Exploring Non-Uniformity of the ISM in Spatially Resolved HII Regions

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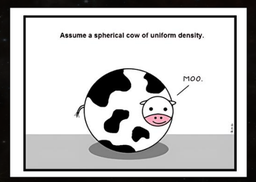
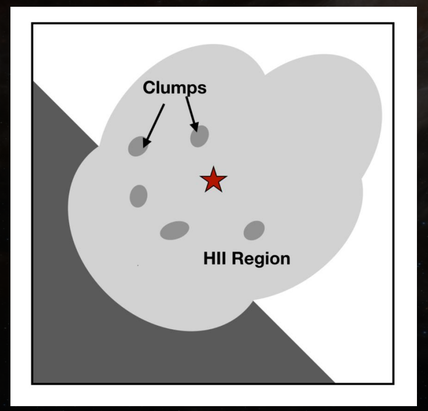
Background:

- Star-forming HII regions provide a vital probe of gas-phase metallicity, and allow us to trace the cumulative chemical evolution of the ISM in a galaxy
- However, models of HII regions often assume a 'spherical cow' (uniform density or temperature) which does not account for spatial variations such as density clumps or inhomogeneities that bias the observed line emission
- Metallicity diagnostics are typically calibrated on integrated HII regions which also do not account for this





HII region diagram adapted from Jin et al. 2022.

Is an integrated HII region metallicity truly representative of all the ISM *within* an HII region?

*example HST image of SMC N81

1 arsec slit - one integrated value for entire HII region

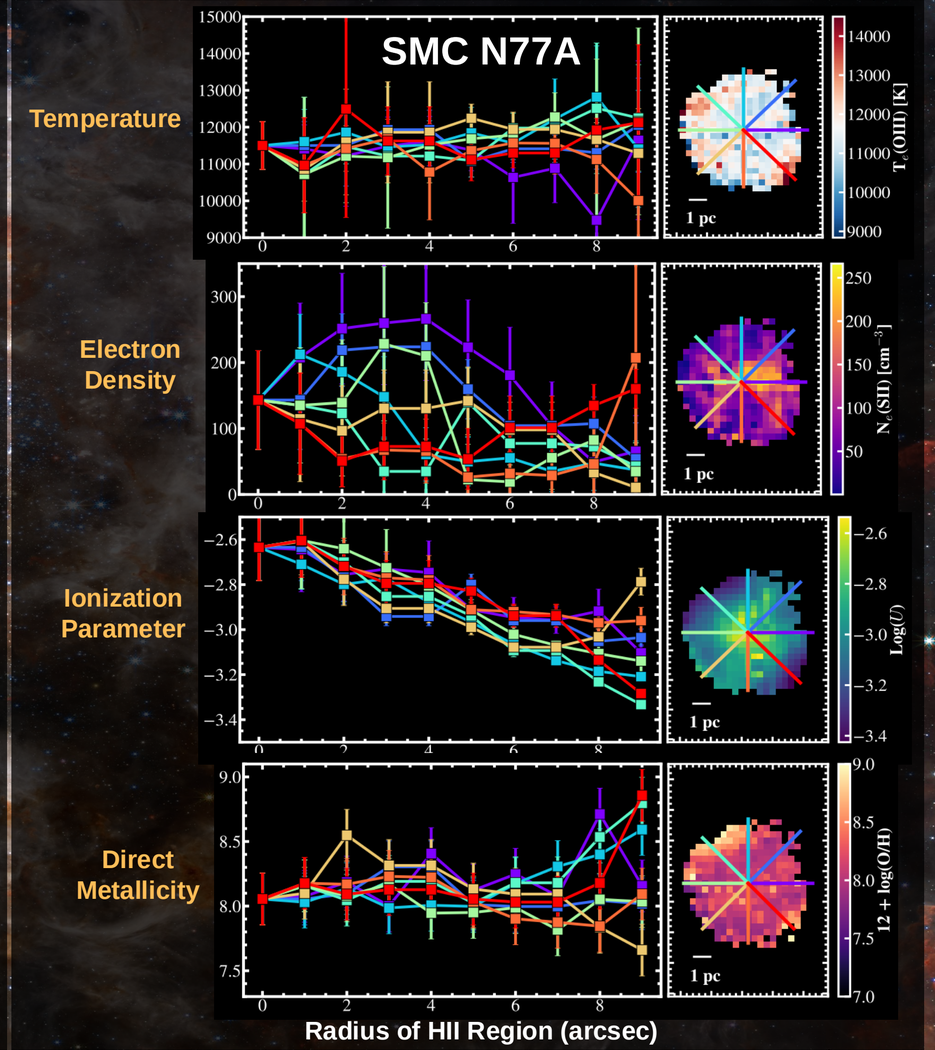
IFU observations - one value per pixel in FOV

Sub-parsec resolution of WiFeS IFU observations from ANU 2.3m telescope allow us to ***map variations and complex internal structures throughout HII regions.***

- Sample of compact HII regions in the Magellanic Clouds at **~0.3pc resolution**
- Deep enough to detect **faint lines** required for direct temperature and metallicity

Spatial distribution of electron temperature, density, ionization parameter and gas-phase metallicity is ***not* homogeneous or isotropic.**

More results in *Ridolfo et al. in prep.*



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Background image credit: JWST