Nitrogen fractionation across the Galaxy

Observations of the $^{14}N/^{15}N$ ratio in a large sample of high-mass star-forming cores

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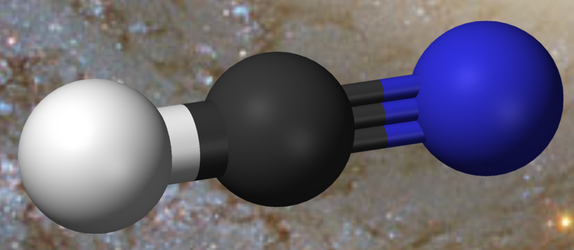
Introduction

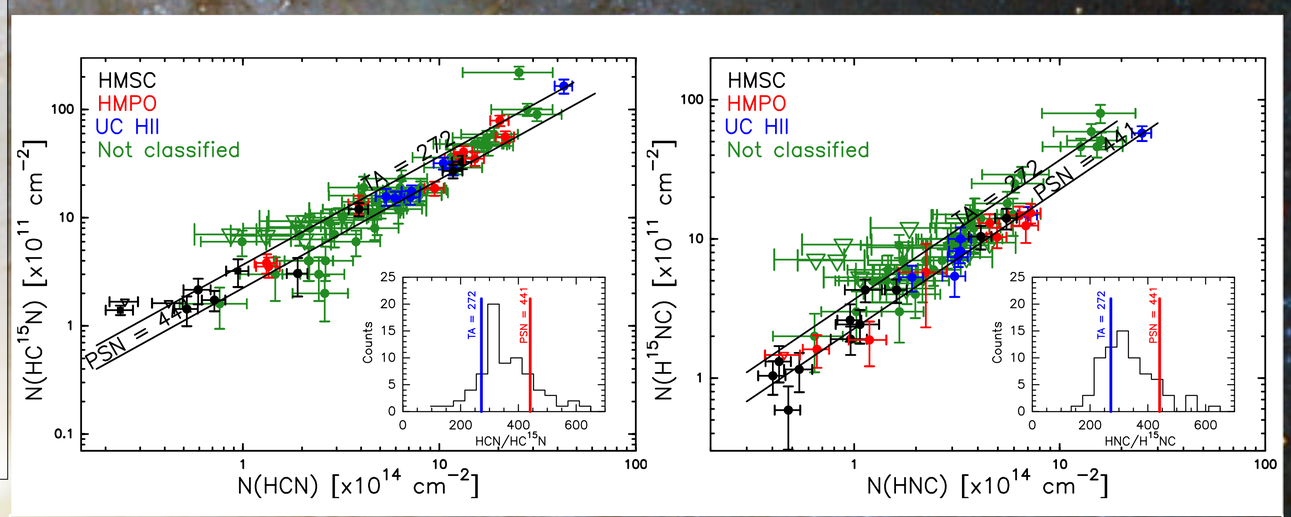
^{15}N is the less abundant stable isotope of nitrogen and is **enriched in comets and carbonaceous chondrites** with respect to the value measured in **the Protosolar Nebula (PSN)** (Marty et al., 2010), but we still do not understand if this enrichment is a heritage of the past chemical history. Because our Sun was born in a rich cluster, possibly including massive stars (e.g. Adams 2010), **observations of massive, dense star forming cores in different evolutionary stages, and in a statistically significant sample, are needed.**

Sample and observations

- **LINES: $HN^{13}C$, $H^{13}CN$, $HC^{15}N$, $H^{15}NC$ (J=1-0)** with the IRAM-30m Telescope;
- **SOURCES: 87** high-mass star forming cores: **27** of these sources **belong to the three main evolutionary categories of the high-mass star formation** process (Colzi et al., 2017). This **sample** has been recently **increased with 60 massive dense cores** and **do not have an evolutionary classification yet** (Colzi et al., in prep).



1) ^{15}N-Fractionation



- $^{14}N/^{15}N$ ~180-555 from HNC
- $^{14}N/^{15}N$ ~115-810 from HCN
- Asymmetric distributions peaked around values <440

2) Galactocentric gradient

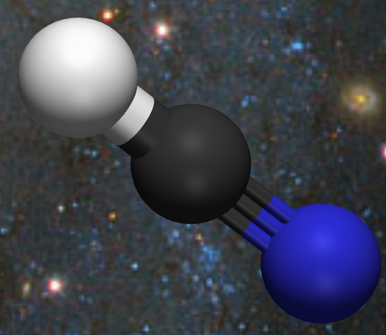
With linear fit:

$HCN/HC^{15}N = 21 \pm 9\ kpc^{-1} \times D_{GC} + 250 \pm 67$

$HNC/H^{15}NC = 20 \pm 6\ kpc^{-1} \times D_{GC} + 221 \pm 42$

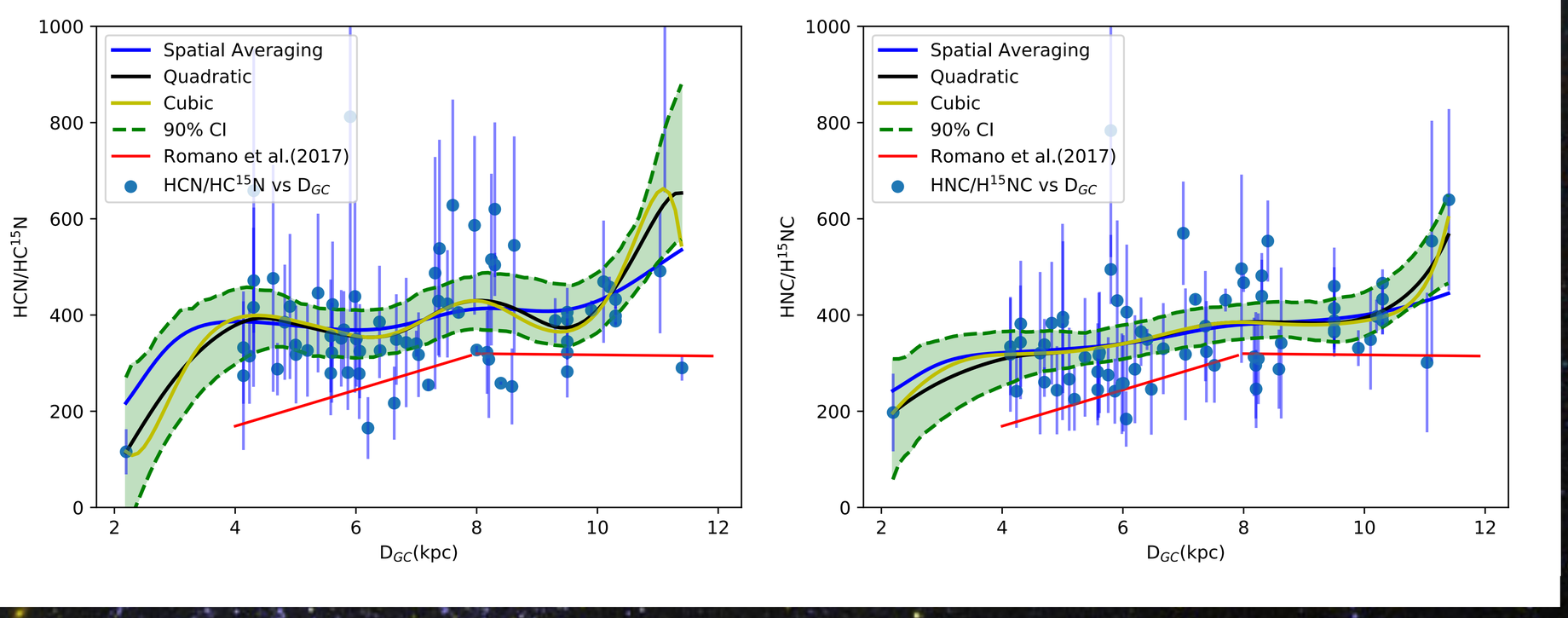
Consistent with that found by Adande & Ziurys (2012).

BASED ON A LARGE STATISTICS!!



3) Comparison with models

Non-Parametric fit can not reproduce the flattening trend of the Galactic Chemical Evolution model made by Romano et al. (2017) for D_{GC} > 8 kpc.



References:

Adams 2010, ARA&A, 48, 74

Adande & Ziurys 2012, ApJ, 744,194

Colzi et al., 2017, arXiv:1709.04237

Marty et al.: *Geochimica et Cosmochimica* Acta74, 340-355, 2010

Romano et al. 2017, MNRAS, 470, 401

NEEDED MORE OBSERVATIONS IN THE OUTER GALAXY…