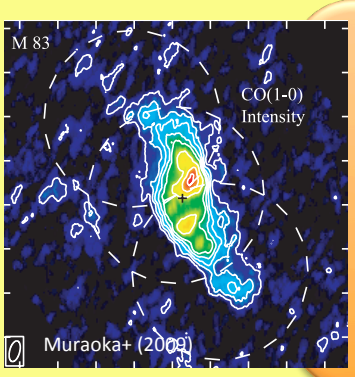
# Did you know?

the Atacama Large Millimeter/submillimeter Array (ALMA) can…

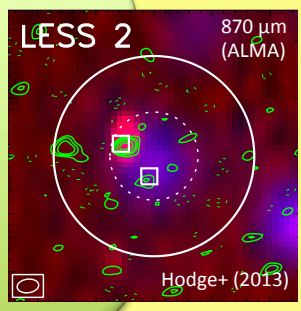



## … resolve molecular clouds in a nearby, star forming galaxy:

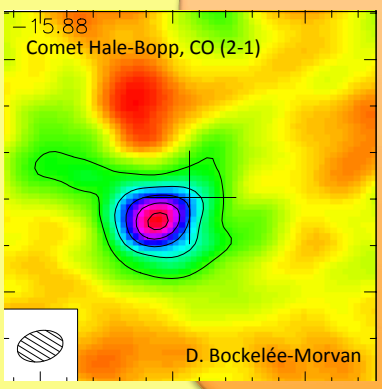
| | in Cycle 2 |
|---|---|
| 6 pc clouds of excited CO(J=3-2) gas across the central 400 pc of M83 | < 2 hours |
| 30 pc clouds of dense HCN(J=1-0) gas in the central 1.5 kpc of M83 | 25 minutes |
| create an HCN(J=1-0) mosaic of the full M83 bar with 30 pc resolution | 2.5 hours |

## … detect the ISM in high redshift galaxies:

| | in Cycle 2 |
|---|---|
| dust emission in a "normal" $10^{11}$ $L_\odot$ galaxy between z=1 and z=6 | 5.5 hours |
| major cooling [CII] line in a lensed Milky Way galaxy at z=4.2 | 30 minutes |
| dust emission in a $10^{12}$ $L_\odot$ luminous infrared galaxy out to z=10 | 7 minutes |



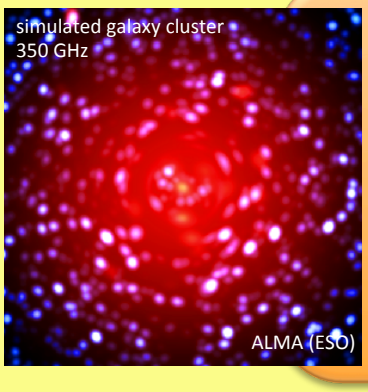

## … reveal the characteristics of Solar System objects:




| | in Cycle 2 |
|---|---|
| obtain wind patterns in the atmosphere of Mars with 300 km resolution | 30 minutes |
| trace the atmospheric water content of Venus using HDO lines | 10 minutes |
| detect volatiles (HCN, $CH_3OH$, $H_2CO$, CS, and HNC) on active comets | 50 minutes |
| measure Kuiper Belt Object sizes from their thermal emission | 1 hour |

## … survey Galactic clouds and star forming regions:

| | in Cycle 2 |
|---|---|
| measure the polarization of dust in 30 protostars in a single star forming region | 2 hours |
| detect thousands of lines over 60 GHz with < 1 km/s resolution toward Orion-KL | 10 minutes |

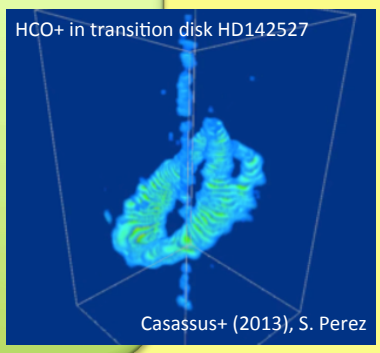


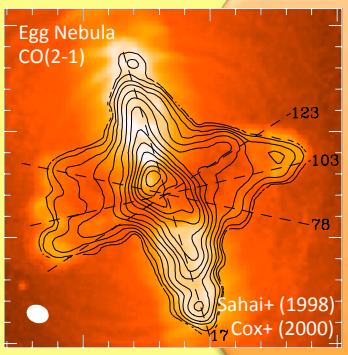

## … trace the formation of galaxy clusters, cosmic structure:

| | in Cycle 2 |
|---|---|
| characterize merger shocks in cluster gas with the Sunyaev-Zel'dovich Effect | 1.5 hours |
| measure the bulk cluster Sunyaev-Zel'dovich Effect in high-z clusters | 3 hours |
| survey clustering in a sample of 23 Lyman-α Blobs (LABs) at z=3.1 | < 1 hour |

## … reveal the nature of planetary disks around nearby stars:

| | in Cycle 2 |
|---|---|
| resolve the "snow line" in the disk around the T Tauri system HD 163296 | 15 minutes |
| measure dense gas flows across gaps in protoplanetary disks | 15 minutes |
| detect a dust disk gap induced by a Jupiter mass planet at 120 pc | 2 hours |
| image full debris disk (dense clumps in disk) of ε Eri with 1 AU resolution | 17 (3) hours |



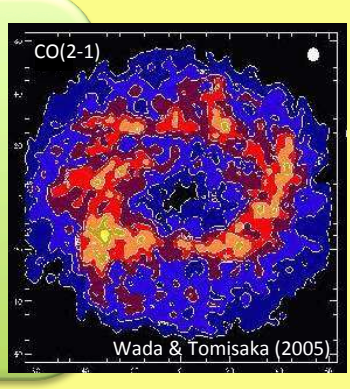




## … measure stellar activity from low to high mass stars:

| | in Cycle 2 |
|---|---|
| image molecular outflows from pre-planetary nebulae | 5 minutes |
| investigate heating mechanisms of red giant stars | 2 minutes |
| detect z=3 (z=10) GRB afterglow two days after the burst | 11 minutes (2.6 hours) |

## … study black holes and their environments, near and far:

| | in Cycle 2 |
|---|---|
| measure black hole mass of NGC 4526 from molecular gas kinematics | 1 hour |
| infer gas properties in the host galaxy of an obscured z=2.8 quasar | 20 minutes |
| understand the energetics of flares from Sagittarius A* | < 1 minute |




*Integration time estimates are on source integration times (no calibration) calculated with the ALMA exposure time calculator:*
*https://almascience.nrao.edu/proposing/sensitivity-calculator*
*More information about the assumptions and setups for each project can be found here: https://science.nrao.edu/facilities/alma/didyouknow*