J/A+A/605/A57 SOLIS. I. OMC2-FIR4 HC_3N and HC_5N images (Fontani+, 2017)

Seeds of Life in Space (SOLIS).
I. Carbon-chain growth in the Solar-type protocluster OMC2-FIR4.
Fontani F., Ceccarelli C., Favre C., Caselli P. Neri R., Sims I.R.,
Kahane C., Alves F., Balucani N., Bianchi E., Caux E., Jaber Al-Edhari A.,
Lopez-Sepulcre A., Pineda J., Bachiller R., BIzzocchi L., Bottinelli S.,
Chacon-Tanarro A., Choudhury R., Codella C., Coutens A., Dulieu F., Feng S.,
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=2017A&A...605A..57F (SIMBAD/NED BibCode)

ADC_Keywords: Infrared sources ; Interstellar medium

Keywords: radio lines: ISM - stars: formation - ISM: molecules

Abstract:
The interstellar delivery of carbon atoms locked into molecules might be one of the key ingredients for the emergence of life. Cyanopolyynes are carbon chains delimited at their two extremities by an atom of hydrogen and a cyano group, meaning that they could be excellent reservoirs of carbon. The simplest member, HC_3N, is ubiquitous in the galactic interstellar medium and found also in external galaxies. Thus, understanding the growth of cyanopolyynes in regions forming stars similar to our Sun, and what affects them, is particularly relevant.

In the framework of the IRAM/NOEMA Large Program SOLIS (Seeds Of Life In Space), we have obtained a map of two cyanopolyynes, HC_3N and HC_5N, in the protocluster OMC-2 FIR4. Because our Sun is thought to be born in a rich cluster, OMC-2 FIR4 is one of the closest and best known representatives of the environment in which the Sun may have been born. We find a HC_3N/HC_5N abundance ratio across the source in the range ~1-30, with the smallest values (<10) in FIR5 and in the Eastern region of FIR4.

The ratios ≤10 can be reproduced by chemical models only if: (1) the cosmic-ray ionisation rate z is ~$4\times10^{-14}s^{-1}$; (2) the gaseous elemental ratio C/O is close to unity; and (3) oxygen and carbon are largely depleted. The large z is comparable to that

measured in FIR4 by previous works and was interpreted as due to a flux of energetic (>10MeV) particles from embedded sources. We suggest that these sources could lie East of FIR4 and FIR5.

Description:

IRAM-NOEMA Interferometer, 3mm receiver, Widex and Narrow-band correlators.

Observations with the IRAM NOEMA Interferometer of HC_3N (9-8) and HC_5N (31-30), at rest frequencies 81.881468GHz and 82.539039GHz , respectively, towards OMC-2 FIR4 have been carried out over 5 days between the 5th and the 19th of August, 2015.

The HC_3N line was observed in the Widex band correlator, providing a resolution in velocity of ~7.15km/s, while the HC_5N line was observed also in the Narrow band correlator with a resolution in velocity of ~0.57km/s.

Objects:

RA (2000)	DE	Designation(s)
05 35 26.97	-05 09 54.5	OMC2-FIR4 = [MWZ90] OMC-2 FIR 4

File Summary:

FileName	Lrecl	Records	Explanations
ReadMe	80	.	This file
list.dat	113	4	List of fits images
fits/*	0	4	Individual fits images

See also:

J/A+A/556/A57 : Transitions in OMC-2 FIR 4 in the far-IR (Kama+, 2013)
J/A+A/596/A26 : OMC-2 FIR 3 and FIR 4 [OI] maps (Gonzalez-Garcia+, 2016)
J/A+A/605/L3 : SOLIS. I. L1157-B1 NH_2CHO image (Codella+, 2017)

Byte-by-byte Description of file: list.dat

Bytes	Format	Units	Label	Explanations

1- 9	F9.5	deg	RAdeg	Right Ascension of center (J2000)
10- 18	F9.5	deg	DEdeg	Declination of center (J2000)
20- 22	I3	---	Nx	Number of pixels along X-axis
24- 26	I3	---	Ny	Number of pixels along Y-axis
28- 39	E12.6	m/s	RV	Radial velocity
41- 42	I2	Kibyte	size	Size of FITS file
44- 67	A24	---	FileName	Name of FITS file, in subdirectory fits
69-113	A45	---	Title	Title of the FITS file

Acknowledgements:
Francesco Fontani, fontani(at)arcetri.astro.it

References:
Codella et al., Paper II 2017A&A...605L...3C, Cat J/A+A/605/L3

(End) Francesco Fontani [INAF-OAA, Italy], Patricia Vannier [CDS] 17-Aug-2017

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