SMA Newsletter

Submillimeter Array Newsletter | Number 14 | August 2012

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FROM THE DIRECTOR

Dear SMA Newsletter readers,

The scientific output and technical capability of the SMA continue on an upward path. The first half of 2012 saw fifty published papers on SMA research. Highlighting the relevance and interest in SMA science, the cover story of the August 2012 issue of *Sky and Telescope,* "Pictures of a Baby Solar System" showcases several years of SMA research on proto-planetary disks led by SAO staff Astrophysicist Sean Andrews. Recent observations demonstrate new technical capabilities. The SMA joined forces with the Submillimeter Telescope Observatory in Arizona and the Atacama Pathfinder Experiment in Chile to make the highest resolution astronomical observations to date with Very Long Baseline Interferometry (http://phys.org/news/2012-07-apex-telescope-sharpest.html). These observations are a milestone toward the challenging goal of imaging the shadow of a black hole. Work continues to further increase the sensitivity and flexibility of observing modes by increasing the bandwidth by another factor of two following a similar increase obtained over the last two years. Much of the necessary hardware for the 1.3 mm waveband is in place (*see article, page 10*). In addition to wider bandwidth, the new receivers also have 20% lower noise and increased flexibility in tuning allowing simultaneous observation of spectral lines separated by up to 24 GHz, twice the previous 12 GHz maximum. Work on doubling the correlator capacity to process the increased data flow continues. We expect to make on-sky tests with our new correlator hardware by the end of 2012. With our new capabilities, we look forward to an even more productive and scientifically exciting second half of the year.

Ray Blundell

CHEMICAL SEGREGATION TOWARD MASSIVE HOT CORES: THE AFGL2591 STAR-FORMING REGION

Izaskun Jiménez-Serra, Qizhou Zhang

At the early stages of massive star formation, massive stars – stars with masses larger than 8 M☉ - are found to be deeply embedded behind large interstellar dust extinction in molecular clouds. The progressive heating of the surrounding gas by the central protostar leads to the release of significant amounts of molecular material from interstellar dust grains (in particular, from their icy mantles mainly formed by H_2O, CO_2, CH_4 and NH_3), enriching the molecular content of the massive envelopes. These envelopes are called *hot molecular cores*, and appear as hot (≥100 K), compact (0.1 pc or 20000 AU), and dense condensations (>10^6 cm^{-3}; Garay & Lizano 1999) with a very rich chemistry in complex molecular species such as methanol (CH_3OH) or sulfur-dioxide (SO_2). Since these molecules are bound to the surface of dust grains with different binding energies, the temperature gradient across hot cores (i.e. hotter regions closer in, cooler regions further out) is expected to naturally generate a chemical segregation due to the selective evaporation of molecular species with increasing temperature and therefore, with smaller distance to the central star (see van Dishoeck & Blake 1998; Nomura & Millar 2004). Consequently, the study of the spatial distribution of complex molecules in hot cores has the potential to provide key information about the internal physical structure, dynamics, and physical processes taking place in hot cores.

Due to the high dust extinction in hot cores, observations at millimeter wavelengths are highly desirable since they can penetrate in the densest and innermost regions of hot cores. In addition, the millimeter wavelength domain is filled with rotational line transitions of complex molecular species such as CH_3OH, making millimeter observations one of the best ways to study the early evolution of massive stars and their impact on the surrounding environment.

In Jiménez-Serra et al. (2012), we have used the eight element Submillimeter Array (SMA) located on Mauna Kea, Hawaii, to observe the rotational line transitions at a wavelength of 1.3 mm from a collection of complex molecular species toward one of the most massive and luminous hot cores in the Galaxy: the AFGL2591 hot core (van der Tak et al. 1999; Sanna et al. 2012), which is located in the direction of the Cygnus X star forming complex at a distance

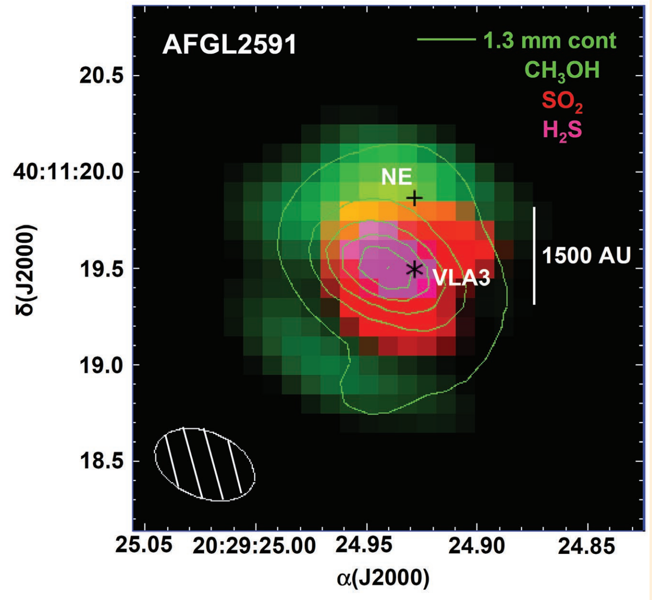

Figure 1: SMA image of the 1.3 mm continuum emission (green contours) observed toward the massive hot core AFGL2591. This image is superimposed on the velocity integrated emission of methanol (CH_3OH; green color scale), sulfur dioxide (SO_2; in red), and hydrogen sulfide (H_2S; in magenta). The measured size of the envelope is ~3000 AU. The ellipse in the lower left corner represents the SMA beam of 0.5 x 0.35 arcseconds. The star and cross show the location of the VLA 3 and NE sources detected by Trinidad et al. (2003) and Sanna et al. (2012) toward AFGL2591.

of ~3 kpc, with the mass and luminosity of the central protostar of 40 $M_\odot$ and 2×10^5 $L_\odot$, respectively.

The SMA observations toward the AFGL2591 hot core reveal that the molecular gas in this object is distributed in concentric shells probed by different molecular species, showing a clear chemical segregation (Fig. 1). This is the first time that such a chemical segregation is ever reported toward hot cores. While CH_3OH (green color scale in Fig. 1) traces the cooler and outer gas of the hot core, SO_2 (in red) is found at an intermediate shell circumventing the position of the massive protostar (this position is provided by the peak of the 1.3 mm continuum emission shown in green contours in Fig. 1). Hydrogen sulfide (H_2S), the precursor of the sulfur chemistry in hot cores (magenta color scale in Fig. 1), peaks toward the position of the massive protostar, tracing the inner and hotter regions closer to the star. We note that the chemical structure in AFGL2591 is also observed in other lines with a wide range of excitation conditions. This implies that the chemical segregation in the AFGL2591 hot core cannot be attributed to excitation or optical depth effects.

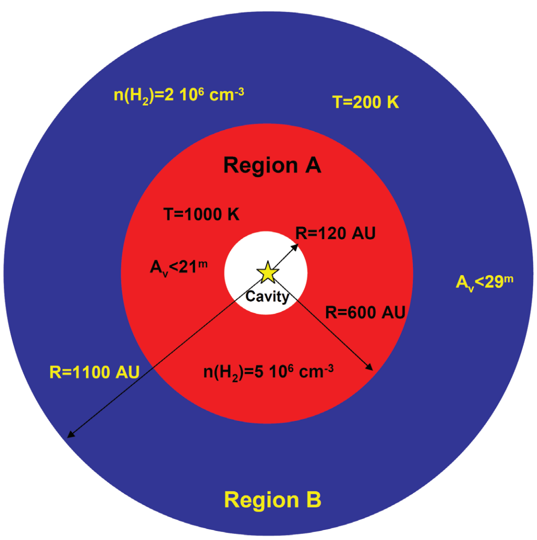

Figure 2: Scheme of the two-point model (Regions A and B) assumed for the AFGL2591 hot core. The physical parameters used for every region are shown.

In order to understand the origin of the chemical segregation detected toward AFGL2591, we have used a simple two-point chemical model where the molecular envelope can be divided into a hotter (temperature of T~1000 K) and inner core (radius of 600 AU; Region A in Fig. 2), with a cooler (T~200 K) and outer envelope (radius of 1100 AU; Region B in Fig. 2). In addition, we consider the existence of an inner cavity in the AFGL2591 hot core (radius of 120 AU), as proposed by Preibisch et al. (2003) and de Wit et al. (2009).

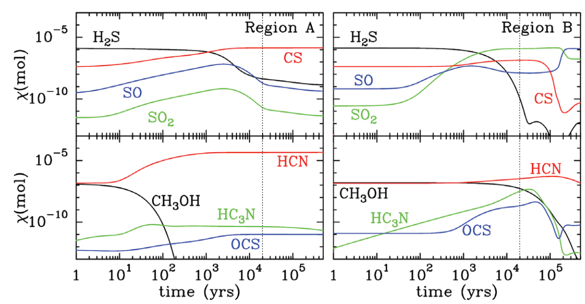

Figure 3: Abundances of several molecular species, including H_2S, SO_2, and CH_3OH, predicted by the two-point chemical model of the AFGL2591 hot core (Regions A and B). Vertical dotted lines show the dynamical age of the AFGL2591 source (~2 x 10^4 yr) derived by Doty et al. (2002).

The results from the chemical model of the AFGL2591 hot core shows that the chemical segregation is produced by a severe molecular UV photo-dissociation within the inner and hotter core (where dust extinction is relatively low due to the presence of the cavity; A_v<21^m), combined with a high-temperature gas-phase chemistry (Fig. 3). Indeed, once all molecules are evaporated from the mantles of dust grains, these species are destroyed by UV photo-dissociation in time-scales <100 yr. However, the high temperatures of the gas (T~1000 K) allow the re-formation of few species such as H_2S via endothermic reactions, making the H_2S abundance in the inner core high. Unlike H_2S, CH_3OH cannot be re-formed in the gas-phase (Garrod et al. 2008), completely vanishing from the inner core (Region A; Fig. 3), consistent with what is observed in AFGL2591. The presence of an inner cavity in the AFGL2591 hot core is therefore required to explain the chemical segregation in this object, since it leads to lower dust extinction in the inner regions of the core, allowing molecular photo-dissociation to occur.

For the outer and cooler envelope (Region B; Fig. 3), molecular photo-dissociation is less severe thanks to the higher extinction of the envelope (A_v<29m), allowing species such as CH_3OH to survive. Since the temperature in the outer envelope is lower (T~200K), the energy barrier of endothermic reactions such as that of H_2S cannot be overcome, and the subsequent gas-phase chemistry of sulfur takes over. This leads to large abundances of sulfur-bearing products such as SO_2, which peak at distances further away from the central source, as observed in AFGL2591.

The SMA results show that high-angular resolution imaging with interferometers such as the SMA and ALMA, combined with detailed chemical modeling of hot cores, provide crucial information about the internal physical structure of these objects, with the potential to unveil structures such as cavities, holes, disks, or less massive companions in massive hot cores.

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MAPPING LINEARLY POLARIZED THERMAL MOLECULAR LINE EMISSION IN EVOLVED STARS

W.H.T. Vlemmings, J. M. Girart, N. Patel

One of the outstanding questions in the study of evolved stars is the cause of the asymmetry in the structure of planetary nebulae. While they evolve from mass-losing nearly spherical Asymptotic Giant Branch (AGB) stars, the majority of planetary nebulae display mild to extreme deviations from spherical symmetry. The origin of the aspherical morphology is attributed to be either an influence on the AGB mass-loss of a binary companion, or magnetic fields, or a combination of these. High angular resolution observations of molecular lines in the circumstellar envelopes of AGB stars are important to directly detect the potential asymmetries and determine the role of magnetic fields via observations of polarization.

Very intense maser lines of SiO, H_2O and OH have been used in several studies to indicate that magnetic field appears well ordered and the Zeeman splitting suggests field strengths ranging from several Gauss close to the stellar surface, to several mG at a few thousand AU [1,2,3]. Unfortunately, the maser phenomenon, being highly selective in velocity coherence, gives a very under-sampled picture of the magnetic field morphology throughout the envelope. This can be remedied by observing thermal line emission, which is also predicted to be linearly polarized in the presence of magnetic fields and asymmetry in radiation field, via the so-called Goldreich-Kylafis effect [4,5].

Accurate linear polarization observations are now possible with the SMA, as demonstrated in polarized dust continuum emission toward both low and high-mass star-forming regions [6,7,8,9] and molecular line emission toward a high-mass star-forming region [10]. However, the application of such techniques for AGB stars is difficult due to the requirement of extremely high angular resolution (better than half arcsecond) and high sensitivity.

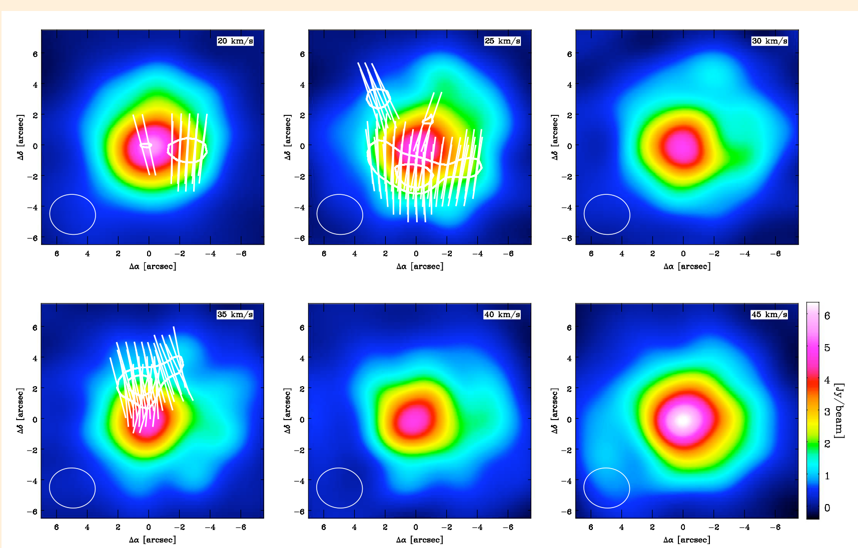

Figure 1: The polarization of the CO(2-1) line at 230.538 GHz in the circumstellar envelope of IK Tau. Channels are averaged across intervals of 5 km/s width and are labeled according to the velocity at the lower end of the spectral bin. The color indicates the CO emission and the contours are the linearly polarized intensity. Contours are drawn at a significance of 3 and 4σ. The line segments indicate the electric vector polarization angle. The beam size is indicated in the lower left corner of each panel.

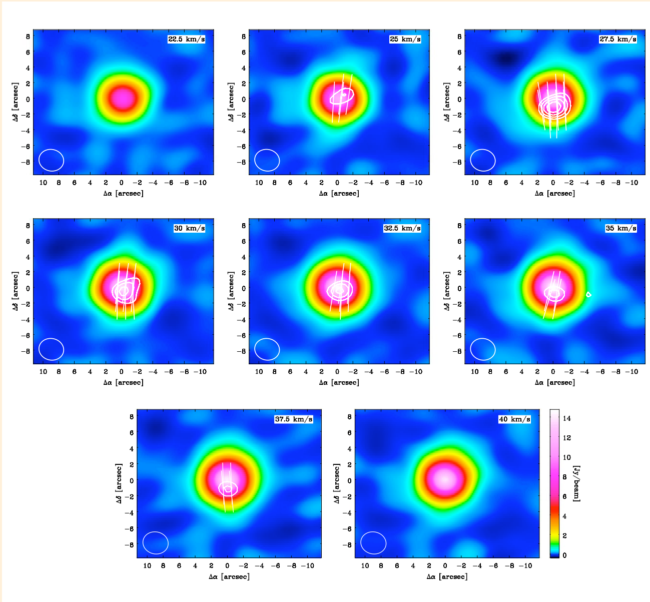

Figure 2: Same as Figure 1, for the SiO(5-4) σ = 0 line at 217.105 GHz. In this case, channels are averaged over intervals of 2.5 km/s and contours are drawn at debiased polarized intensity levels of 3, 4, 5, and 6σ.

Here we report detection of linearly polarized emission in the CO 2–1, SiO 5–4 (in ground vibrational state) lines in the envelope of the oxygen rich AGB star IK Tau [11] and the CO 3–2, SiS 19–18 and CS 7–6 lines in the envelope of the extreme carbon rich AGB star IRC+10216 [12]. These are the first maps of linearly polarized thermal molecular line emission in AGB stars.

Figures 1 & 2 show maps of polarized emission in CO 2–1 and SiO 5–4 lines (respectively) toward IK Tau [11]. The linear polarization in the IK Tau envelope is neither tangential nor purely radial, so it is unlikely that the anisotropic stellar radiation field contributes significantly. The circumstellar magnetic field strength has been shown to be sufficient to determine the molecular alignment axis, as SiO and H2O maser measurements indicate a magnetic field of several Gauss on the surface of the star [13,14]. This implies that the polarization vectors are either parallel or perpendicular to the magnetic field direction [15]. In that case, the overall field geometry is predominantly either east-west or north-south. As the thermal CO (at ~800 AU) and SiO (at <250 AU) probe different regions of the circumstellar envelope, the SMA observations indicate a large-scale magnetic field morphology. The slight east-west elongation of the CO [16] and the previously observed dust asymmetry [17] could be related to the observed large-scale magnetic field morphology, as magneto-hydrodynamical simulations indicate that, for example, a dipole magnetic field in a circumstellar envelope would result in equatorially enhanced density profiles [18]. The fractional linear polarization of the CO 2–1 line (~13%) is however significantly larger than predicted in the standard Goldreich-Kylafis interpretation. This likely requires additional anisotropies in the circumstellar envelope, but could also be an indication that the polarized emission arises from more compact regions. As the SMA observations, lacking the shortest baselines and total power information, spatially filter out a significant amount of extended emission, the fractional polarization can be increased if the linear polarized emission has more small scale structure.

Figure 3 shows the Stokes I, Q and U obtained at the positions of maximum polarized intensity for the lines of CO 3–2, CS 7–6 and SiS 19–18 toward IRC+10216. Figure 4 shows the polarization maps for the emission of these lines averaged over the velocity range that maximizes the polarized emission (which is different for each line). The polarization is expected to be highest at densities close to the critical density of the observed transition [18], so the polarization detected in the CO 3–2 line should arise at volume densities of ~10^4 cm^{-3}, whereas the SiS 19–18 and CS 7–6 polarization is expected to trace inner regions, at densities of ~10^7 cm^{-3}. One of the interesting features is that in the three lines the linear polarization is blueshifted with respect to the total emission (this effect is more significant in the SiS line). Considering that the envelope is expanding, this suggests that the polarized emission is being detected at the side of a shell facing us and with the aforementioned volume densities. In addition, most of the polarized emission arises about 3" offset (~450 AU in projection) of the envelopes center. Thus the optical depth is probably playing an important role. Indeed, subarcsecond resolution maps in the IR [20,21] and HCN 3–2 emission [22] show that the molecular distribution is asymmetrical. This suggests the anisotropy in the radiation field to be a cause for the polarization pattern to be not distributed spherically. This is also in agreement with the single-dish detection of the CS 2–1 line

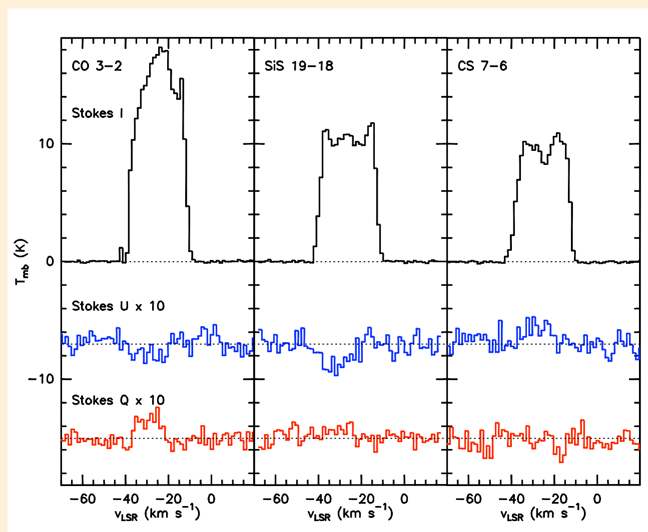

Figure 3: Spectra of the Stokes I (top, black line), U (center, blue line) and Q (bottom, red line) emission of the CO J =3–2 (left panel), SiS J =19–18 (central panel) and CS J =7–6 lines (right panel) toward IRC+10216. For each line the spectra were taken at the position where the maximum polarized emission is detected, after convolving the maps with a Gaussian having a FWHM of 4"x 3".

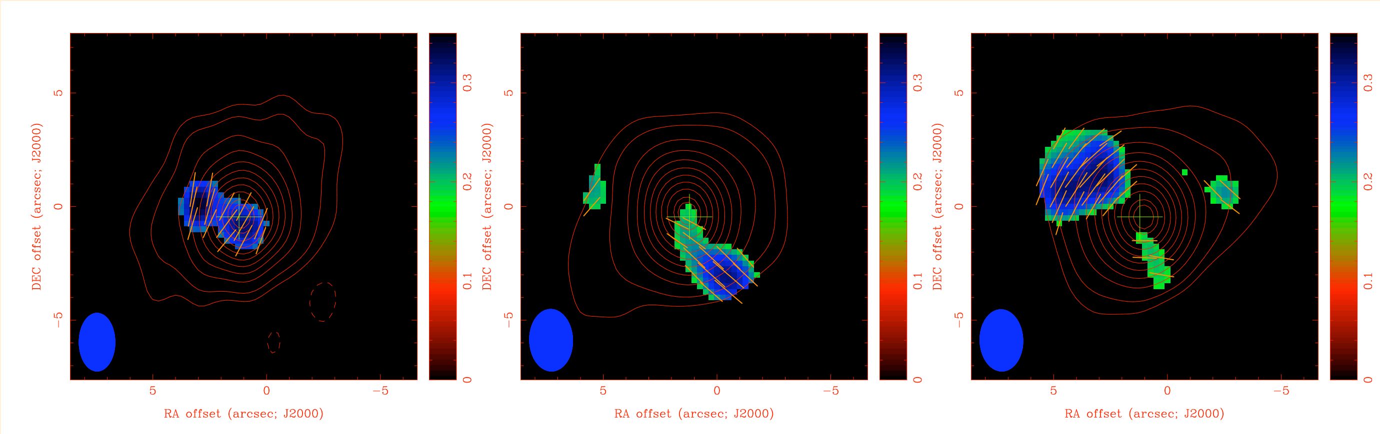

Figure 4: Color image of the linearly polarized intensity of the CO 3–2 (left panel), SiS 19–18 (central panel) and CS 7–6 lines (right panel), overlapped with the contour maps of the I emission for the respective lines from IRC+10216. The orange bars represent the polarization vectors. The CS and CO maps show the emission at the Vlsr velocity of -29 km/s averaged over 16 km s–1 . The SiS map shows the emission at Vlsr =-31.5 km/s averaged over 20 km/s . The contour levels are 5, 10, 20, 30, 40, 50, 60, 70, 80, 90, 95% of the peak intensity. The wedge shows the polarized intensity scale in units of Jy/beam. The synthesized beam is shown in the bottom left corner of each panel.

polarization towards the center of IRC+10216, which suggests that there is a non-radial polarization pattern [23].

The SiS polarization vectors pattern suggest a radial distribution, i.e., they form a nearly perfect concentric arc–like pattern with respect to the envelopes center. We find that this polarization pattern is in agreement with the theoretical predictions [5,19] if the magnetic field is radial in the region where SiS the polarization is detected. However, this radial pattern is not seen in the CS and CO polarization vectors, which implies that the magnetic field configuration does not have a global radial pattern, but it possibly has rather complex magnetic field morphology.

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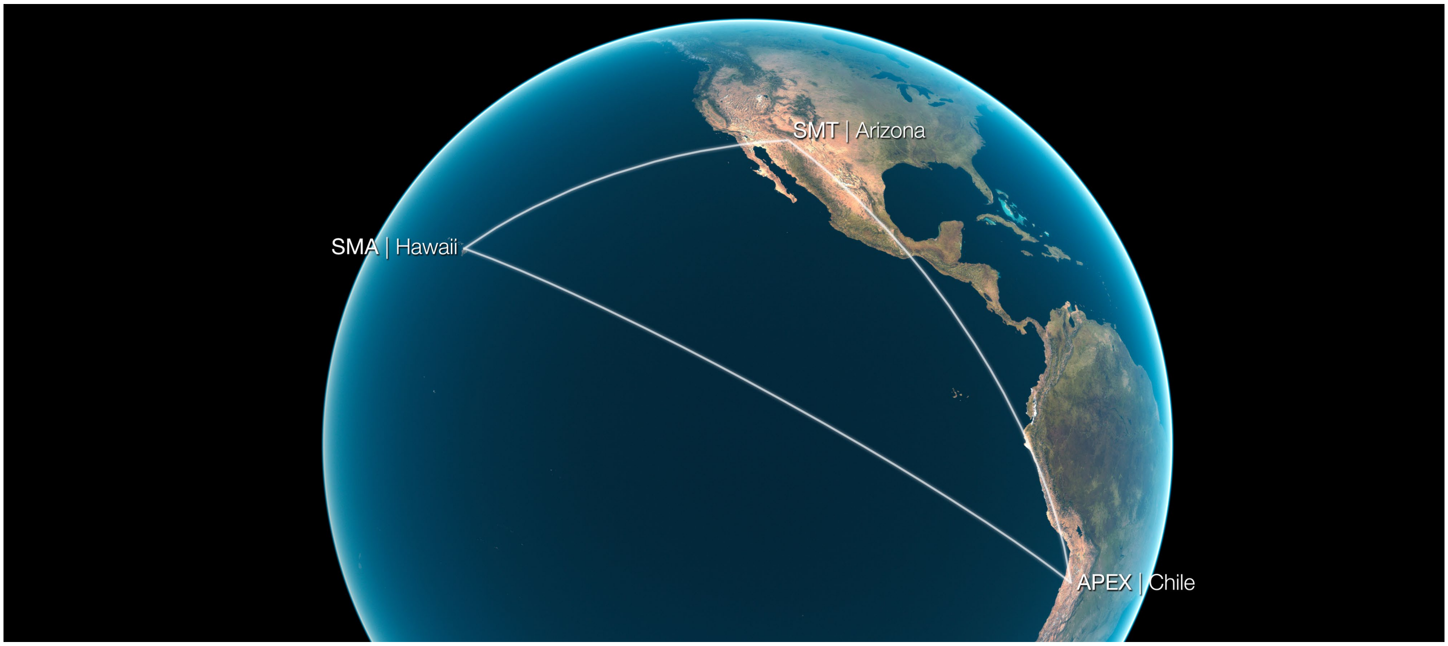
SMA PLAYS KEY ROLE IN THE HIGHEST RESOLUTION ASTRONOMICAL INTERFEROMETRIC OBSERVATION EVER MADE

Eric Keto and Jonathan Weintroub



ESO/L. Calçada

Astronomers connected three telescopes in Hawaii, Arizona, and Chile to make the highest angular resolution interferometric observation ever made in astronomy. This globe-spanning interferometer, called the Event Horizon Telescope (EHT), consists of a growing number of participating observatories. The latest observations made with the Smithsonian Astrophysical Observatory's (SAO) Submillimeter Array (SMA) in Hawaii, the APEX Telescope in Chile, and the Submillimeter Telescope (SMT) in Arizona achieved an angular resolution of 28 micro arcseconds or about 8 billionths of a degree, the equivalent of 2 inches at the distance of the moon. The observations were directed toward a bright quasar, 3C 279, powered by a supermassive black hole in the center of that galaxy. 3C 279 has a redshift of 0.536 meaning that it is receding from us at about half the speed of light owing to the expansion of the universe. Since the distance is proportional to redshift according to the relation established by Edwin Hubble, the distance to 3C 279 is about 15 billion pc or 5 billion light years. The light from 3C 279 just now reaching us was emitted about the same time as our Sun and solar system first formed.

The EHT uses a technique known as very long baseline interferometry (VLBI) to achieve its exquisite resolution. Since the angular resolution of a telescope scales with its diameter, the highest resolution is achieved by the largest telescope, or with VLBI, by combining the signals from two or more individual telescopes separated by a very large distance. The three telescopes of the EHT are separated by 4,500 miles (7,200km) from Chile to Arizona, 2,900 miles (4,600km) from Arizona to Hawaii, and the longest, 5,900 miles (9,400 kilometers), from the Apex Telescope in Chile to the Smithsonian's SMA in Hawaii. Astronomers routinely use intercontinental VLBI, but the observations of the EHT achieve higher angular resolution by observing at a higher radio frequency than other VLBI arrays.

The ultimate goal of the EHT is to image a black hole, or more properly the shadow of a black hole that is seen against the bright background created as the black hole's intense gravitational field bends the light from behind the black hole and focuses it toward the observer. The shadow is about the size of the black hole's event horizon, or more properly the innermost stable circular orbit (ISCO) which is the radius at which the gravitational field bends the light rays so much that they orbit the black hole. Imaging the event horizon would provide a definitive test of Einstein's theory of general relativity in the strong field limit. This theory has been tested before in weaker gravitational fields around neutron stars and our Earth and found in agreement with observations. In fact, the global positioning system now commonly in our cars to provide driving directions would not be accurate without the predictions of general relativity. The EHT will test general relativity in the limit of extremely large gravitational fields around supermassive black holes, a million times more massive than neutron stars and a trillion times more massive than the earth.

The most promising targets for the EHT are the black hole in the center of own Galaxy and the one in the galaxy known as M87. Being relatively nearby, about 8330 parsec away or only 25,000 light years, our own supermassive black hole is a promising target because it is easier to resolve details in a nearby object. The angular resolution just demonstrated by the EHT is comparable to the size of our own black hole's event horizon. However, our own supermassive black hole is relatively small, about one million times the mass of the sun, and too faint for the sensitivity of the current EHT. Very soon, the capability of the EHT will be significantly improved by the completion of the ALMA telescope, currently under construction in Chile. ALMA consists of 54 radio dishes each equivalent to the single dish of the APEX telescope. The EHT may also include another two Smithsonian radio telescopes in addition to the SMA. SAO is a partner in the South Pole Telescope currently operating in Antarctica and also a partner with ASIAA and other institutions in the development of a new radio telescope to be located on the Greenland ice sheet. Both these telescopes can be linked into the EHT network to improve the angular resolution.

ESO/M. Kornmesser

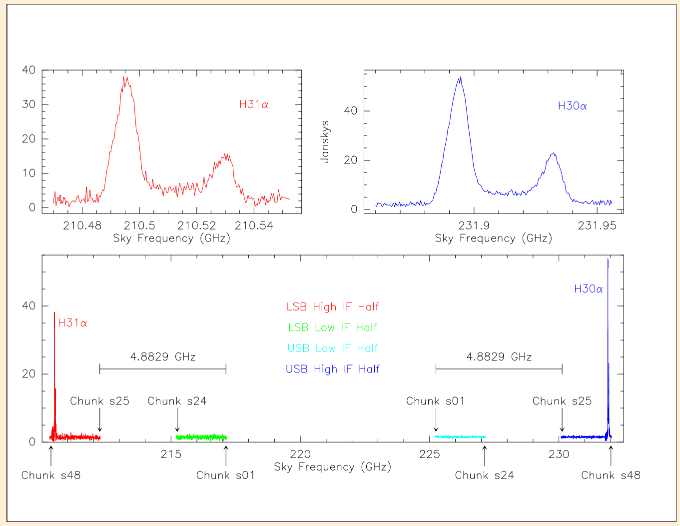
The quasar 3C 279 was chosen for the current observations even though it is too far away to resolve its event horizon. It is about 6 times brighter than the black hole in our Galaxy and 15 times brighter than M87. The observations of 3C 279 are important as a demonstration of the technology in the EHT, the technique of high angular resolution VLBI, and a step along the way toward the goal of imaging a black hole.

NEW OBSERVING MODE FOR THE 2012B SEMESTER

Ken Young

Our 230 GHz band receivers have been upgraded to provide higher bandwidth. Working in the 230 band, we now have a usable IF from 4 to 12 GHz, double the bandwidth of 4 to 8 GHz that our older receivers provided. We do not yet have the correlator resources necessary to process the full 8 GHz IF, but we can already make some use of this new capability. When operating in one receiver, 4 GHz bandwidth mode, the IF is processed in two 2 GHz wide bands which are usually separated by 2 GHz. Starting this semester we will support changing that band separation to any value between 2 and 6 GHz. If, for example, the separation is set to 4 GHz, then the lower band will cover the IF range from 4 to 6 GHz, and the upper IF will cover the range from 8 to 10 GHz. So while we can still cover no more than 8 GHz of sky frequency at one time, this new flexibility will allow us to simultaneously observe any two spectral lines whose frequencies differ by less than 24 GHz.

The figure below shows how we can now target two lines that we could not previously observe simultaneously. The plots show the H30 and H31 alpha hydrogen recombination lines in the peculiar star MWC 349. These lines differ in frequency by 21.4 GHz. By changing the spacing between the two IF halves to 4.88 GHz, we introduce a large, unprocessed gap between the two IF halves, but increase the sky frequency difference between the upper and lower sidebands of the upper IF half to accommodate both of the recombination lines.



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CALL FOR SMA SCIENCE OBSERVING PROPOSALS

The joint CfA-ASIAA SMA Time Allocation Committee (TAC) solicits proposals for observations for the period 2012 Nov 16 - 2013 May 15. The deadline for submitting proposals is 2012 September 13 (20:00 GMT = 16:00 EDT = 10:00 HST). For more information please see link below.

http://sma1.sma.hawaii.edu/proposing.html

The deadlines for the following semesters (2013A and 2013B) are expected to be on February 7, 2013 and August 8, 2013.

POSTDOCTORAL OPPORTUNITIES AT THE SMA

Applications are now being accepted for employment starting in the Summer/Fall of 2013. These positions are aimed chiefly at research in submillimeter astronomy, and successful candidates will participate either in observations with the SMA or in their interpretation. For more information please see the link below. Closing date: 10/01/2012.

http://www.cfa.harvard.edu/opportunities/fellowships/sma/

PROPOSAL STATISTICS 2012A (16 MAY 2012 – 15 NOV 2012)

The SMA received a total of 105 proposals (SAO & ASIAA: 99 and UH: 6) requesting observing time in the 2012A semester. The proposals received by the joint SAO and ASIAA Time Allocation Committee are divided among science categories as follows:

Category	Proposals
high mass (OB) star formation, cores	28
low/intermediate mass star formation, cores	17
local galaxies, starbursts, AGN	15
evolved stars, AGB, PPN	8
protoplanetary, transition, debris disks	8
GRB, SN, high energy	6
submm/hi-z galaxies	6
UH	6
galactic center	5
other	3
solar system	3

TRACK ALLOCATIONS BY WEATHER REQUIREMENT (ALL PARTNERS):

PWV[1]	SAO+ASIAA	UH[2]
< 4mm	21A + 39B	8
< 2.5mm	35A + 31B	4
< 1 mm	10A + 3B	5
Total	**66A + 73B**	**17**

(1) Precipitable water vapor required for the observations.
(2) UH does not list As and Bs.

TOP-RANKED SAO AND ASIAA PROPOSALS - 2012A SEMESTER

The following is the listing of all SAO and ASIAA proposals with at least partial A ranking with the names and affiliations of the principal investigators.

EVOLVED STARS, AGB, PPN

Joanna Brown, Cfa
CO J=2-1 Imaging of M Supergiant Winds - Antares and Rasalgethi

Nimesh Patel, CfA, SMA
Imaging Cold Dust around Wolf-Rayet Stars

Wouter Vlemmings, Chalmers University of Technology
CO polarization probing the large scale magnetic field in circumstellar envelopes

GALACTIC CENTER

Dan Marrone, University of Arizona
Flaring in Sagittarius A: Coordinated Monitoring from 1mm to <1nm*

Jens Kauffmann, Jet Propulsion Lab
High Mass Cold GMCs in the Galactic Center

Katharine Johnston, Max Planck Institute for Astronomy
The Cradle of an Arches-like cluster?

Paul Ho, SAO/ASIAA
Kinematic Processes of the Extremely Turbulent ISM around the Supermassive Blackholes

GRB, SN, HIGH ENERGY

Laura Chomiuk, Harvard-Smithsonian Center for Astrophysics/ National Radio Astronomy Observatory
Exploring the Millimeter Behavior of Novae

Sayan Chakraborti, Tata Institute of Fundamental Research
The SMA Rapid Transient (SMART) Legacy Program

Sergio Martin Ruiz, European Southern Observatory
Observing the peak emission of gamma-ray bursts afterglows in submillimeter frequencies

HIGH MASS (OB) STAR FORMATION, CORES

Hau-Yu Baobab Lu, Harvard-Smithonian CfA
Structures and Kinematics of the Hub-Filament System: The High Mass Case

Izaskun Jimenez-Serra, Harvard-Smithsonian Center for Astrophysics
Deuteration toward AFGL2591: Impact of Warm Gas-phase Reactions and UV Photochemistry on Deuterium Fractionation in Hot Cores

Izaskun Jimenez-Serra, Harvard-Smithsonian Center for Astrophysics
Unveiling the hot-core cluster population toward the massive star formation ridge in SgrB2

Patrick Koch, ASIAA
Magnetic Field Strength Profiles

Roberto Galvan-Madrid, ESO (Germany)
Disentangling the Accretion Flow around the Massive Protostar W33A

LOCAL GALAXIES, STARBURSTS, AGN

Lisa H. Wei, SAO/CfA
Circumnuclear Starbursts: Put a Ring On It

LOW/INTERMEDIATE MASS STAR FORMATION, CORES

Howard Smith, CfA
From cold cores to hot cores (2b): The early evolution of massive star formation, an SMA followup of Herschel FIR maps

John Tobin, National Radio Astronomy Observatory
The Inner Envelope Kinematics of a Class 0 Protostar: Observationally Constraining Disk Formation

Ramprasad Rao, ASIAA SMA
Magnetic Fields through Polarization Observations of the Serpens Main Core

OTHER

Michael McCollough, Smithsonian Astrophysical Observatory
Monitoring Cygnus X-3 Flare

PROTOPLANETARY, TRANSITION, DEBRIS DISKS

Charlie Qi, CfA
Resolving the Distribution N2H+ in the Disk of HD 163296

Meredith Hughes, UC Berkeley
The Structure of Debris Disks around Solar-Type Stars

Sean Andrews, CfA
A Disk-Based Dynamical Mass Estimate for the Young Binary Star AK Sco

SOLAR SYSTEM

Mark Gurwell, Harvard-Smithsonian Center for Astrophysics
SUN: Structure of Uranus and Neptune

SUBMM/HI-Z GALAXIES

Giovanni G. Fazio, Harvard Smithsonian Center for Astrophysics
SMA Observations of an Exceptionally Bright Gravitationally-Lensed Submillimeter Galaxy at z = 2.4

Shane Bussmann, CfA
SMA Observations of Candidate z >4 SMGs Discovered By Herschel

ALL SAO PROPOSALS - 2011B SEMESTER

The following is the listing of all the SAO proposals observed in the 2011B semester (16 November 2011 – 15 May 2012)

Sean Andrews, CfA
Dynamical Measurements of Young Star Masses from Gas Disk Rotation Curves

Henrik Beuther, Max-Planck-Institute for Astronomy
Fragmentation of a star-forming filamentary cloud

Tyler Bourke, SAO
Disk Structure around Class I Protostars

Joanna Brown, Cfa
Unravelling the wind outflows of Betelgeuse

Shane Bussmann, CfA
Compact imaging of Gravitationally Lensed ULIRGs

Shane Bussmann, CfA
SMA Imaging of F880um ~ 60 mJy Strongly-lensed z >2 Galaxies Discovered By Herschel

Shane Bussmann, CfA
Short-baseline Imaging of G12v2.30

Rosie Chen, Max Planck Institute for Radio Astronomy
Probing Birth Environments of Super-Star Clusters at Low-Metallicity

Laura Chomiuk, Harvard-Smithsonian Center for Astrophysics/ National Radio Astronomy Observatory
Exploring the Millimeter Behavior of Novae

Lauren Cleeves, University of Michigan
Searching for an Extrasolar Heliopause

David Clements, Imperial College London
Completing Detailed Imaging of Herschel Candidate High z Galaxies

David Clements, Imperial College London
Herschel Selected High z Dusty Galaxies

Claudia Cyganowski, SAO/CfA
An Isolated Accreting Massive Protostar?: G19.01-0.03

Sheperd Doeleman, MIT Haystack Observatory
230 GHz VLBI Observations of SgrA and M87*

Michael Dunham, Yale University
Outflow and Disk Properties of a Candidate First Core

Catherine Espaillat, Harvard-Smithsonian Center for Astrophysics
Constraining Planet Formation in Dusty Disks Around Young Stars

Giovanni G. Fazio, Harvard Smithsonian Center for Astrophysics
SMA Observations of an Exceptionally Bright Gravitationally-Lensed Submillimeter Galaxy at z~4.6

Jan Forbrich, CfA
A Star Formation Survey of the Nearby Southern Galaxy NGC 300

Michel GUELIN, IRAM
Small scale structure of the outer CO shells of IRC+10216

Mark Gurwell, Harvard-Smithsonian Center for Astrophysics
Detection and Characterization of Vibrationally Excited HC3N From Titan's Stratosphere

Mark Gurwell, Harvard-Smithsonian Center for Astrophysics
Vertically Resolved Stratospheric Winds on Titan and Mapping of Nitrile Species

Robert Harris, Harvard-Smithsonian CfA
A Protoplanetary Disk Census in Taurus Multiple Star Systems

Hiroyuki Hirashita, Academia Sinica, Institute of Astronomy and Astrophysics
Free-free-dominated 850 micron emission from young active star formation

Paul Ho, SAO/ASIAA
Kinematic Processes of the Extremely Turbulent ISM around the Supermassive Blackholes (duplicate of 2011B-A019)

Paul Ho, SAO/ASIAA
Kinematic Processes of the Extremely Turbulent ISM around the Supermassive Blackholes (duplicate of 2011B-S040)

Pei-Ying Hsieh, Academia Sinica Institute of Astronomy & Astrophysics
Warm Central Molecular Zone of IC 342 Associated with the Nuclear Spiral

Meredith Hughes, UC Berkeley
Molecular Gas in Debris Disks: HD 141569

Meredith Hughes, UC Berkeley
Resolving Structure in the Debris Disk around HD 61005

Izaskun Jimenez-Serra, Harvard-Smithsonian Center for Astrophysics
Fragmentation of a quiescent massive core in a Spitzer IRDC?

Izaskun Jimenez-Serra, Harvard-Smithsonian Center for Astrophysics
Unveiling the Origin of the Radio Recombination Maser Emission toward the eta Carinae Massive Star

Ryohei Kawabe, NAOJ
Sub-mm continuum and CO high-resolution observations toward the candidates モSource Aヤ in rho Oph-A

Eric Keto, CFA
The building blocks of the starburst in M82

Chin-Fei Lee, ASIAA
B-field structure in the disk of the protostellar system HH 111

Hua-bai Li, MPIA
Fragmentation and Ambipolar Diffusion in Filamentary Molecular Clouds II

Hau-Yu Baobab Lu, Harvard-Smithonian CfA
Evolutionary Processes in High-Mass Star Formation Region: The Very Luminous Region G10.3-0.1

Meredith MacGregor, Harvard University
Compact Configuration Observations of the HR4796A Debris Disk

Rita Mann, Herzberg Institute of Astrophysics - National Research Council
Disk Masses and Lifetimes in Rich Clusters

Dan Marrone, University of Arizona
Disentangling the Polarization of Sagittarius A with SMA and CARMA*

Arielle Moullet, NRAO
Investigating Iapetus' surface dichotomy at 1.3mm

Nimesh Patel, CfA, SMA
SiO maser in L2 Pup

Charlie Qi, CfA
Search for N2H+ in TW Hya

Keping Qiu, Max-Planck-Institute for Radioastronomy
Probing the densest regions in Orion Bar

Ramprasad Rao, ASIAA SMA
Magnetic Fields through Polarization Observations of the Serpens Main Core

Laurence Sabin, Institute of Astronomy, Universidad Nacional Autonoma de Mexico
Magnetic Fields in Proto-Planetary nebulae

Giuseppe Sacco, Rochester Institute of Technology
Gas and Dust in the multiple system HBC 515

Raghvendra Sahai, Jet Propulsion Laboratory
Investigating the High-Velocity Outflows in, and Environment of, an Interstellar Bullet Engine

Kazushi Sakamoto, ASIAA
Circumnuclear Gas in NGC 4418

Kazushi Sakamoto, ASIAA
Circumnuclear Gas in NGC 4418 (=2011B-S026)

Benjamin Sargent, Space Telescope Science Institute
Gas Mass Loss Rates and Gas-to-Dust Ratios of Galactic Bulge Evolved Stars

Shigehisa Takakuwa, ASIAA
The Protobinary System L1551 NE: From Envelope to Circumbinary Disk to Accretion Streams onto Circumstellar Disks

Mark Thompson, University of Hertfordshire
A candidate isolated proto-brown dwarf discovered in the Herschel ATLAS

An-Li Tsai, NCU
The 230 GHz flux of the Fermi Sources 1FGL J1311.7-3429

An-Li Tsai, NCU
The 230 GHz flux of the Fermi Sources 2FGL J1823.8+4312

Junko Ueda, Harvard-Smithsonian Center for Astrophysics
Observations of Class-0/I source [BHB2007] #11 in the Pipe nebula; unveiling disk rotationg-outflow connection

Yuji Urata, NCU/ASIAA
Constrain Emission Mechanism of GRB Afterglow with Broadband SED

Zhong Wang, CfA
Continuing the On-going SMA Suyrvey of Ultra-luminous Galaxies

Zhong Wang, CfA
Test Tracks for Molecular Gas Observations of ALFALFA Galaxies

Lisa H. Wei, SAO/CfA
The Mass Spectrum of the ISM in Starbursts

David Wilner, CfA
The HD 104860 Debris Disk

David Wilner, CfA
The HR4796A Debris Disk

Hsi-Wei Yen, ASIAA
Unveiling Rotational Profiles of Protostellar Envelopes from 100 to 5000 AU: How Disks Form?

Luis Zapata, CRyA-UNAM
Episodic Mass Ejection Event in a Young Star - Follow Up

Bevin Zauderer, Harvard
Insights on Gamma-Ray Bursts and Transients from Combined mm/cm Observations

Qizhou Zhang, CfA
Filaments, Star Formation and Magnetic Fields

RECENT PUBLICATIONS

Title: An Observed Lack of Substructure in Starless Cores II: Super-Jeans Cores
Authors: Schnee, Scott; Sadavoy, Sarah; Di Francesco, James; Johnstone, Doug; Wei, Lisa
Publication: *eprint arXiv:*1206.5008
Publication Date: 06/2012
Abstract: http://adsabs.harvard.edu/abs/2012arXiv1206.5008S

Title: Winds of change - a molecular outflow in NGC 1377? The anatomy of an extreme FIR-excess galaxy
Authors: Aalto, S.; Muller, S.; Sakamoto, K.; Gallagher, J. S.; Martin, S.; Costagliola, F.
Publication: *eprint arXiv:*1206.4858
Publication Date: 06/2012
Abstract: http://adsabs.harvard.edu/abs/2012arXiv1206.4858A

Title: Revealing The Millimeter Environment of the New FU Orionis Candidate HBC722 with the Submillimeter Array
Authors: Dunham, Michael M.; Arce, Hector G.; Bourke, Tyler L.; Chen, Xuepeng; van Kempen, Tim A.; Green, Joel D.
Publication: *eprint arXiv:*1206.4730
Publication Date: 06/2012
Abstract: http://adsabs.harvard.edu/abs/2012arXiv1206.4730D

Title: ALMA Observations of the Outflow from Source I in the Orion-KL Region
Authors: Zapata, Luis A.; Rodríguez, Luis F.; Schmid-Burgk, Johannes; Loinard, Laurent; Menten, Karl M.; Curiel, Salvador
Publication: *The Astrophysical Journal Letters,* Volume 754, Issue 1, article id. L17 (2012).
Publication Date: 07/2012
Abstract: http://adsabs.harvard.edu/abs/2012ApJ...754L..17Z

Title: Fragmentation and OB Star Formation in High-Mass Molecular Hub-Filament System
Authors: Liu, Hauyu Baobab; Jiménez-Serra, Izaskun; Ho, Paul T.-P.; Chen, Huei-Ru; Zhang, Qizhou; Li, Zhi-Yun
Publication: *eprint arXiv:*1206.1907
Publication Date: 06/2012
Abstract: http://adsabs.harvard.edu/abs/2012arXiv1206.1907L

Title: The Structure and Emission Model of the Relativistic Jet in the Quasar 3C 279 Inferred from Radio to High-energy γ-Ray Observations in 2008-2010
Authors: Hayashida, M.; Madejski, G. M.; Nalewajko, K.; Sikora, M.; Wehrle, A. E.; Ogle, P.; Collmar, W.; Larsson, S.; Fukazawa, Y.; Itoh, R.; Chiang, J.; Stawarz, Ł.; Blandford, R. D.; Richards, J. L.; Max-Moerbeck, W.; Readhead, A.; Buehler, R.; Cavazzuti, E.; Ciprini, S.; Gehrels, N.; Reimer, A.; Szostek, A.; Tanaka, T.; Tosti, G.; Uchiyama, Y.; Kawabata, K. S.; Kino, M.; Sakimoto, K.; Sasada, M.; Sato, S.; Uemura, M.; Yamanaka, M.; Greiner, J.; Kruehler, T.; Rossi, A.; Macquart, J. P.; Bock, D. C.-J.; Villata, M.; Raiteri, C. M.; Agudo, I.; Aller, H. D.; Aller, M. F.; Arkharov, A. A.; Bach, U.; Benítez, E.; Berdyugin, A.; Blinov, D. A.; Blumenthal, K.; Böttcher, M.; Buemi, C. S.; Carosati, D.; Chen, W. P.; Di Paola, A.; Dolci, M.; Efimova, N. V.; Forné, E.; Gómez, J. L.; Gurwell, M. A.; Heidt, J.; Hiriart, D.; Jordan, B.; Jorstad, S. G.; Joshi, M.; Kimeridze, G.; Konstantinova, T. S.; Kopatskaya, E. N.; Koptelova, E.; Kurtanidze, O. M.; Lähteenmäki, A.; Lamerato, A.; Larionov, V. M.; Larionova, E. G.; Larionova, L. V.; Leto, P.; Lindfors, E.; Marscher, A. P.; McHardy, I. M.; Molina, S.

N.; Morozova, D. A.; Nikolashvili, M. G.; Nilsson, K.; Reinthal, R.; Roustazadeh, P.; Sakamoto, T.; Sigua, L. A.; Sillanpää, A.; Takalo, L.; Tammi, J.; Taylor, B.; Tornikoski, M.; Trigilio, C.; Troitsky, I. S.; Umana, G.
Publication: *The Astrophysical Journal,* Volume 754, Issue 2, article id. 114 (2012).
Publication Date: 08/2012
Abstract: http://adsabs.harvard.edu/abs/2012ApJ...754..114H

Title: Panchromatic Observations of SN 2011dh Point to a Compact Progenitor Star
Authors: Soderberg, A. M.; Margutti, R.; Zauderer, B. A.; Krauss, M.; Katz, B.; Chomiuk, L.; Dittmann, J. A.; Nakar, E.; Sakamoto, T.; Kawai, N.; Hurley, K.; Barthelmy, S.; Toizumi, T.; Morii, M.; Chevalier, R. A.; Gurwell, M.; Petitpas, G.; Rupen, M.; Alexander, K. D.; Levesque, E. M.; Fransson, C.; Brunthaler, A.; Bietenholz, M. F.; Chugai, N.; Grindlay, J.; Copete, A.; Connaughton, V.; Briggs, M.; Meegan, C.; von Kienlin, A.; Zhang, X.; Rau, A.; Golenetskii, S.; Mazets, E.; Cline, T.
Publication: *The Astrophysical Journal,* Volume 752, Issue 2, article id. 78 (2012).
Publication Date: 06/2012
Abstract: http://adsabs.harvard.edu/abs/2012ApJ...752...78S

Title: From dusty filaments to massive stars: The case of NGC 7538 S
Authors: Naranjo-Romero, Raul; Zapata, Luis A.; Vazquez-Semadeni, Enrique; Takahashi, Satoko; Palau, Aina; Schilke, Peter
Publication: *eprint arXiv:*1205.5750
Publication Date: 05/2012
Abstract: http://adsabs.harvard.edu/abs/2012arXiv1205.5750N

Title: Different Evolutionary Stages in the Massive Star-forming Region W3 Main Complex
Authors: Wang, Yuan; Beuther, Henrik; Zhang, Qizhou; Bik, Arjan; Rodón, Javier A.; Jiang, Zhibo; Fallscheer, Cassandra
Publication: *The Astrophysical Journal,* Volume 754, Issue 2, article id. 87 (2012).
Publication Date: 08/2012
Abstract: http://adsabs.harvard.edu/abs/2012ApJ...754...87W

Title: A Keplerian Circumbinary Disk around the Protostellar System L1551 NE
Authors: Takakuwa, Shigehisa; Saito, Masao; Lim, Jeremy; Saigo, Kazuya; Sridharan, T. K.; Patel, Nimesh A.
Publication: *The Astrophysical Journal,* Volume 754, Issue 1, article id. 52 (2012).
Publication Date: 07/2012
Abstract: http://adsabs.harvard.edu/abs/2012ApJ...754...52T

Title: HerMES: Candidate Gravitationally Lensed Galaxies and Lensing Statistics at Submillimeter Wavelengths
Authors: Wardlow, Julie L.; Cooray, Asantha; De Bernardis, Francesco; Amblard, A.; Arumugam, V.; Aussel, H.; Baker, A. J.; Béthermin, M.; Blundell, R.; Bock, J.; Boselli, A.; Bridge, C.; Buat, V.; Burgarella, D.; Bussmann, R. S.; Calanog, J.; Carpenter, J. M.; Casey, C. M.; Castro-Rodríguez, N.; Cava, A.; Chanial, P.; Chapman, S. C.; Clements, D. L.; Conley, A.; Cox, P.; Dowell, C. D.; Dye, S.; Eales, S.; Farrah, D.; Franceschini, A.; Frayer, D. T.; Frazer, C.; Fu, Hai; Gavazzi, R.; Glenn, J.; Griffin, M.; Gurwell, M. A.; Harris, A. I.; Hatziminaoglou, E.; Hopwood, R.; Ibar, E.; Ivison, R. J.; Kim, S.; Lagache, G.; Levenson, L.; Marchetti, L.; Marsden, G.; Negrello, M.; Neri, R.; Nguyen, H. T.; O'Halloran, B.; Oliver, S. J.; Omont, A.; Page, M. J.; Panuzzo, P.; Papageorgiou, A.; Pearson, C. P.; Pérez-Fournon, I.; Pohlen, M.; Riechers, D.; Rigopoulou, D.; Roseboom, I. G.; Rowan-Robinson, M.; Schulz, B.; Scott, D.; Scoville, N.; Seymour, N.; Shupe, D. L.; Smith, A. J.; Symeonidis, M.; Trichas, M.; Vaccari, M.; Vieira, J. D.; Viero, M.; Wang, L.; Xu, C. K.; Yan, L.; Zemcov, M.
Publication: *eprint arXiv:*1205.3778
Publication Date: 05/2012
Abstract: http://adsabs.harvard.edu/abs/2012arXiv1205.3778W

Title: 880 μm Imaging of a Transitional Disk in Upper Scorpius: Holdover from the Era of Giant Planet Formation?
Authors: Mathews, Geoffrey S.; Williams, Jonathan P.; Ménard, Francois
Publication: *The Astrophysical Journal,* Volume 753, Issue 1, article id. 59 (2012).
Publication Date: 07/2012
Abstract: http://adsabs.harvard.edu/abs/2012ApJ...753...59M

Title: Resolving the Circumstellar Disk around the Massive Protostar Driving the HH 80-81 Jet
Authors: Carrasco-González, Carlos; Galván-Madrid, Roberto; Anglada, Guillem; Osorio, Mayra; D'Alessio, Paola; Hofner, Peter; Rodríguez, Luis F.; Linz, Hendrik; Araya, Esteban D.
Publication: *The Astrophysical Journal Letters,* Volume 752, Issue 2, article id. L29 (2012).
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Title: Luminous Infrared Galaxies with the Submillimeter Array. III. The Dense Kiloparsec Molecular Concentrations of Arp 299
Authors: Sliwa, Kazimierz; Wilson, Christine D.; Petitpas, Glen R.; Armus, Lee; Juvela, Mika; Matsushita, Satoki; Peck, Alison B.; Yun, Min S.
Publication: *The Astrophysical Journal,* Volume 753, Issue 1, article id. 46 (2012).
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Abstract: http://adsabs.harvard.edu/abs/2012ApJ...753...46S

Title: Chemical Segregation toward Massive Hot Cores: The AFGL2591 Star-forming Region
Authors: Jiménez-Serra, I.; Zhang, Q.; Viti, S.; Martín-Pintado, J.; de Wit, W.-J.
Publication: *The Astrophysical Journal,* Volume 753, Issue 1, article id. 34 (2012).
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Title: Submillimeter Array Observations of the RX J1633.9-2442 Transition Disk: Evidence for Multiple Planets in the Making
Authors: Cieza, Lucas A.; Mathews, Geoffrey S.; Williams, Jonathan P.; Ménard, Francois C.; Kraus, Adam L.; Schreiber, Matthias R.; Romero, Gisela A.; Orellana, Mariana; Ireland, Michael J.
Publication: *The Astrophysical Journal,* Volume 752, Issue 1, article id. 75 (2012).
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Title: H II Regions, Embedded Protostars, and Starless Cores in Sharpless 2-157
Authors: Chen, Chian-Chou; Williams, Jonathan P.; Pandian, Jagadheep D.
Publication: *The Astrophysical Journal,* Volume 752, Issue 2, article id. 102 (2012).
Publication Date: 06/2012
Abstract: http://adsabs.harvard.edu/abs/2012ApJ...752..102C

Title: Mapping the Linearly Polarized Spectral Line Emission around the Evolved Star IRC+10216
Authors: Girart, J. M.; Patel, N.; Vlemmings, W. H. T.; Rao, Ramprasad
Publication: *The Astrophysical Journal Letters,* Volume 751, Issue 1, article id. L20 (2012).
Publication Date: 05/2012
Abstract: http://adsabs.harvard.edu/abs/2012ApJ...751L..20G

Title: The Magnetized Environment of the W3(H2O) Protostars
Authors: Chen, Huei-Ru; Rao, Ramprasad; Wilner, David J.; Liu, Sheng-Yuan
Publication: *The Astrophysical Journal Letters,* Volume 751, Issue 1, article id. L13 (2012).
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Abstract: http://adsabs.harvard.edu/abs/2012ApJ...751L..13C

Title: A Rotating Molecular Jet from a Perseus Protostar
Authors: Pech, Gerardo; Zapata, Luis A.; Loinard, Laurent; Rodríguez, Luis F.
Publication: *The Astrophysical Journal,* Volume 751, Issue 1, article id. 78 (2012).
Publication Date: 05/2012
Abstract: http://adsabs.harvard.edu/abs/2012ApJ...751...78P

Title: Spatially Resolving Substructures within the Massive Envelope around an Intermediate-mass Protostar: MMS 6/OMC-3
Authors: Takahashi, Satoko; Saigo, Kazuya; Ho, Paul T. P.; Tomida, Kengo
Publication: *The Astrophysical Journal,* Volume 752, Issue 1, article id. 10 (2012).
Publication Date: 06/2012
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Title: H2D+ in the High-mass Star-forming Region Cygnus X
Authors: Pillai, T.; Caselli, P.; Kauffmann, J.; Zhang, Q.; Thompson, M. A.; Lis, D. C.
Publication: *The Astrophysical Journal,* Volume 751, Issue 2, article id. 135 (2012).
Publication Date: 06/2012
Abstract: http://adsabs.harvard.edu/abs/2012ApJ...751..135P

Title: The Nature of Transition Circumstellar Disks. III. Perseus, Taurus, and Auriga
Authors: Cieza, Lucas A.; Schreiber, Matthias R.; Romero, Gisela A.; Williams, Jonathan P.; Rebassa-Mansergas, Alberto; Merín, Bruno
Publication: *The Astrophysical Journal,* Volume 750, Issue 2, article id. 157 (2012).
Publication Date: 05/2012
Abstract: http://adsabs.harvard.edu/abs/2012ApJ...750..157C

Title: A Resolved Census of Millimeter Emission from Taurus Multiple Star Systems
Authors: Harris, Robert J.; Andrews, Sean M.; Wilner, David J.; Kraus, Adam L.
Publication: *The Astrophysical Journal,* Volume 751, Issue 2, article id. 115 (2012).
Publication Date: 06/2012
Abstract: http://adsabs.harvard.edu/abs/2012ApJ...751..115H

Title: Submillimeter Array and Spitzer Observations of Bok Globule CB 17: A Candidate First Hydrostatic Core?
Authors: Chen, Xuepeng; Arce, Héctor G.; Dunham, Michael M.; Zhang, Qizhou; Bourke, Tyler L.; Launhardt, Ralf; Schmalzl, Markus; Henning, Thomas
Publication: The *Astrophysical Journal,* Volume 751, Issue 2, article id. 89 (2012).
Publication Date: 06/2012
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Title: Outflow and accretion detections in the young stellar object IRAS 04579+4703
Authors: Xu, Jin-Long; Wang, Jun-Jie; Qin, Sheng-Li
Publication: *Astronomy & Astrophysics,* Volume 540, id.L13
Publication Date: 04/2012
Abstract: http://adsabs.harvard.edu/abs/2012A%26A...540L..13X

Title: The Small-scale Physical Structure and Fragmentation Difference of Two Embedded Intermediate-mass Protostars in Orion
Authors: van Kempen, T. A.; Longmore, S. N.; Johnstone, D.; Pillai, T.; Fuente, A.
Publication: *The Astrophysical Journal,* Volume 751, Issue 2, article id. 137 (2012).
Publication Date: 06/2012
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Title: Polarization of thermal molecular lines in the envelope of IK Tauri
Authors: Vlemmings, W. H. T.; Ramstedt, S.; Rao, R.; Maercker, M.
Publication: *Astronomy & Astrophysics,* Volume 540, id.L3
Publication Date: 04/2012
Abstract: http://adsabs.harvard.edu/abs/2012A%26A...540L...3V

Title: The molecular emissions and the infall motion in the high-mass young stellar object G8.68-0.37
Authors: Ren, Zhiyuan; Wu, Yuefang; Zhu, Ming; Liu, Tie; Peng, Ruisheng; Qin, Shengli; Li, Lixin
Publication: *Monthly Notices of the Royal Astronomical Society,* Volume 422, Issue 2, pp. 1098-1108.
Publication Date: 05/2012
Abstract: http://adsabs.harvard.edu/abs/2012MNRAS.422.1098R

Title: A Resolved Millimeter Emission Belt in the AU Mic Debris Disk
Authors: Wilner, David J.; Andrews, Sean M.; MacGregor, Meredith A.; Hughes, A. Meredith
Publication: *The Astrophysical Journal Letters,* Volume 749, Issue 2, article id. L27 (2012).
Publication Date: 04/2012
Abstract: http://adsabs.harvard.edu/abs/2012ApJ...749L..27W

Title: Two Populations of Molecular Clouds in the Antennae Galaxies
Authors: Wei, Lisa H.; Keto, Eric; Ho, Luis C.
Publication: *The Astrophysical Journal,* Volume 750, Issue 2, article id. 136 (2012).
Publication Date: 05/2012
Abstract: http://adsabs.harvard.edu/abs/2012ApJ...750..136W

Title: Confirming the Primarily Smooth Structure of the Vega Debris Disk at Millimeter Wavelengths
Authors: Hughes, A. Meredith; Wilner, David J.; Mason, Brian; Carpenter, John M.; Plambeck, Richard; Chiang, Hsin-Fang; Andrews, Sean M.; Williams, Jonathan P.; Hales, Antonio; Su, Kate; Chiang, Eugene; Dicker, Simon; Korngut, Phil; Devlin, Mark
Publication: *The Astrophysical Journal,* Volume 750, Issue 1, article id. 82 (2012).
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Title: Evidence for Multiple Pathways to Deuterium Enhancements in Protoplanetary Disks
Authors: Öberg, Karin I.; Qi, Chunhua; Wilner, David J.; Hogerheijde, Michiel R.
Publication: *The Astrophysical Journal,* Volume 749, Issue 2, article id. 162 (2012).
Publication Date: 04/2012
Abstract: http://adsabs.harvard.edu/abs/2012ApJ...749..162O

Title: Discovery of a Binary System in IRAM 04191+1522
Authors: Chen, Xuepeng; Arce, Héctor G.; Dunham, Michael M.; Zhang, Qizhou
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Title: A Comprehensive View of a Strongly Lensed Planck-Associated Submillimeter Galaxy
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Authors: Maury, A.; Ohashi, N.; André, P.
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Title: Magnetic Field Strength Maps for Molecular Clouds: A New Method Based on a Polarization-Intensity Gradient Relation
Authors: Koch, Patrick M.; Tang, Ya-Wen; Ho, Paul T. P.
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Authors: Espaillat, C.; Ingleby, L.; Hernández, J.; Furlan, E.; D'Alessio, P.; Calvet, N.; Andrews, S.; Muzerolle, J.; Qi, C.; Wilner, D.
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Title: Probing Circumnuclear Environments with the HCN(J = 3-2) and HCO+(J = 3-2) Lines: Case of NGC 1097
Authors: Hsieh, Pei-Ying; Ho, Paul T. P.; Kohno, Kotaro; Hwang, Chorng-Yuan; Matsushita, Satoki
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Title: Radio Monitoring of the Tidal Disruption Event Swift J164449.3+573451. I. Jet Energetics and the Pristine Parsec-scale Environment of a Supermassive Black Hole
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Title: The Circular Polarization of Sagittarius A* at Submillimeter Wavelengths
Authors: Muñoz, D. J.; Marrone, D. P.; Moran, J. M.; Rao, R.
Publication: *The Astrophysical Journal,* Volume 745, Issue 2, article id. 115 (2012).
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Title: Pre-ALMA observations of GRBs in the mm/submm range
Authors: de Ugarte Postigo, A.; Lundgren, A.; Martín, S.; Garcia-Appadoo, D.; de Gregorio Monsalvo, I.; Peck, A.; Michałowski, M. J.; Thöne, C. C.; Campana, S.; Gorosabel, J.; Tanvir, N. R.; Wiersema, K.; Castro-Tirado, A. J.; Schulze, S.; De Breuck,

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Publication:	*Astronomy & Astrophysics,* Volume 538, id.A44
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Title:	The Discovery of the Youngest Molecular Outflow Associated with an Intermediate-mass Protostellar Core, MMS-6/OMC-3
Authors:	Takahashi, Satoko; Ho, Paul T. P.
Publication:	*The Astrophysical Journal Letters,* Volume 745, Issue 1, article id. L10 (2012).
Publication Date:	01/2012
Abstract:	http://adsabs.harvard.edu/abs/2012ApJ...745L..10T

The Submillimeter Array (SMA) is a pioneering radio-interferometer dedicaed to a broad range of astronomical studies including finding protostellar disks and outflows; evolved stars; the Galactic Center and AGN; normal and luminous galaxies; and the solar system. Located on Mauna Kea, Hawaii, the SMA is a collaboration between the Smithsonian Astrophysical Observatory and the Academia Sinica Institute of Astronomy and Astrophysics.

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