The JWST view of the ISM in I Zw 18 : Warm H_2 and Warm Dust (2025, ApJ, 993, 84)

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I Zw 18

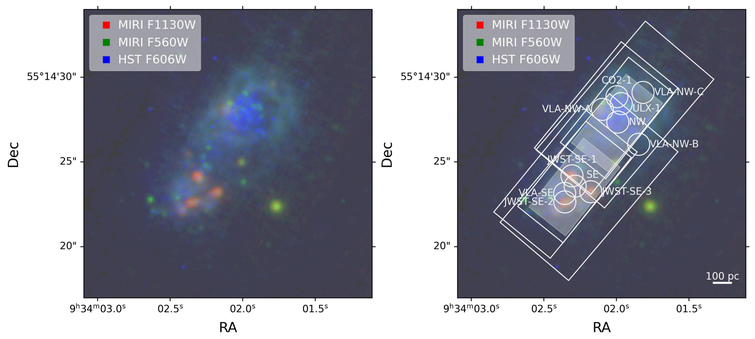
Star Formation in a Very Low Metallicity Galaxy

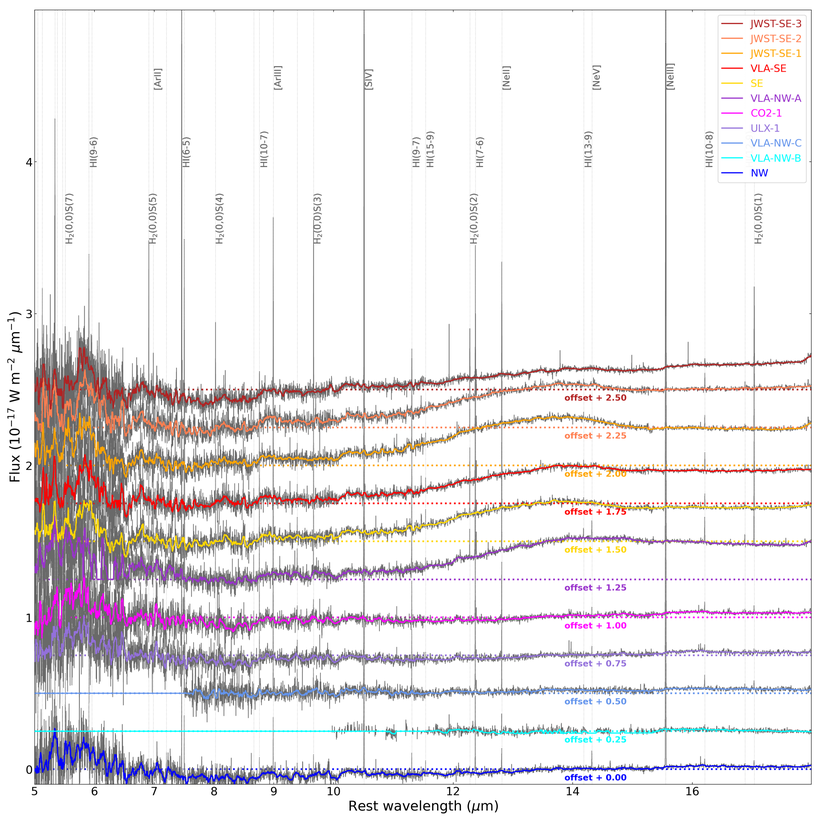
- $M_\star \approx 10^{6.50.5} M_\odot$
- $M(H\,I) \approx 108 M_\odot$
- SFR ≈ 0.3-1 $M_\odot$/yr
- $Z \approx 0.03\ Z_\odot$

Is H_2 present in the star-forming regions?

MIRI Imaging and Spectroscopy

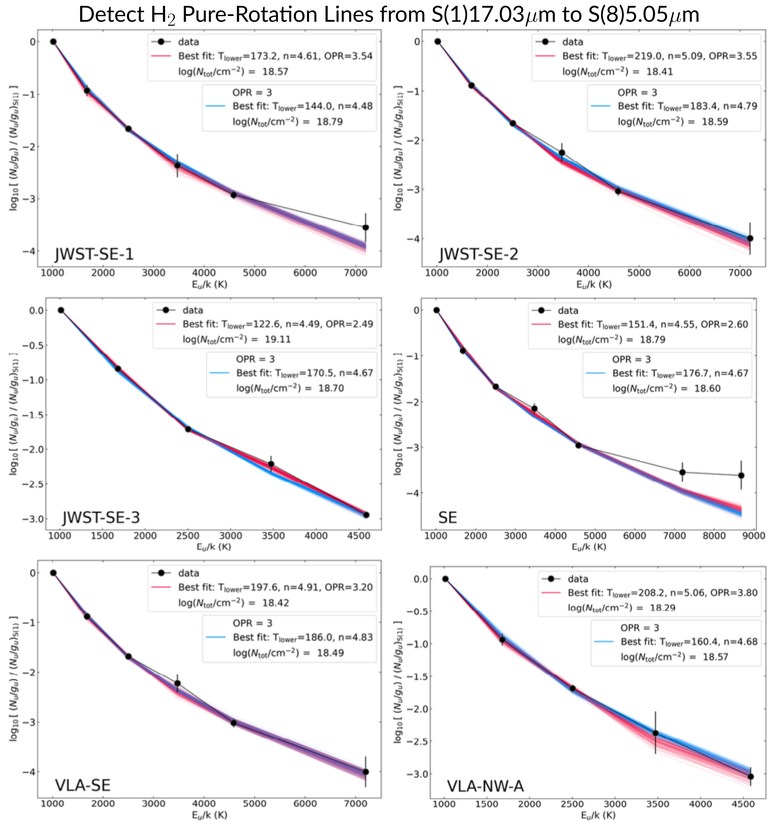
JWST spectroscopy revealed four 14μm continuum sources: VLA-NW-A associated with an H II region identified in the radio continuum, and three in the SE: JWST-SE-1, 2, 3.





Molecular Hydrogen

Detect H_2 Pure-Rotation Lines from S(1)17.03μm to S(8)5.05μm



— fixed OPR=3 — adjustable OPR

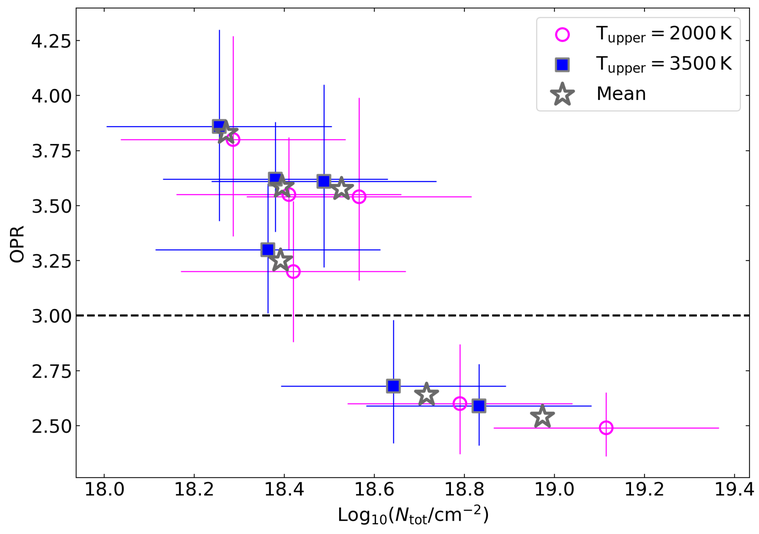
1. Assume rotational levels are in local LTE (except for OPR)
2. Assume $dN/dT \propto T^{-n}, T_\ell < T < T_u$; free parameters: T_ℓ, T_u, n
3. OPR = ortho/para ratio: free parameter.

6 regions with ≥5 transitions with S/N >3

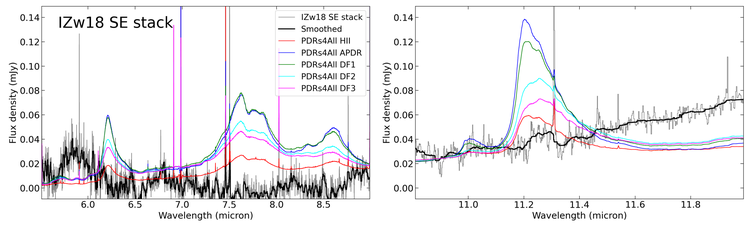
Result: 4/6 regions have OPR > 3

OPR increases with decreasing $N(H_2)$

(as expected for propagating photodissociation front)

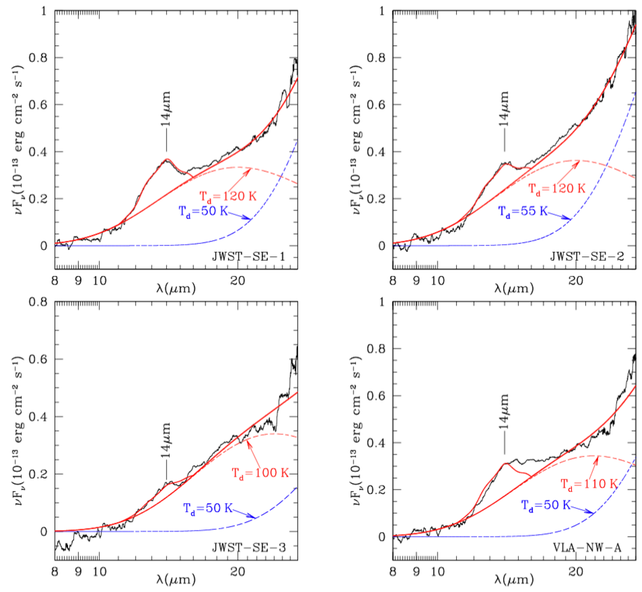


No Evidence for PAHs

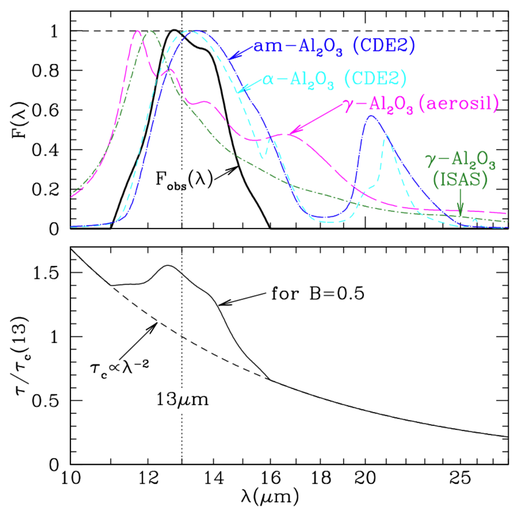


Search for PAHs: *No Detection*

Unusual Emission Feature at 14μm



Tentative Identification of 14μm Feature: Al_2O_3



$F_{obs}(\lambda)$ = empirical opacity profile

Also shown: opacities for different Al_2O_3 specimens