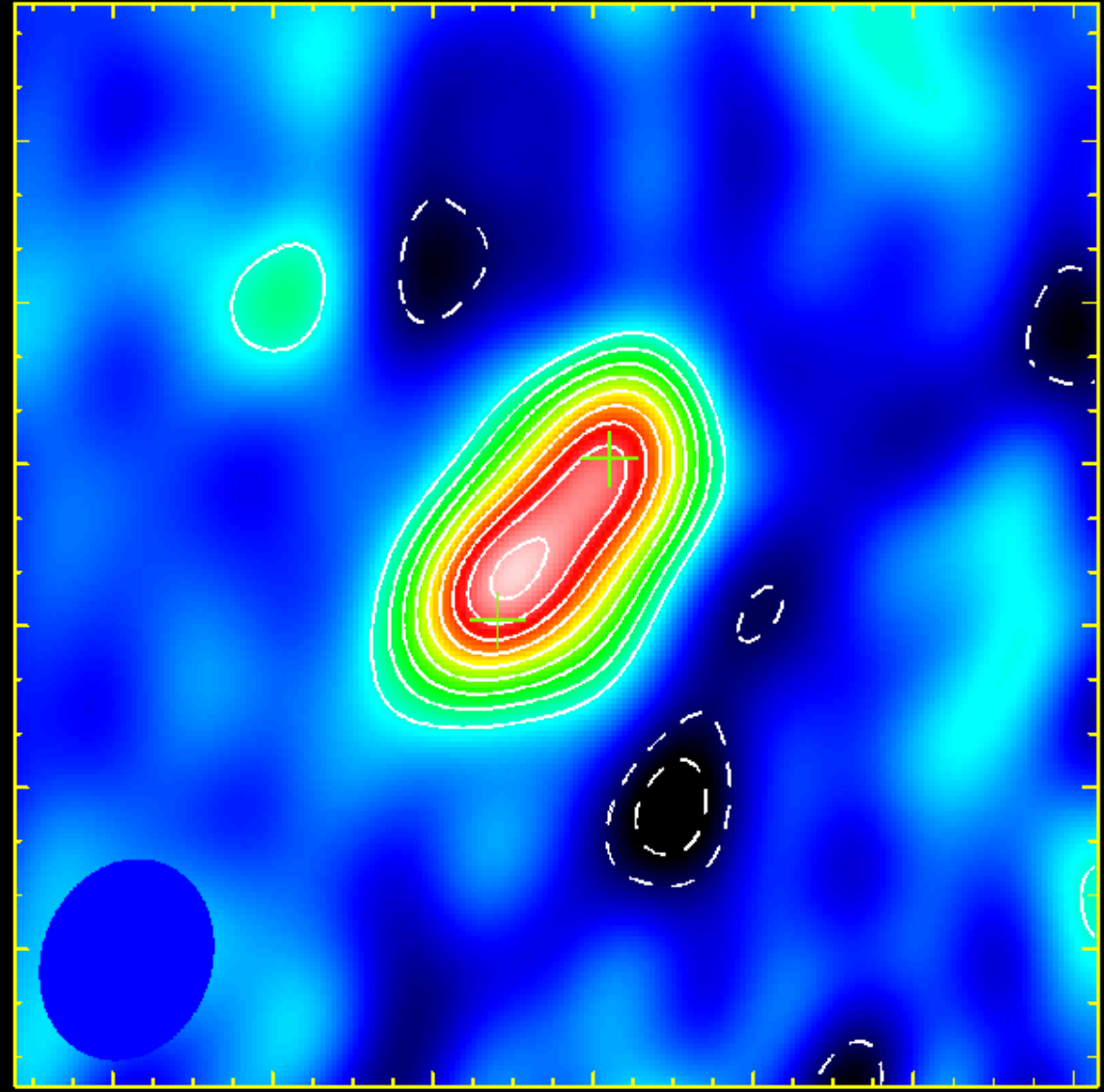
23^s.0

22^s.8

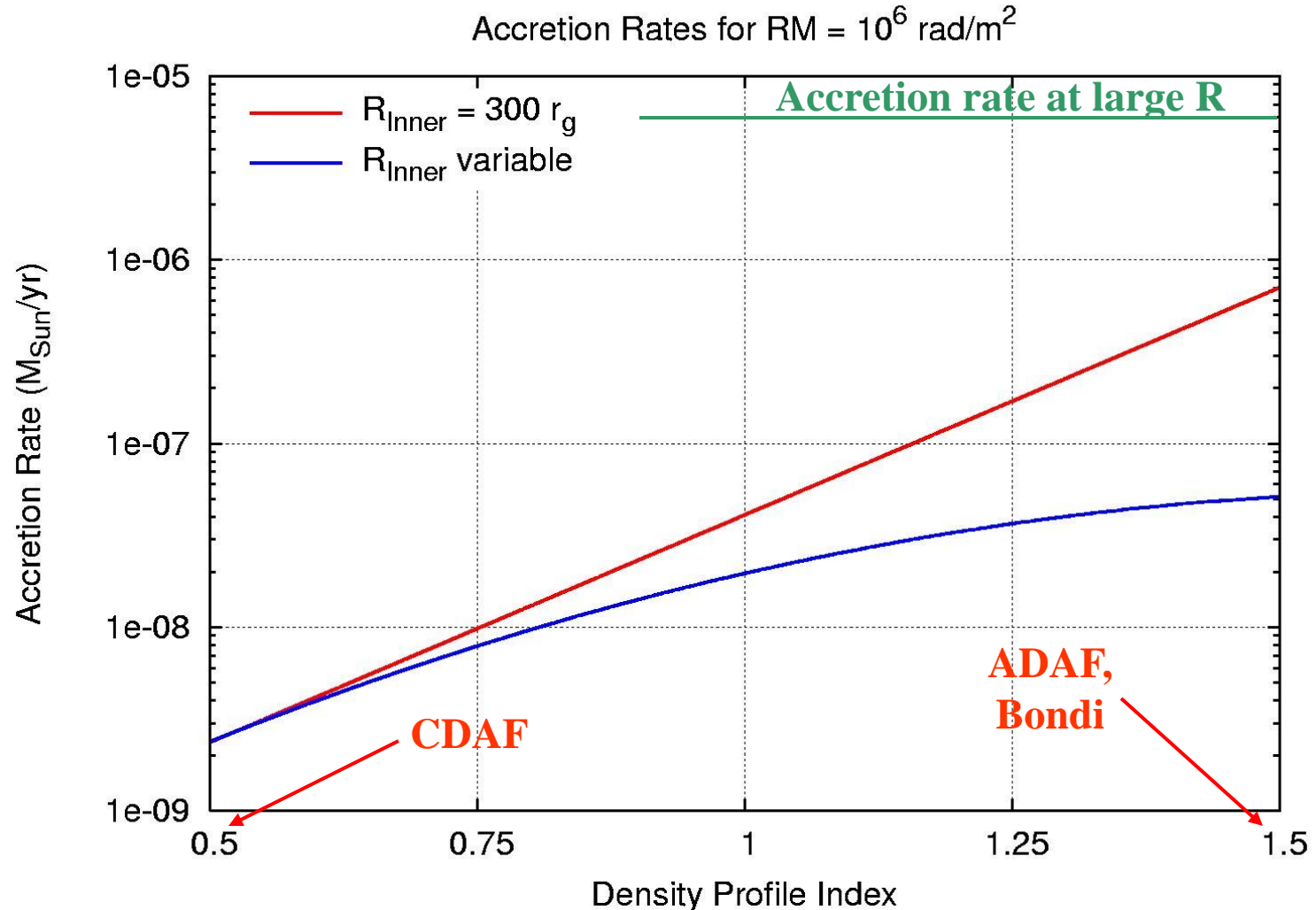
22^s.6

22^s.4

RA (J2000)



Accretion Rate Limits



Advice from Chairman Jack

1989 SMA Advisory Committee Report

- **“The original proposal pays inadequate attention to some important areas such as extragalactic science . . . Can distant or protogalaxies be detected in the 158mm CII lines?”**
- **“The array is being built at just at the right time to focus on polarimetry . . . [which will help] to provide a key to understanding magnetic accretion disks.**
- **“A long approval process for either site [Mt. Graham or Mauna Kea] must be anticipated.”**
- **“We should emphasize that the receiver problem is likely to exist throughout the lifetime of the project and receiver development plans should have highest priority.”**
- **“Marian Pospeszalski at NRAO has an active bandwidth design for 1-2 GHz which looks promising.”**
- **“The reliability of SIS receivers appears sufficient to justify putting many in the same cryostat.”**
- **“A general caution is to avoid getting into the situation most of us are in, where the loss of one key individual could cripple the project.”**
- **“It will not be easy to obtain an affordable price for the antennas.”**

More advice from Chairman Jack

- **“The pointing specification of 1 arc second is going to be particularly difficult to meet.”**
- **“The first far IR polarization maps with 10” resolution (e.g., SOFIA) will probably begin to appear before first light on the Array.”**
- **“The choice of six antennas each of 6 meter diameter has much to recommend it.”**
- **“It is very important to consider how to solve the short spacing problem.”**
- **“Reduce the number of spectral channels by at least a factor of two A large number of channels poses unnecessary burdens on the computing requirements.”**
- **“It is very important that a separate wide band continuum correlator be included for maximum continuum sensitivity.”**
- **“All telescope projects located on remote, high sites have found that equipment installation and checkout proceed more slowly than expected.”**
- **“It is also very important to try to interest young astronomy and physics students in the project. These are the scientists who should grow with the project.”**

More advice from Chairman Jack

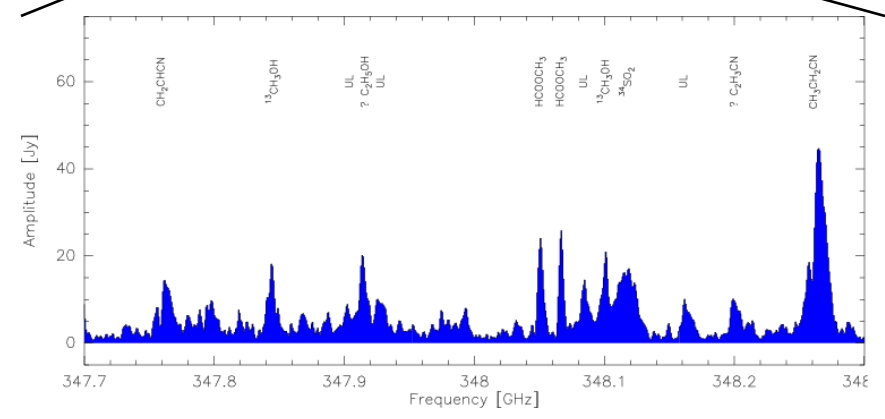
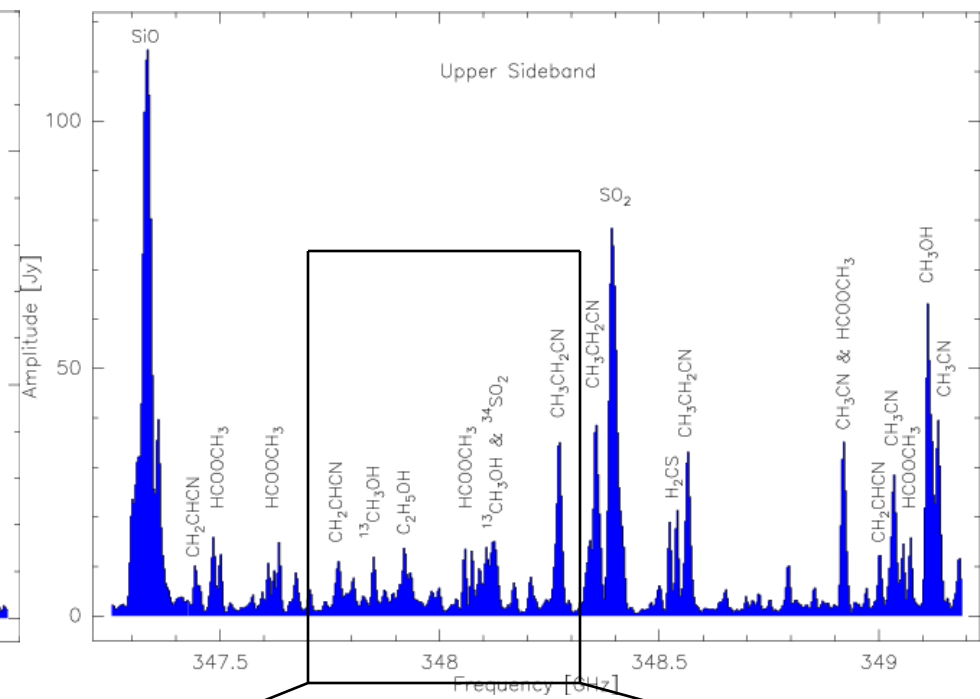
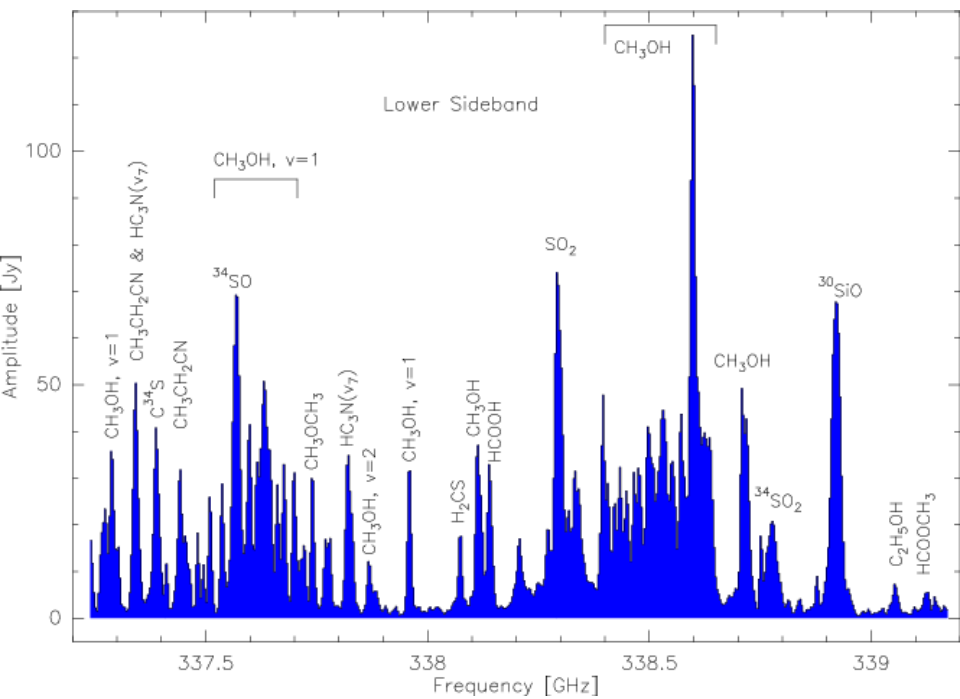
1990 SMA Advisory Committee Report

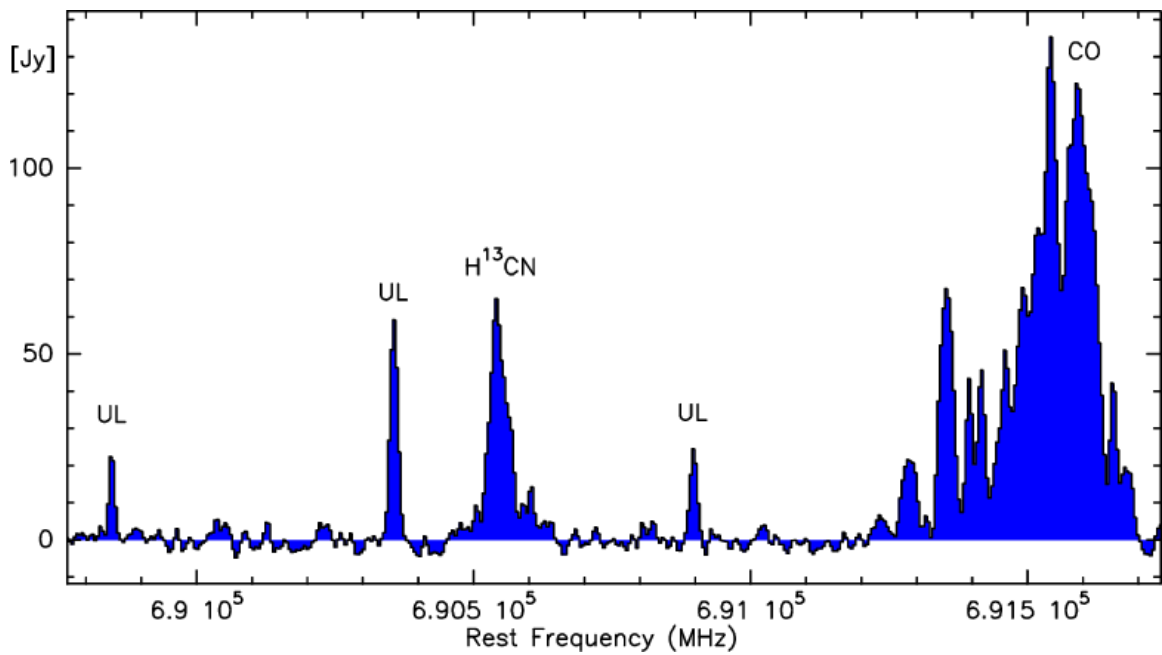
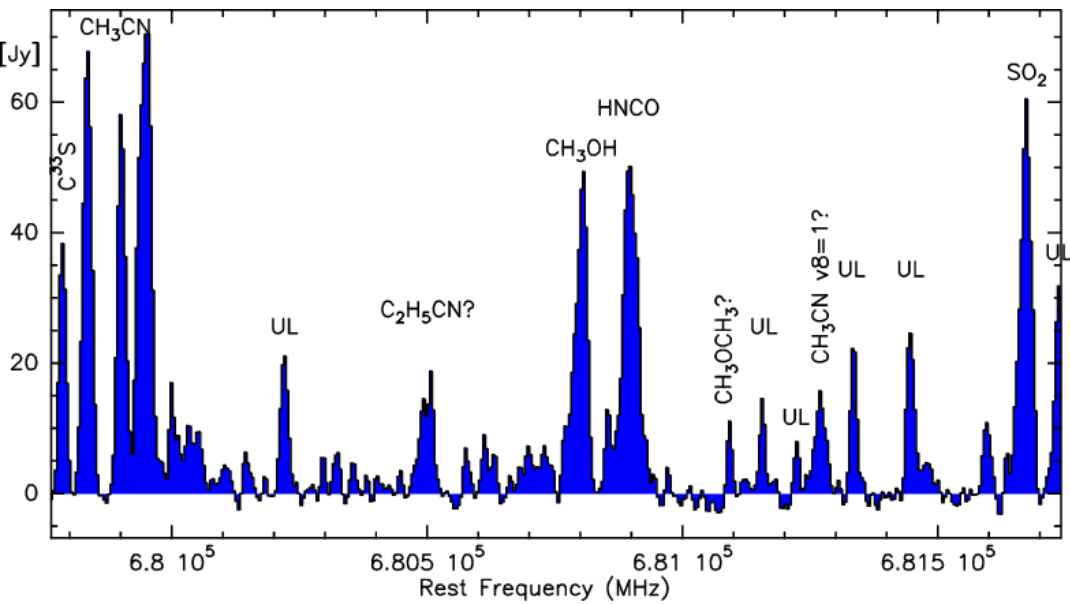
- **“The weight is unbalanced on the elevation axis. This is an unconventional approach . . .”**
- **“It is important that the astronomers spend more of their time on the instrument.”**

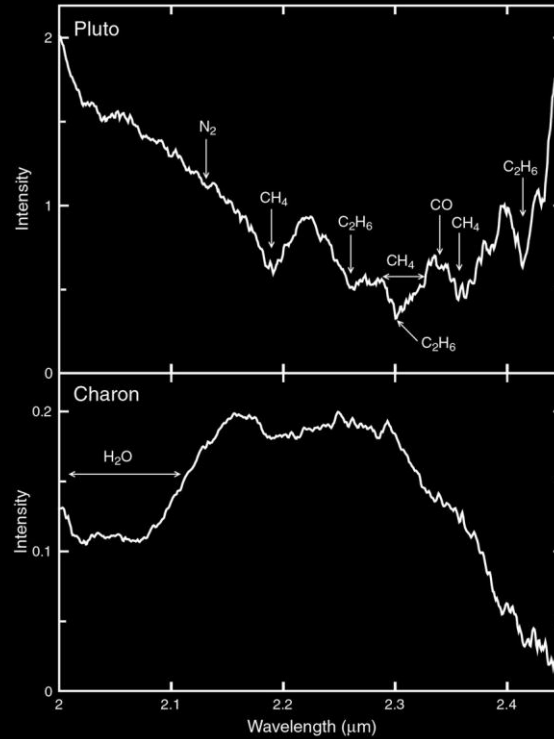
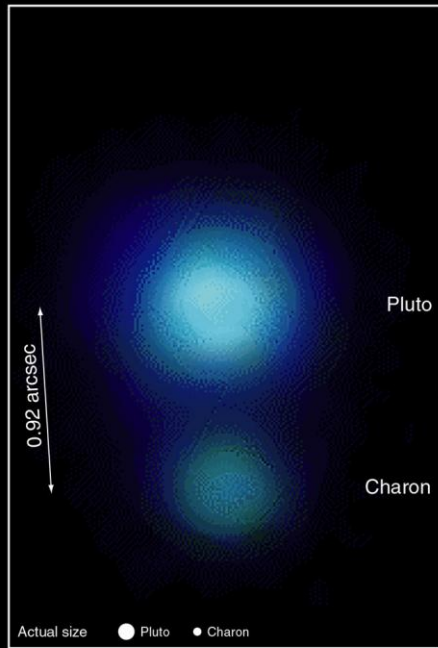
1992 SMA Advisory Committee Report

- **“With 35 subcontracts for antenna components it will be difficult to maintain a tight time schedule.”**
- **“The development of a new independent image processing cannot be justified. It is hoped that AIPS++, which is being developed by an international team coordinated by NRAO will become the system of choice.”**
- **“Focal plan arrays will considerably accelerate the data acquisition . . . The spectrometer group should consider this possibility.”**
- **“The schedule for developing the Mauna Kea site is too optimistic.”**
- **“Abandon the principle that all of the arrays should be concentric”**









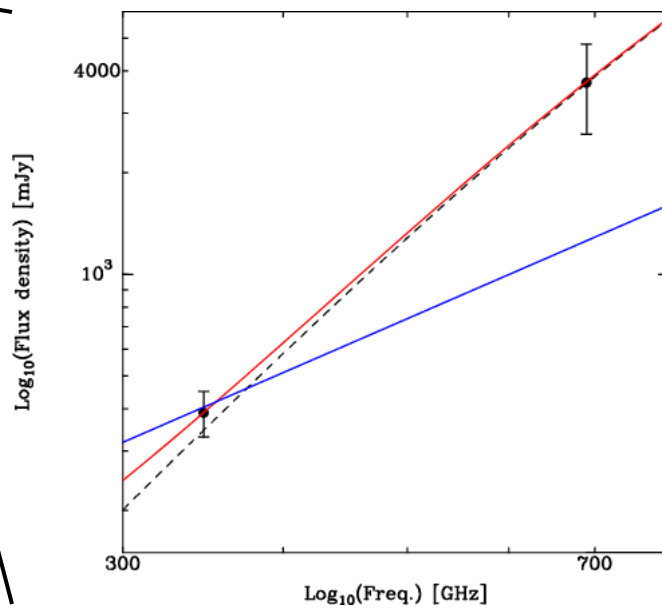
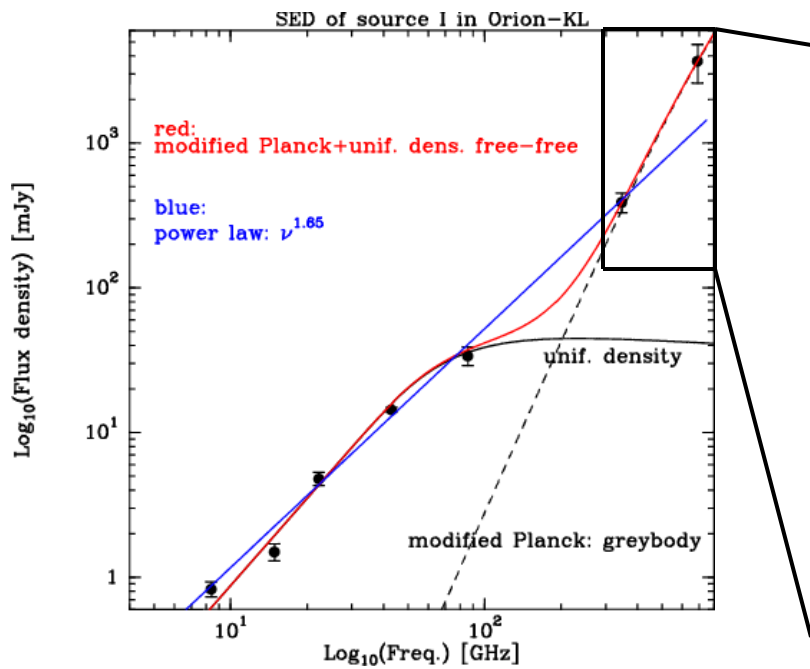
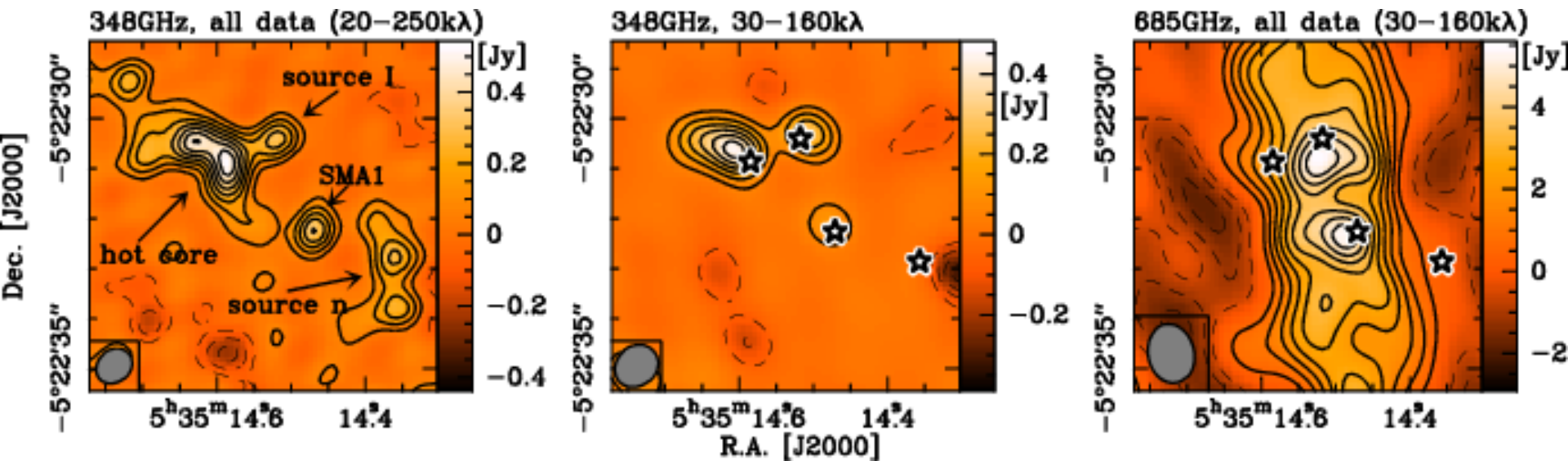
Pluto and the Satellite Charon

Subaru Telescope, National Astronomical Observatory of Japan

CISCO (J, H, K')

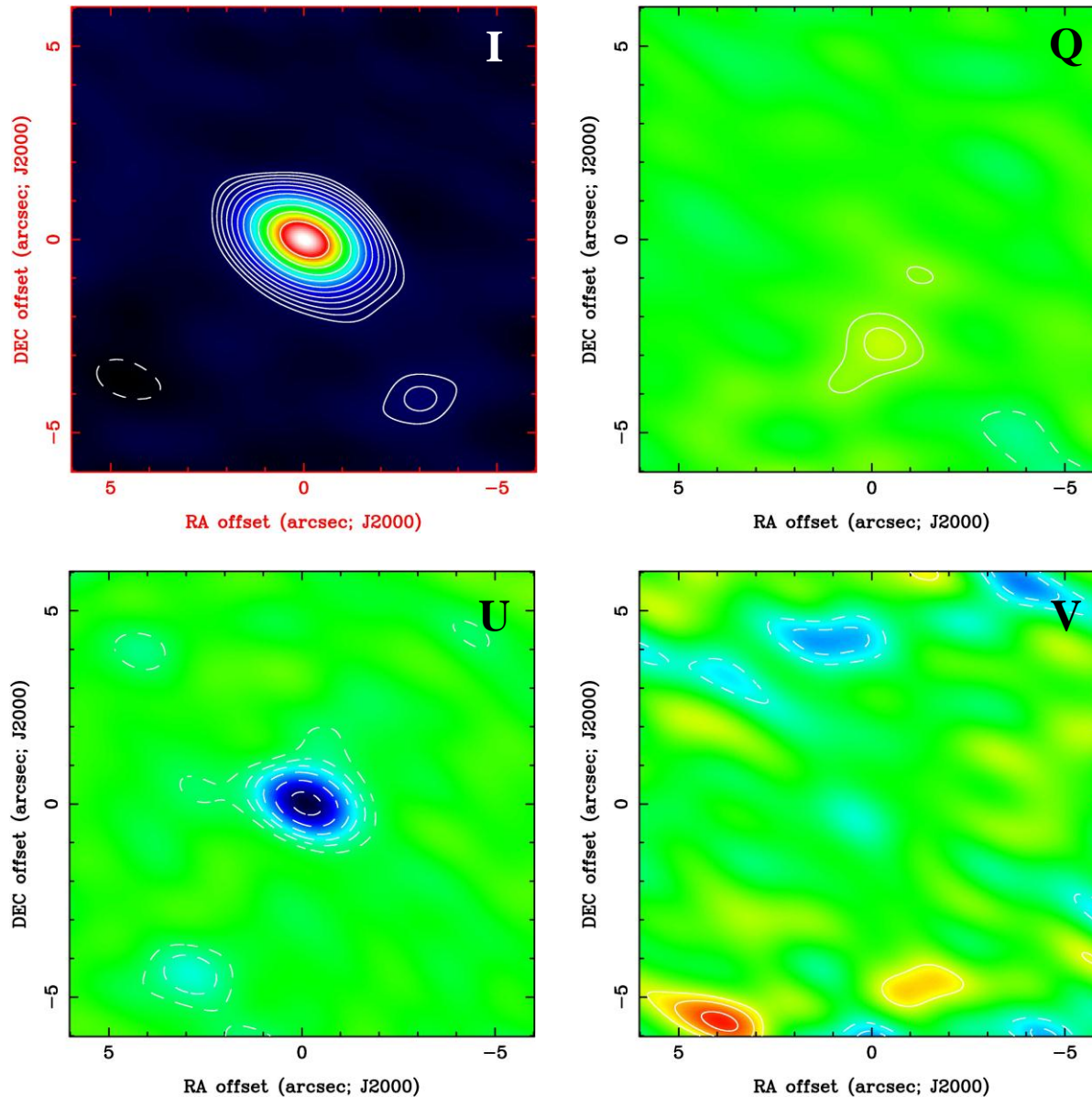
July 19, 1999

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Beuther et al
2005

Sgr A* Polarization at 340 GHz

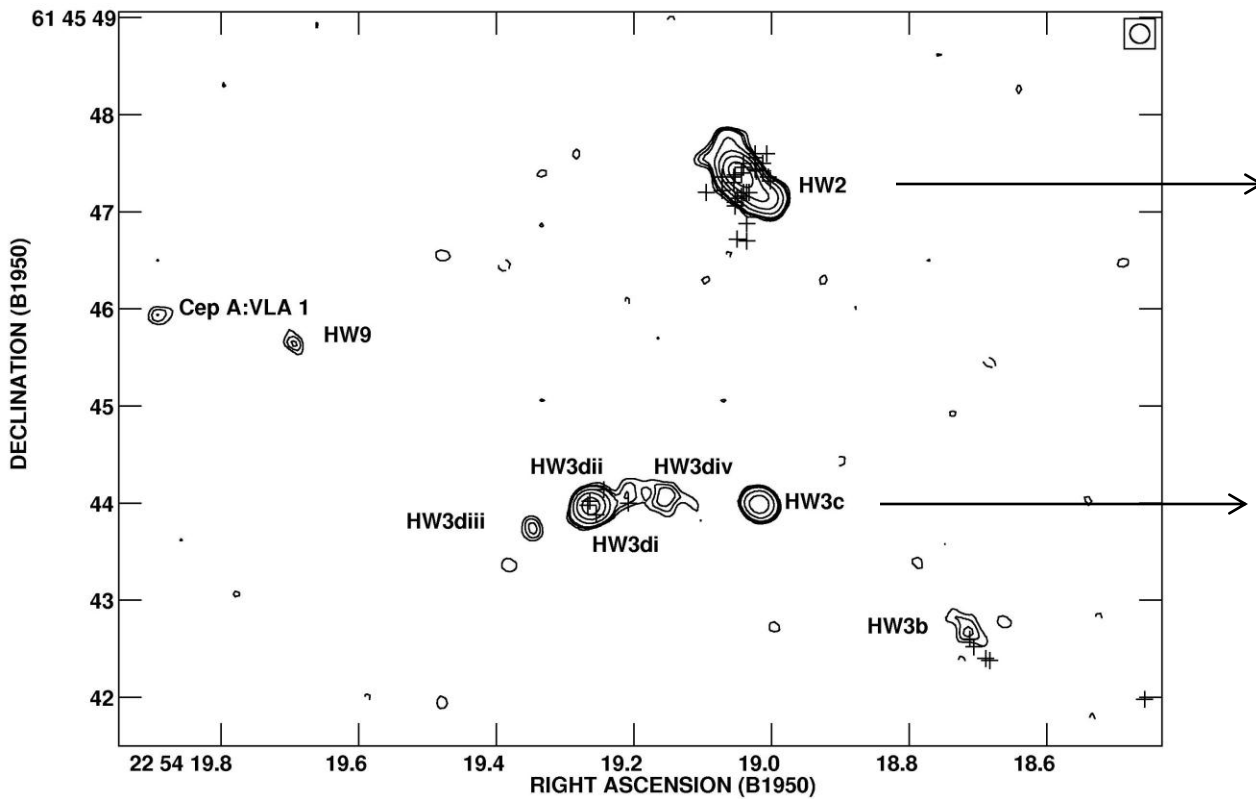


Marrone et al
2005

Cepheus A Star Formation Region

VLA continuum (contours and 22 GHz Masers)

Torrelles et al 1996



SMA 321 GHz masers

Patel et al 2005

