

ALMA アーカイブを使ったサイエンス:星形成

Science case with ALMA archive; SFRs

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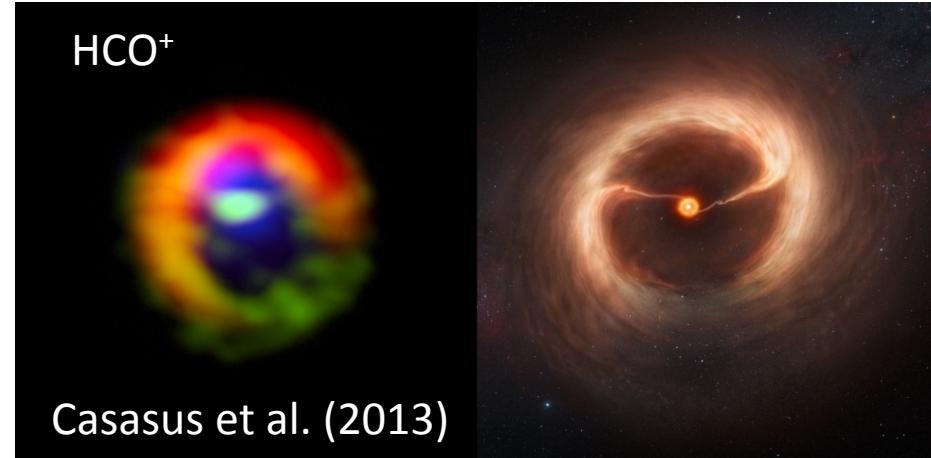
Science case for SFRs

- Category of ALMA proposal (in case of cycle 2)
 3. ISM, star formation and astrochemistry
 4. Circumstellar disks, exoplanets and the solar system
- Category of archive data
 - Science Verification data
 - Highest priority and filler projects in Cycle 0
 - Few papers based on archive data from cycle 0 projects
 - According to ADS search with keyword “ADS/JAO.ALMA#2011”
- Mainly focusing on science cases of SV data in terms of motivation/idea/specialty rather than scientific results

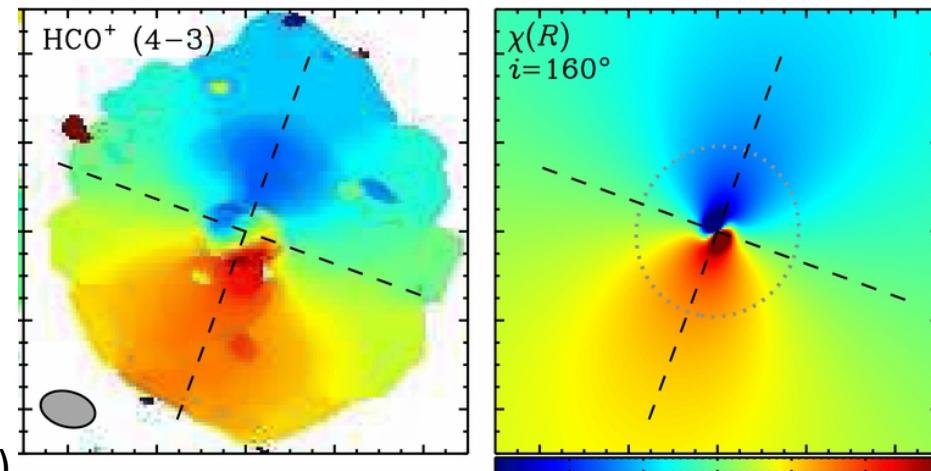
HD142527 (cycle 0)

- Transitional disk forming giant planets (145pc)
 - Cycle 0

- Casassus et al. (2013)
 - HCO⁺ at band 7
 - According to their proposal, CO and HCO⁺ at band 6, 7, and 9 are proposed?

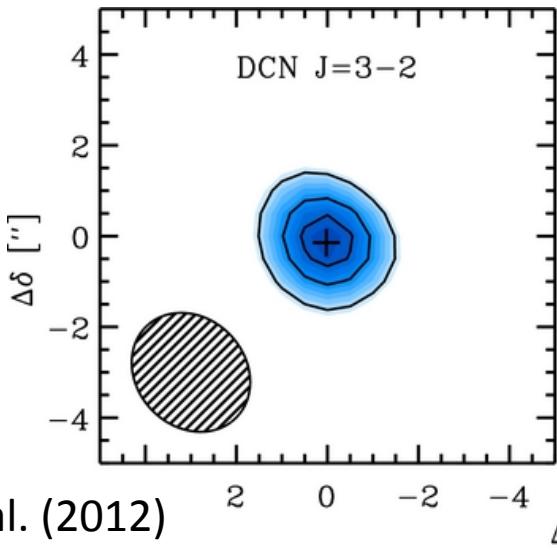


- Archive
 - Rosenfeld et al. (2014)
 - Model calculations
 - Application of their model to ALMA data as a test

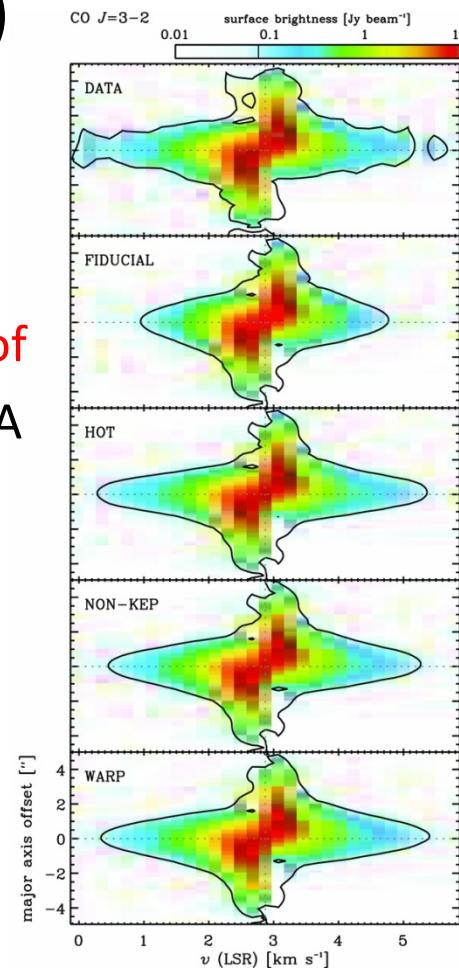
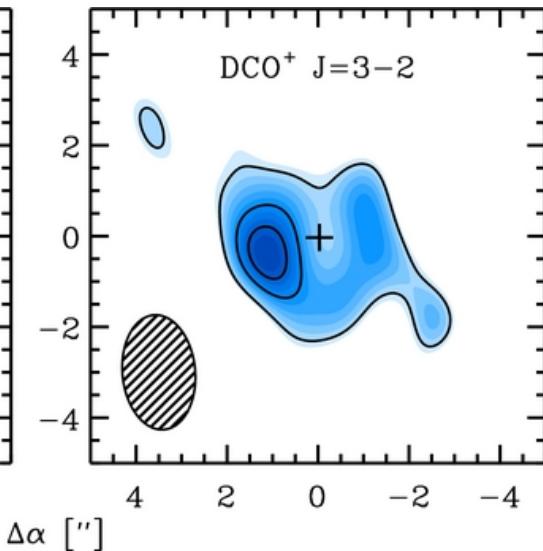


TW Hya (SV)

- One of the nearest YSOs with disk (~ 51 pc)
 - Band 6 ($\sim 2.6''$) and band 7 ($\sim 1.6''$)
 - Oberg et al. (2012); Compare DCN and **DCO⁺(SMA)**
 - Rosenfeld et al. (2012); Model calculation of CO
 - Bergin et al. (2013), Favre et al. (2013); **detection of HD by Herschel**, temperature is estimated by ALMA



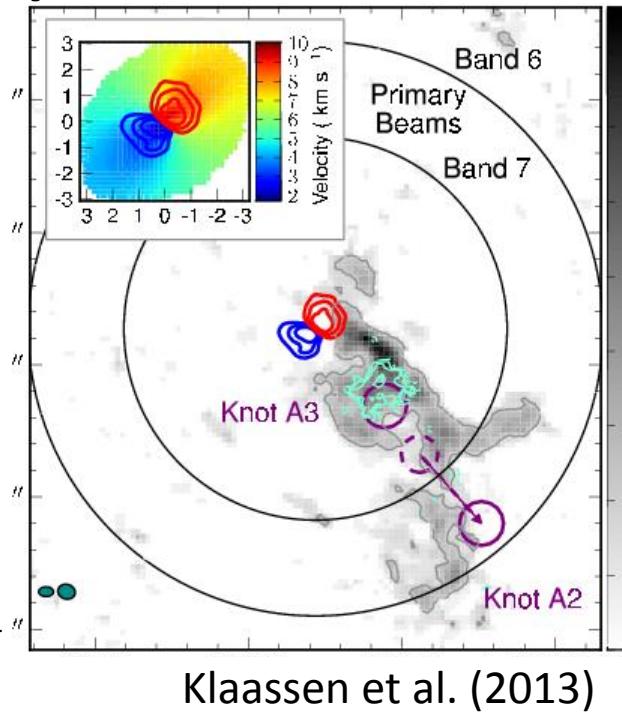
Oberg et al. (2012)



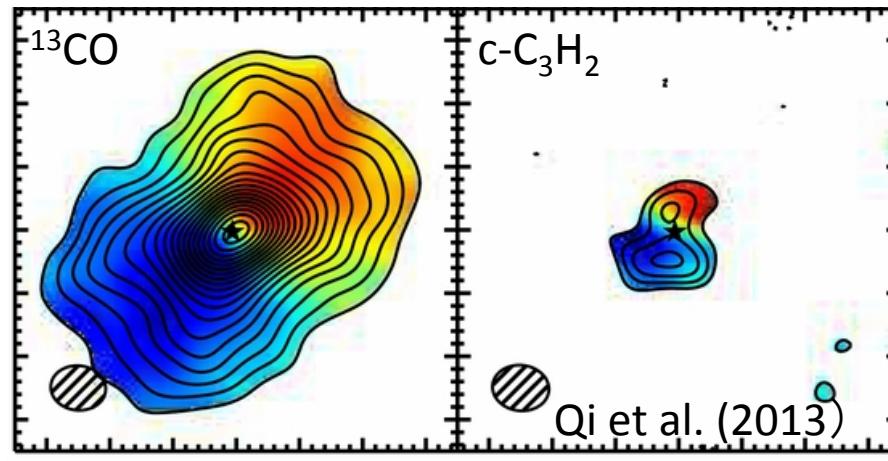
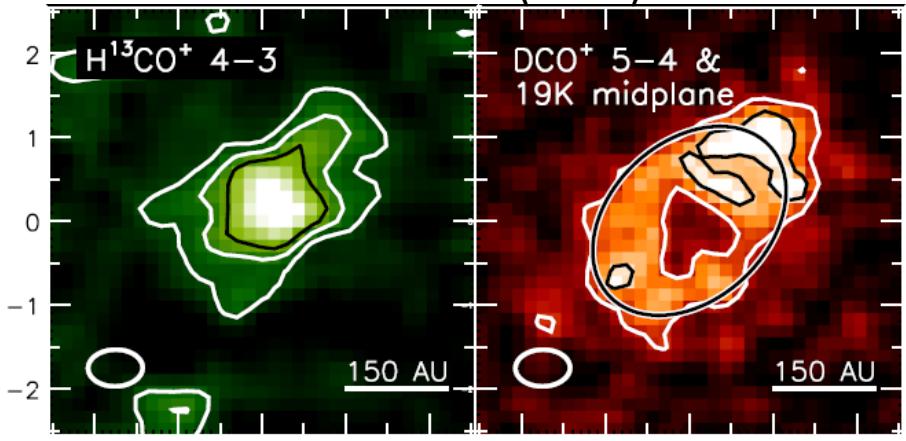
Rosenfeld et al. (2012)

HD 163296 (SV)

- Well studied Herbig Ae star
 - Band 6 ($\sim 0.8''$) and Band 7 ($\sim 0.5''$)
 - Klaassen et al. (2013); CO
 - de Gregorio-Monsalvo et al. (2013); CO
 - Rosenfeld et al. (2013); CO/ ^{13}CO / C^{18}O
 - Qi et al. (2013); c- C_3H_2
 - Mathews et al. (2013); $\text{HCO}^+/\text{H}^{13}\text{CO}^+/\text{DCO}^+$

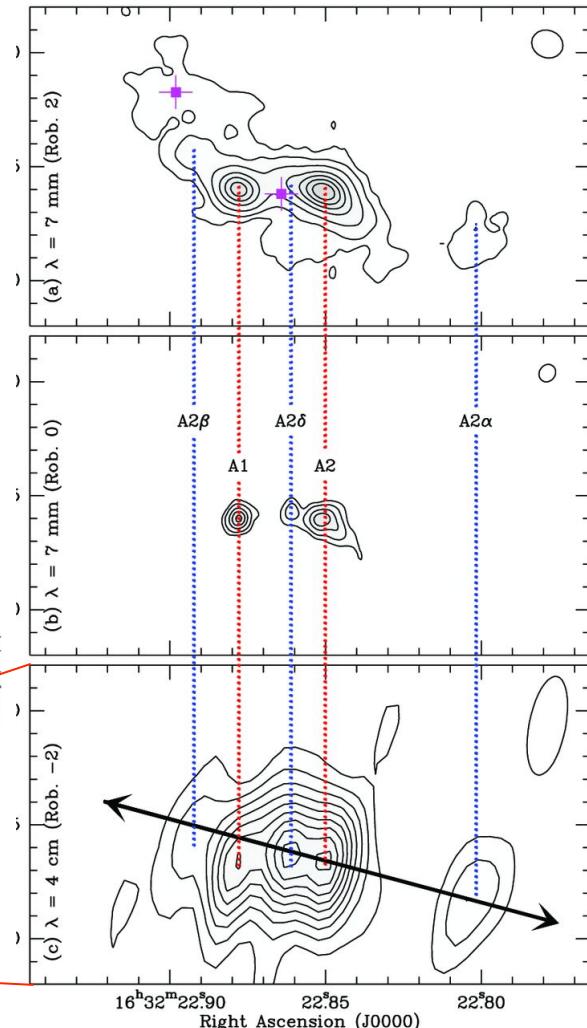
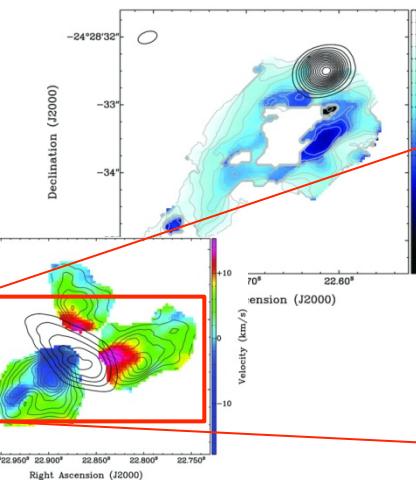
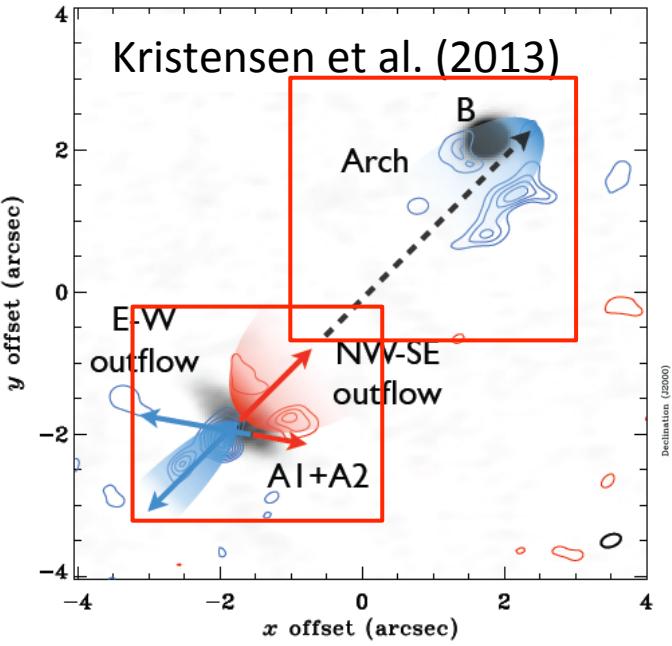


Mathews et al. (2013)



IRAS16293-2422 (SV)

- Nearest Class 0 stars (120 pc)
 - Band 9 ($\sim 0.3'' \times 0.2''$)
 - Kristensen et al. (2013); CO and continuum
 - Loinard et al. (2013); CO and continuum, comparison with **VLA continuum data**

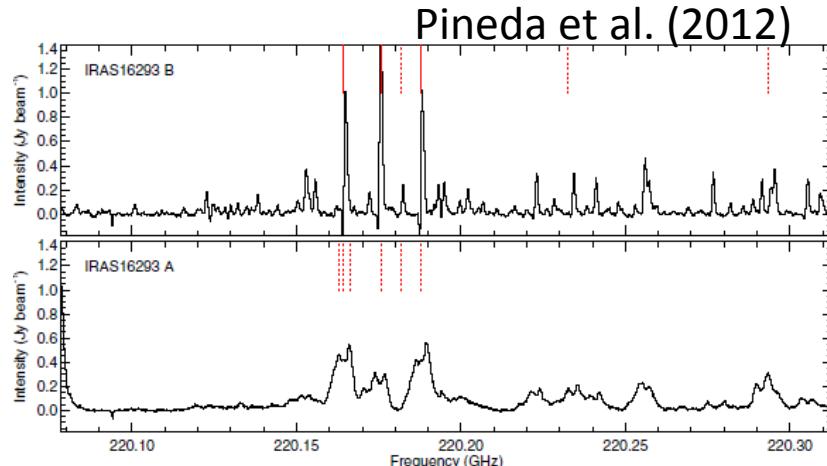
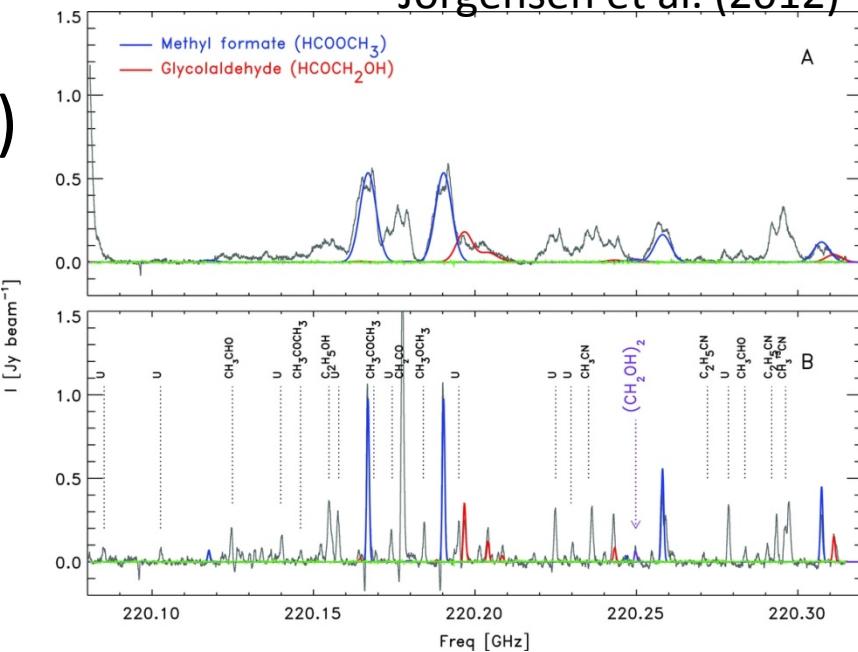


Loinard et al. (2013)

IRAS16293-2422 (SV)

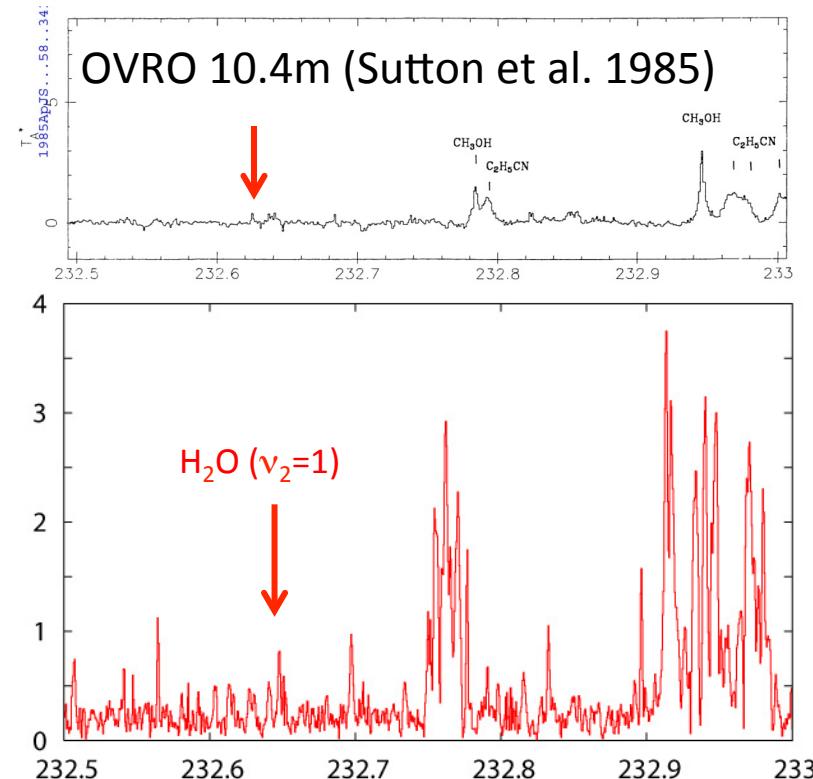
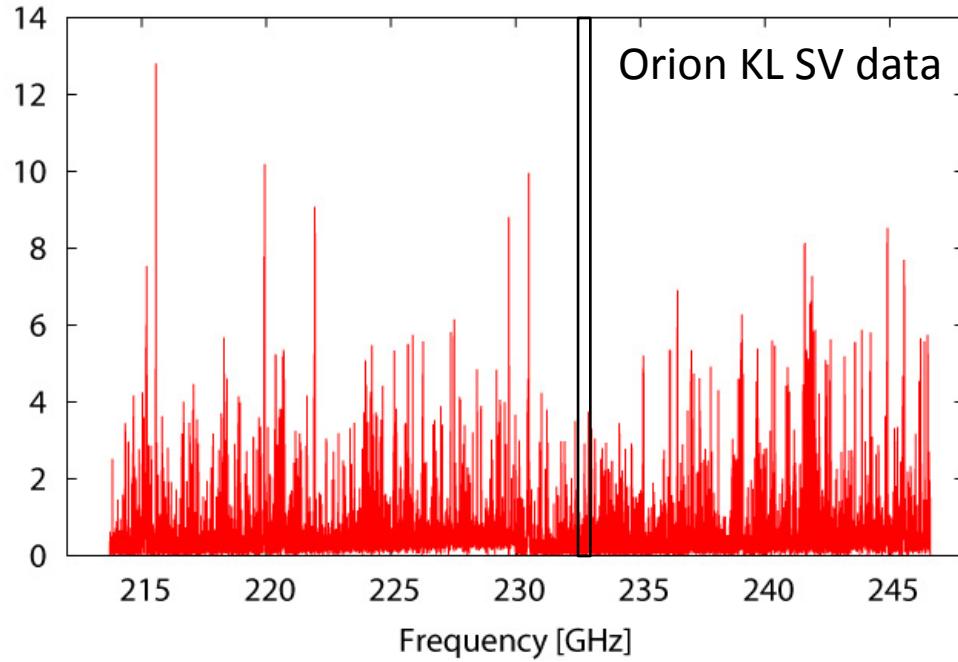
Jorgensen et al. (2012)

- Nearest Class 0 stars (120 pc)
 - Band 9 ($\sim 0.3'' \times 0.2''$)
 - Persson et al. (2013); $H_2^{18}O$, combine SMA data at 230 GHz
 - Zapata et al. (2013); $H^{13}CN$, $HC^{15}N$, CH_3OH
 - Band 6 ($\sim 2.2'' \times 1.0''$)
 - Jorgensen et al. (2012); $HCOCH_2OH$ (band 9 as well)
 - Pineda et al. (2012); CH_3OCHO , H_2CCO
 - Detection of infalling motion



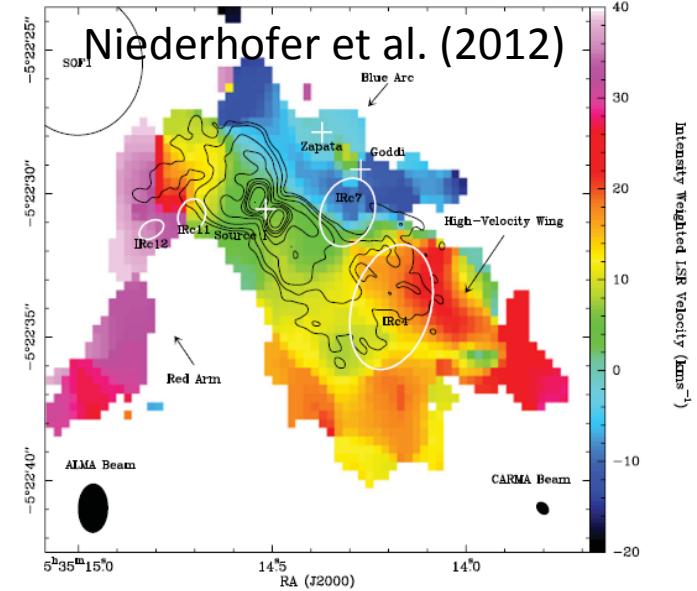
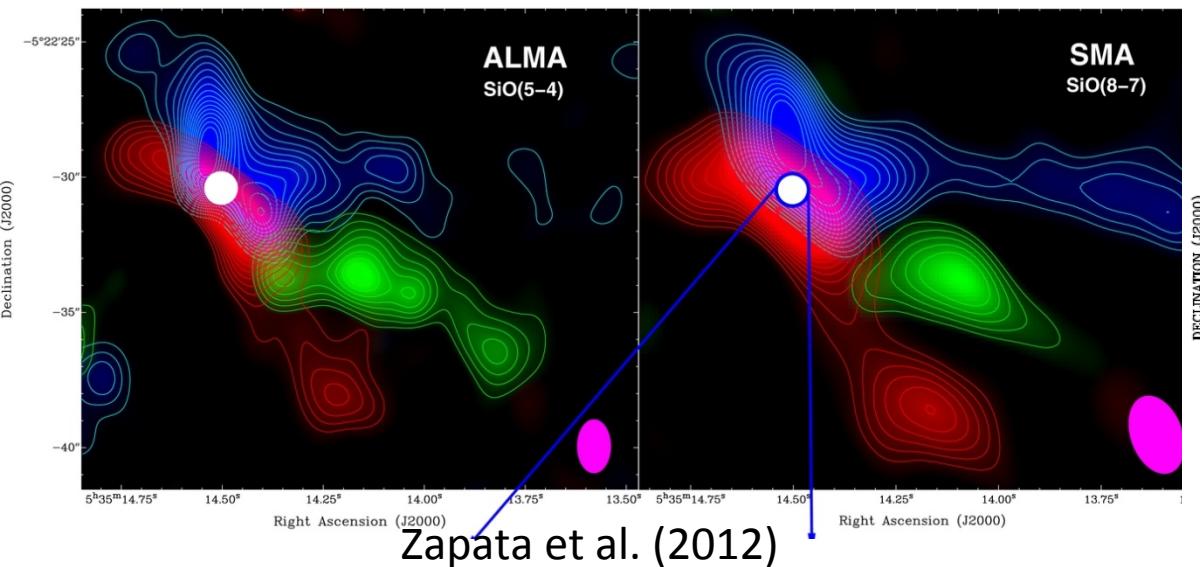
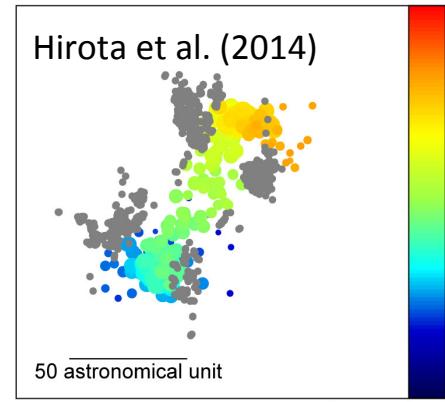
Orion KL (SV)

- Nearest massive star-forming region (420 pc)
 - Intense spectra at all bands
 - Famous in abundant molecular species/lines; “line forest”
 - Band 6 ($\sim 1.5''$)



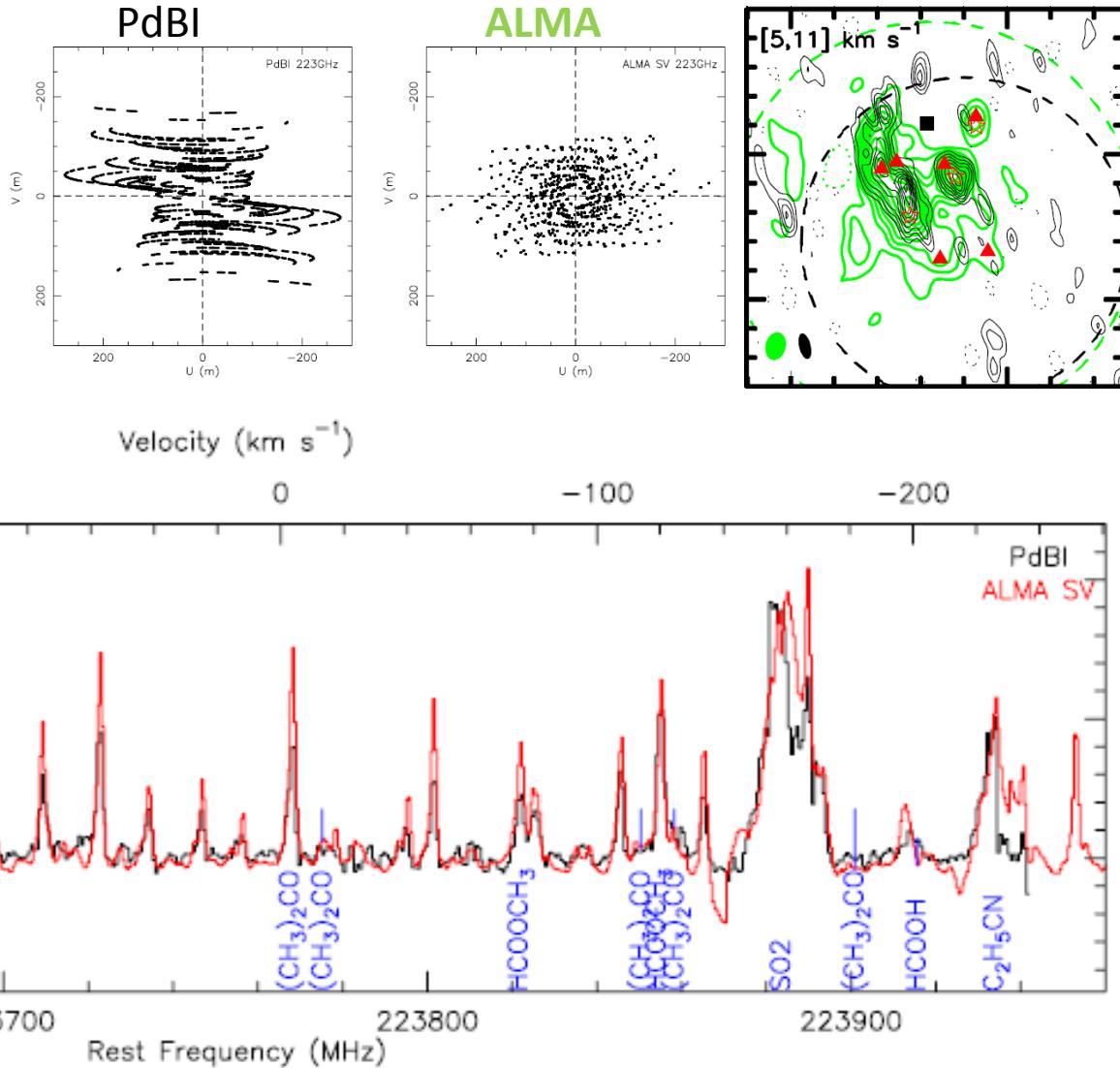
Orion KL (SV)

- Two papers for SiO with different interpretation
 - Zapata et al. (2012)
 - SiO($J=5-4$) and SiO ($J=8-7$) data by SMA
 - Niederhofer et al. (2012)
 - Isotopologues and vibrationally excited lines



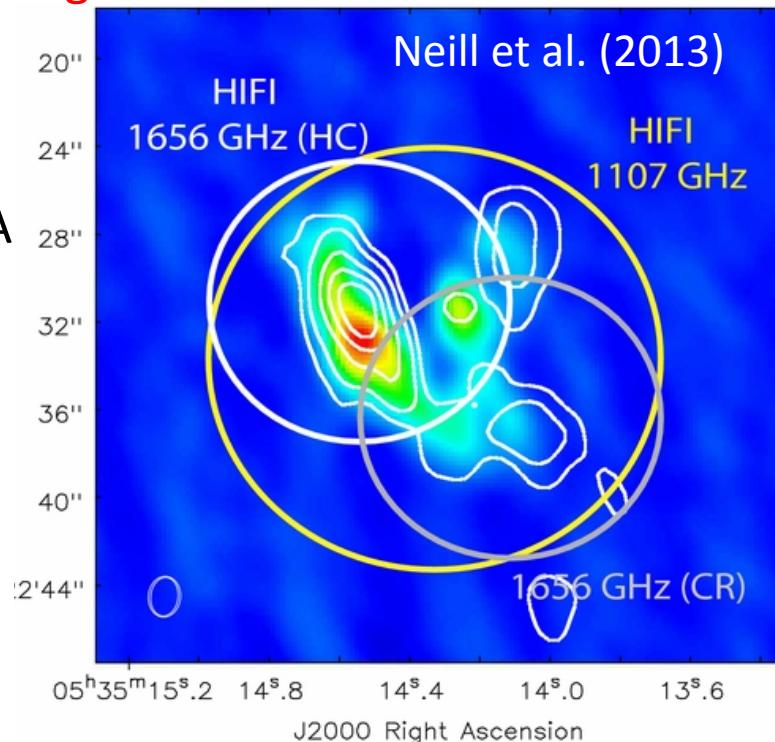
Orion KL (SV)

- $(\text{CH}_3)_2\text{CO}$ by PdBI
 - Peng et al. (2013)
 - Compared with SV
 - Possible effect of different UV



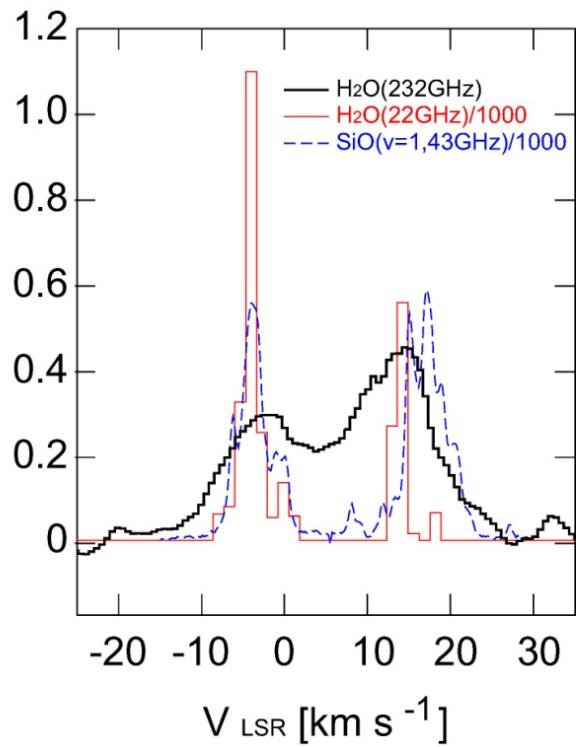
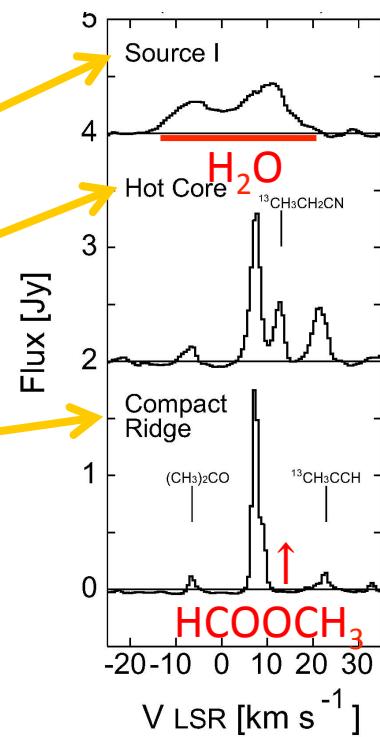
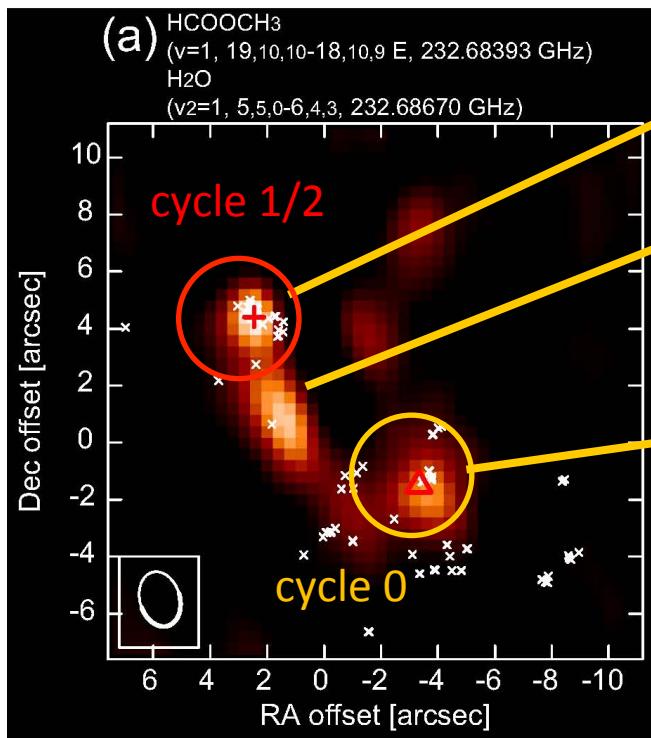
Orion KL (SV)

- Other published results
 - Fortman et al. (2012)
 - Journal of Molecular Spectroscopy
 - Comparison with molecular line catalogue
 - Galvan-Madrid et al. (2013)
 - Hydrogen recombination line
 - Multi-transition with VLA and ALMA
 - Neill et al. (2013a,b)
 - Deuterated molecules, HDO, NH₂D, ¹³CH₃OH, observed by Herschel



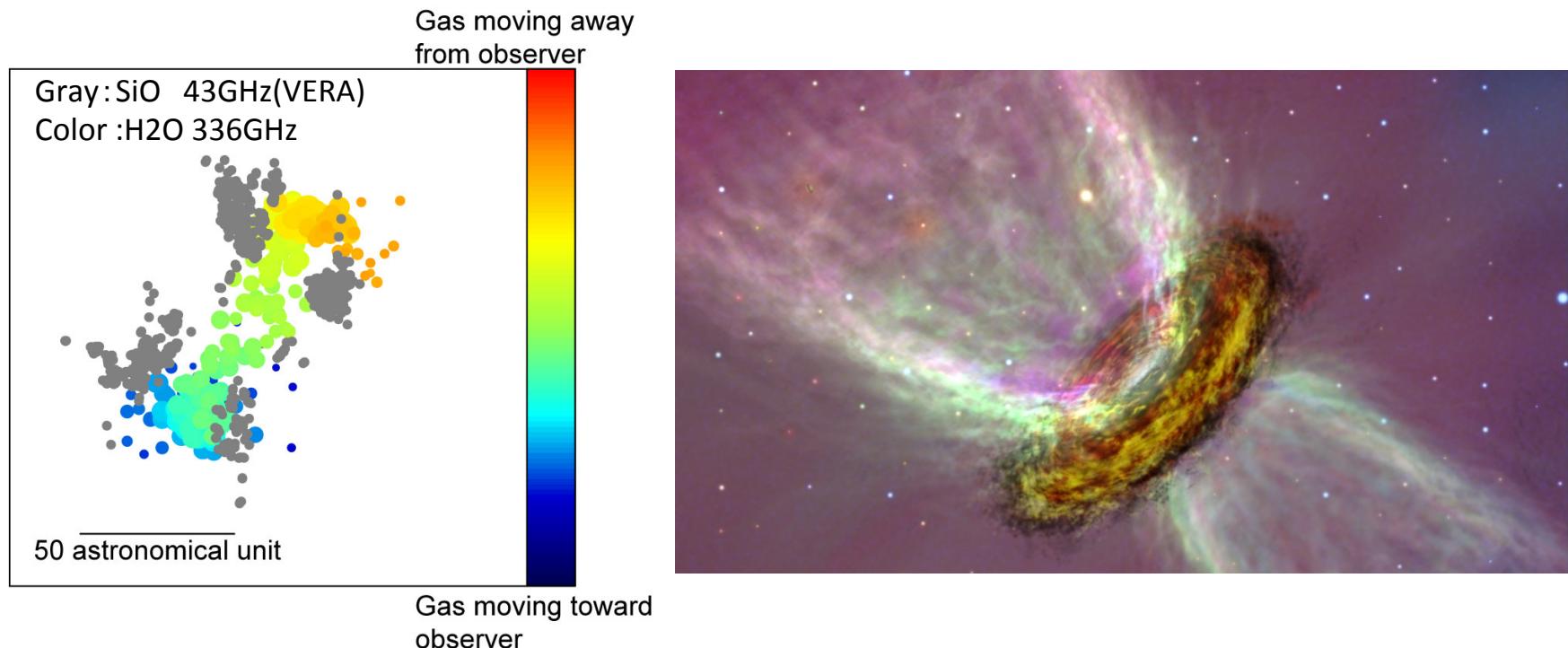
Orion KL (SV)

- Detection of vibratory excited H₂O at 232 GHz
 - Hirota et al. (2012)
 - Compared with SiO maser data by VERA (Kim et al. 2008)
 - By-product in cycle 0, new proposal to cycles 1 and 2



Orion KL (cycle 0)

- H₂O at band 7 in extended configuration
 - Hirota et al. (2014)
 - Science case different from original proposal
 - Compared with **VERA** observations of SiO masers (Kim et al. 2008)



Summary

- Impression in preparing this presentation
 - Only few papers based on cycle 0 archive compared with SV.
 - Many are based on their own data in addition to archive data.
 - SMA, Hershel, VLA, spectroscopy, simulation, etc.
- My personal experience
 - Archive data will be able to extended to next proposals
 - Careful check of data including calibration is necessary
 - Archive data are useful to familiarize with CASA.