

ORGANIC MOLECULES AT THE OUTER REACHES OF THE GALAXY

OBSERVATIONS OF CH_3OH , $\text{C-C}_3\text{H}_2$, AND CH_3CN BEYOND 15 KPC

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Retracing the GHZ with Organic Chemistry

The Galactic Habitable Zone (GHZ) is the region of the galaxy where life could potentially form

Molecular clouds near the edge of the galaxy are cold and dark ($T=10-25$ K)

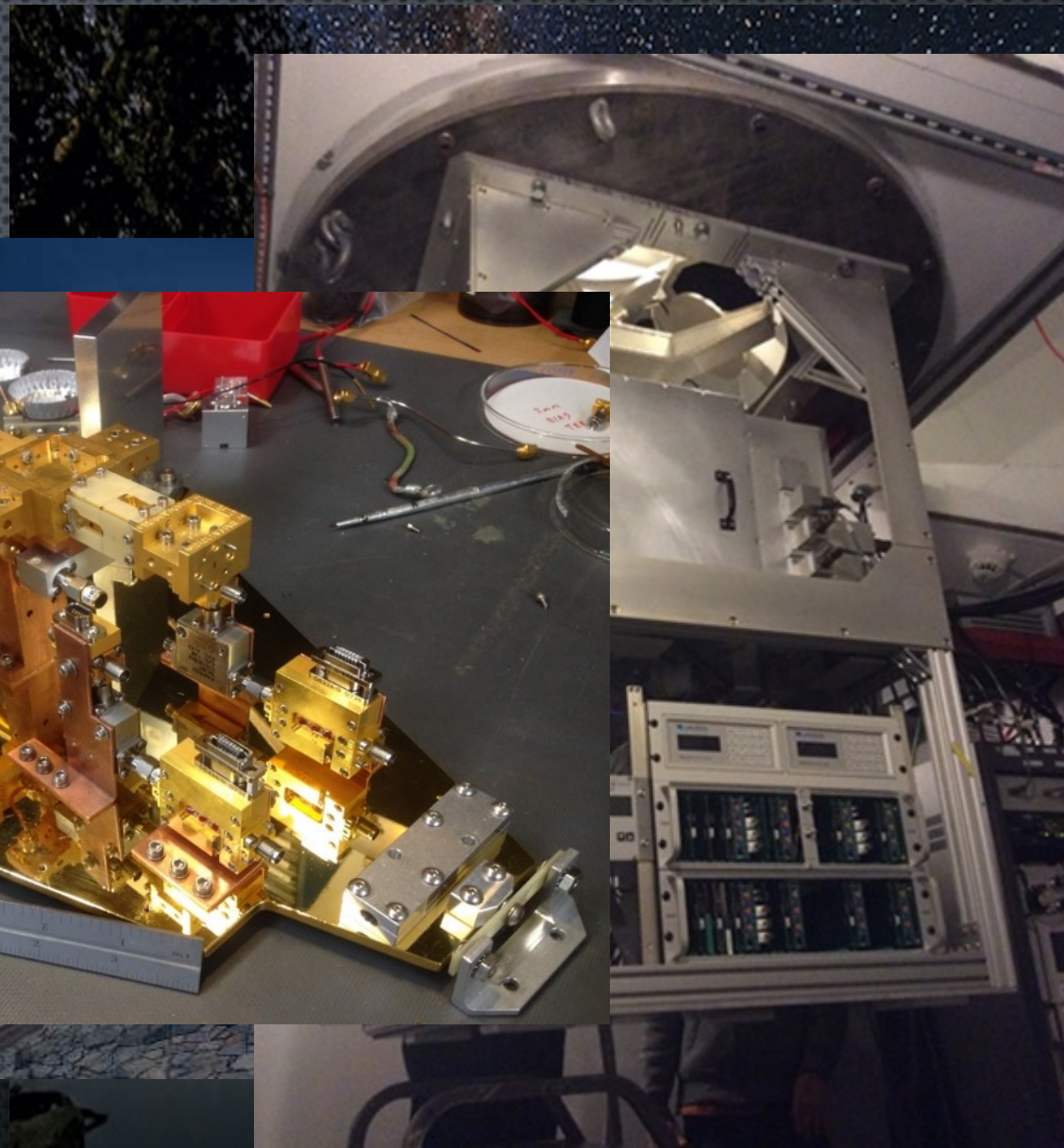
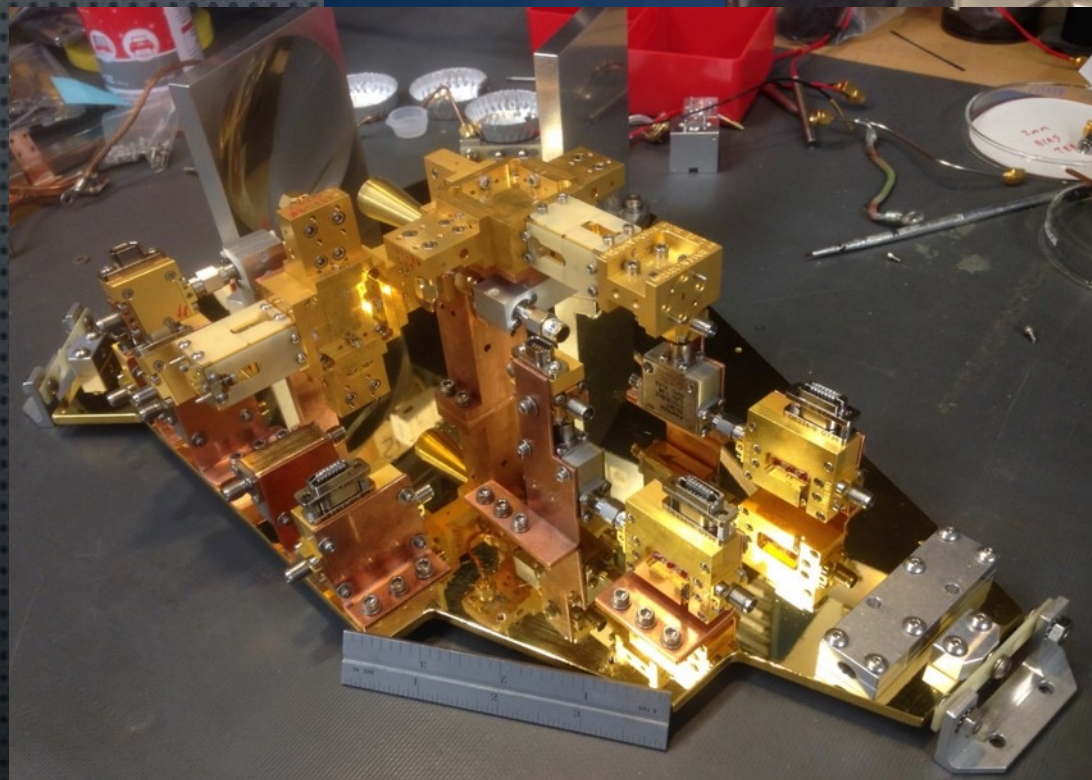


The lighter orange indicates the currently accepted boundaries of the GHZ, and the darker orange indicates the regions where organic molecules have been found. The Sun's location is shown as the blue circle

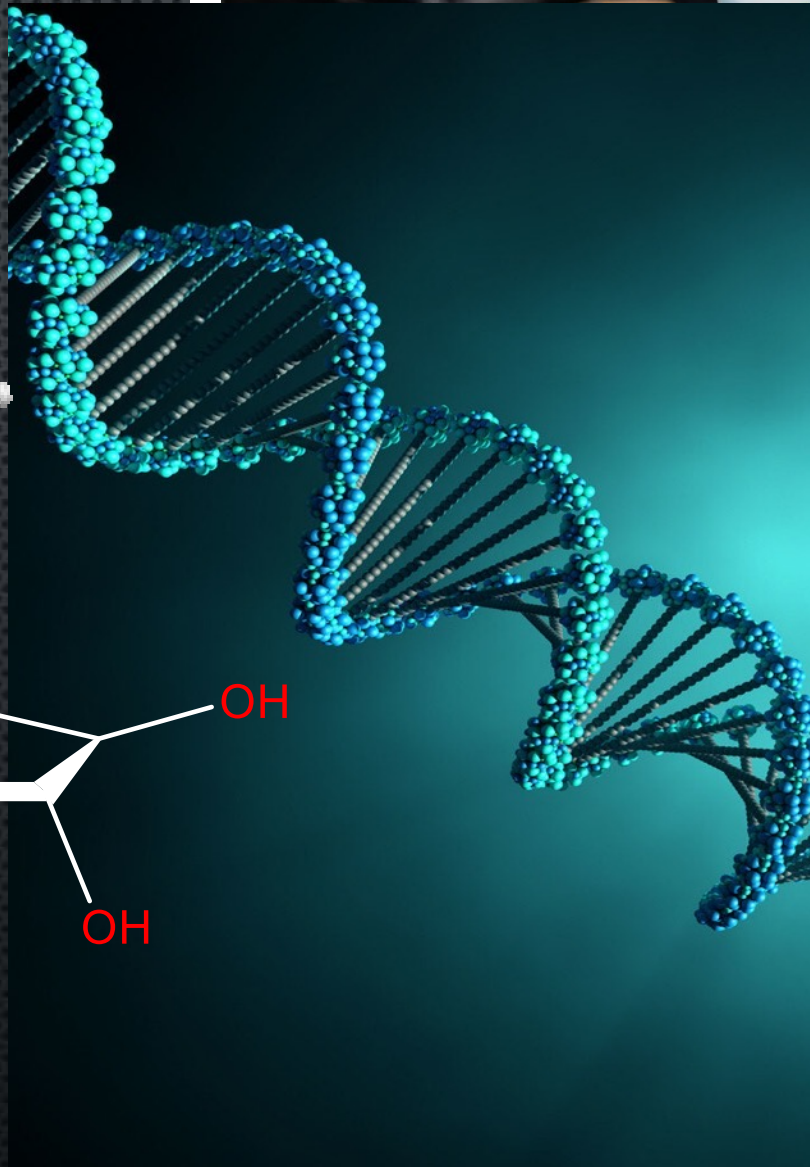
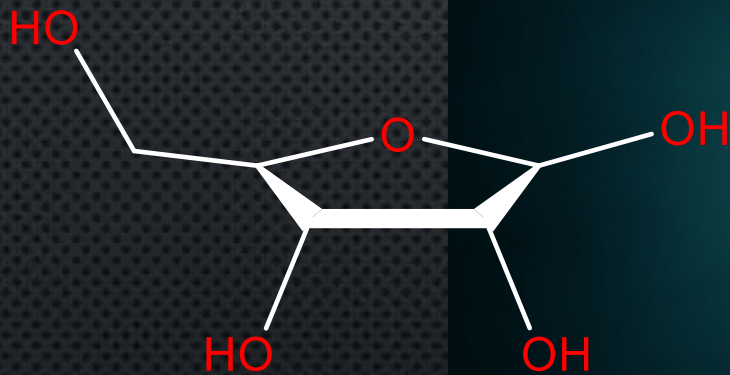
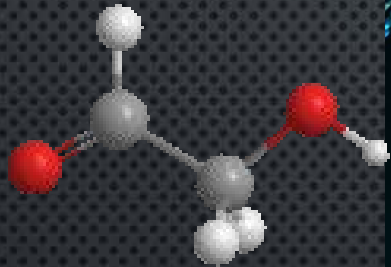
METHODS

WE SURVEYED 20
MOLECULAR CLOUDS
RANGING FROM $R_{GC} =$
12.9 – 23.5 KPC

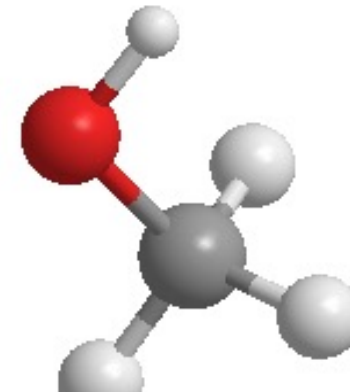
OBSERVATIONS WERE
COMPLETED USING ARO
12M ON KITT PEAK,
ARIZONA AT 3MM FOR
METHANOL AND 2MM
FOR C-C₃H₂

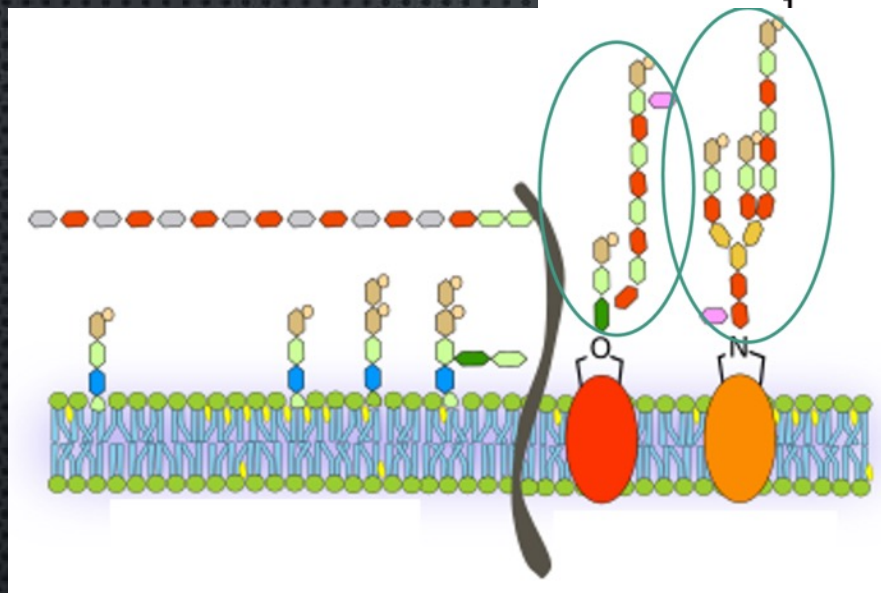


METHANOL

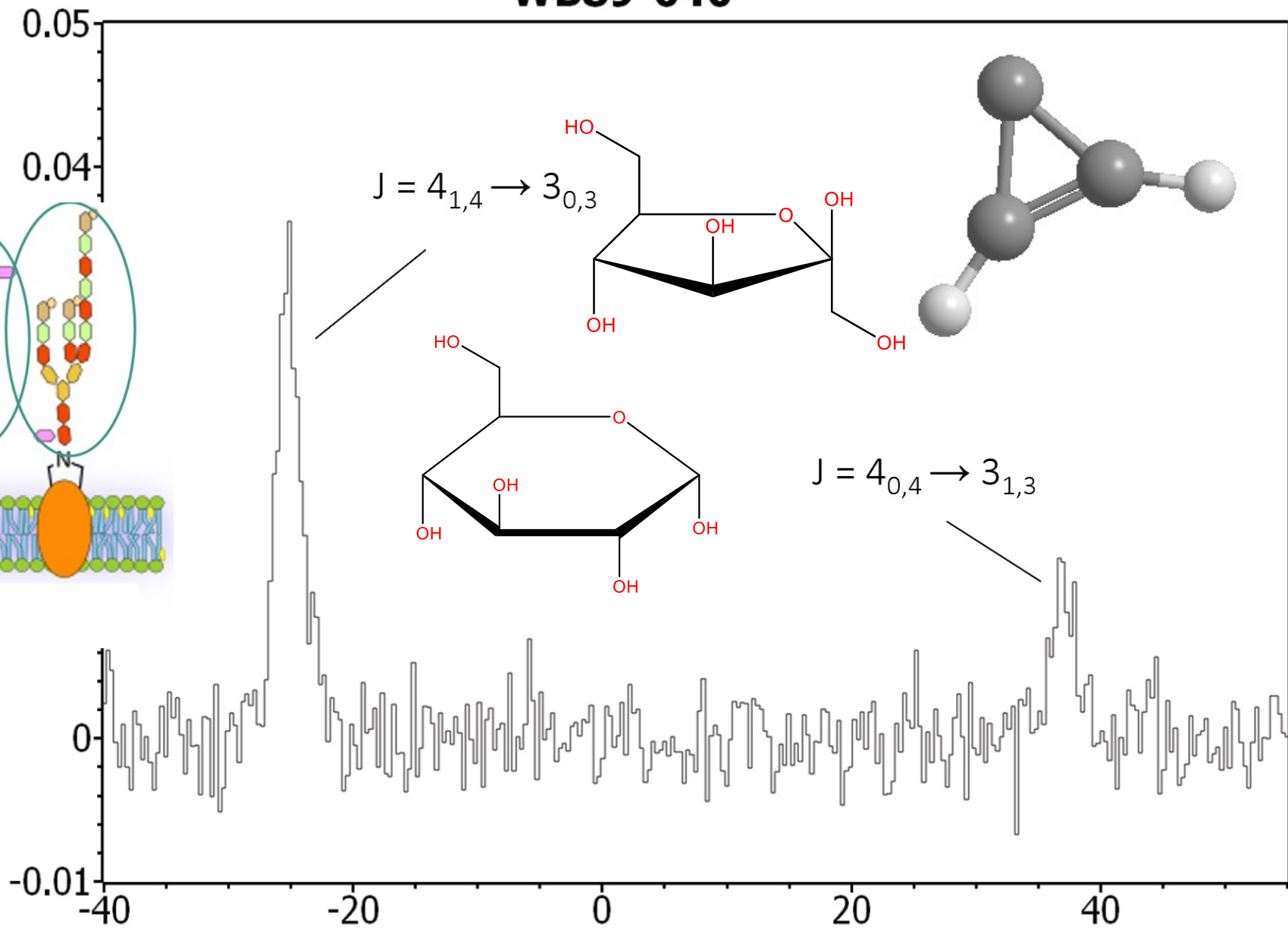


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NITRIC OXIDE



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$$F = \frac{5}{2} \rightarrow \frac{3}{2}, f$$

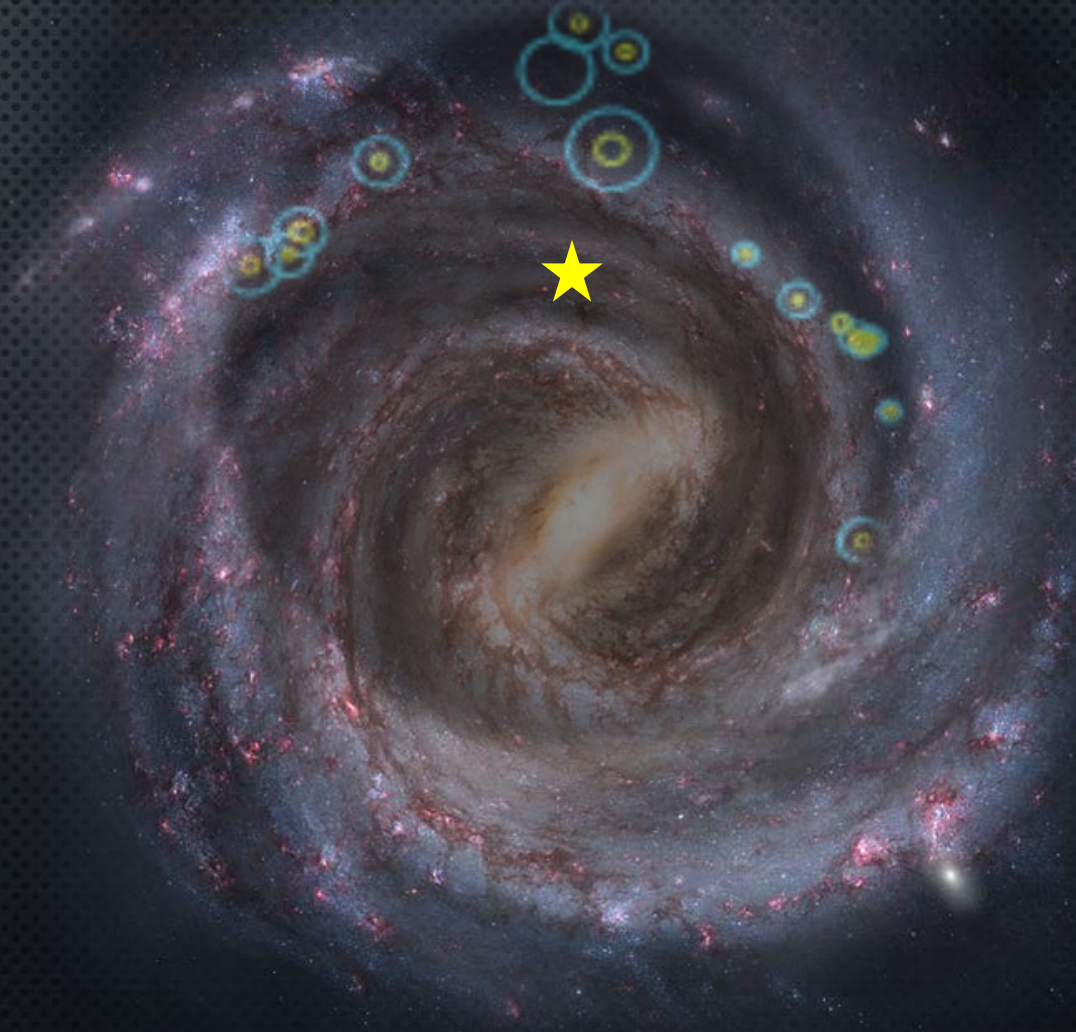
$$\rightarrow \frac{3}{2} f$$

$$F = \frac{3}{2} \rightarrow \frac{1}{2}, f$$



REGION OF OZ (ORGANIC ZONE) IN MILKY WAY?

Organic Chemistry is prevalent throughout the Galaxy, regardless of distance from Galactic Center



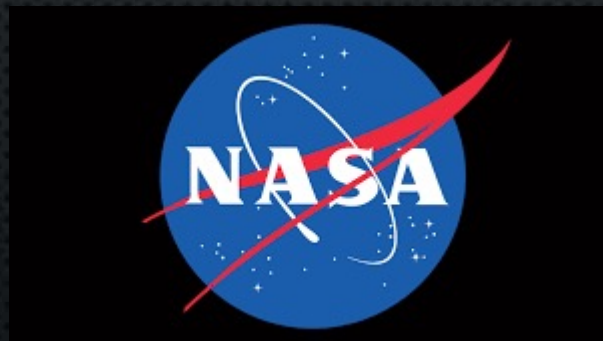
OZ could indicate regions where conditions for prebiotic life are ripe, extending the GHZ

SUMMARY

- Organic Molecules discovered near the outer reaches of the galaxy
- The abundances of these molecules appear to be independent of galactic radius
- OZ can be extended to the edges of the galactic disk
- Next Steps: search for CH_3CN , glycolaldehyde, phosphorus molecules, etc.

ACKNOWLEDGEMENTS

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PRESS RELEASE LINK

[HTTPS://NEWS.ARIZONA.EDU/STORY/ORGANIC-MOLECULES-OFFER-CLUES-ABOUT-DYING-STARS-AND-OUTSKIRTS-MILKY-WAY](https://news.arizona.edu/story/organic-molecules-offer-clues-about-dying-stars-and-outskirts-milky-way)