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Authors	CODELLA, CLAUDIO, Ceccarelli, C., Caselli, P., Balucani, N., Baroneinst, V., Fontani, F., Lefloch, B., Podio, L., Viti, S., Feng, S., Bachiller, R., Bianchi, E., Dulieu, F., Jimenez-Serra, I., Holdship, J., Neri, R., Pineda, J., Pon, A., Sims, I., Spezzano, S., Vasyunin, A. I., Alves, F., Bizzocchi, L., Bottinelli, S., Caux, E., Chacon-Tanarro, A., Choudhury, R., Coutens, A., Favre, C., Hily-Blant, P., Kahane, C., Jaber Al-Edhari, A., Laas, J., Lopez-Sepulcre, A., Ospina, J., Oya, Y., Punanova, A., Puzzarini, C., Quenard, D., Rimola, A., Sakai, N., Skouteris, D., Taquet, V., Testi, L., Theule, P., Ugliengo, P., Vastel, C., Vazart, F., Wiesenfeld, L., Yamamoto, S.
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J/A+A/605/L3

SOLIS. II. L1157-B1 NH₂CHO image

(Codella+, 2017)

Seeds of Life in Space (SOLIS).

II. Formamide in protostellar shocks: evidence for gas-phase formation.

Codella C., Ceccarelli C., Caselli P., Balucani N., Baroneinst V., Fontani F., Lefloch B., Podio L., Viti S., Feng S., Bachiller R., Bianchi E., Dulieu F., Jimenez-Serra I., Holdship J., Neri R., Pineda J., Pon A., Sims I., Spezzano S., Vasyunin A.I., Alves F., Bizzocchi L., Bottinelli S., Caux E., Chacon-Tanarro A., Choudhury R., Coutens A., Favre C., Hily-Blant P., Kahane C., Jaber Al-Edhari A., Laas J., Lopez-Sepulcre A., Ospina J., Oya Y., Punanova A., Puzzarini C., Quenard D., Rimola A., Sakai N., Skouteris D., Taquet V., Testi L., Theule P., Ugliengo P., Vastel C., Vazart F., Wiesenfeld L., Yamamoto S.

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=[2017A&A...605L...3C](#) (SIMBAD/NED BibCode)

ADC_Keywords: Interstellar medium ; Interferometry

Keywords: stars: formation - ISM: jets and outflows - ISM: molecules -
ISM: individual objects: L1157-B1

Abstract:

Modern versions of the Miller-Urey experiment claim that formamide (NH₂CHO) could be the starting point for the formation of metabolic and genetic macromolecules. Intriguingly, formamide is indeed observed in regions forming Solar-type stars as well as in external galaxies.

How NH₂CHO is formed has been a puzzle for decades: our goal is to contribute to the hotly debated question of whether formamide is mostly formed via gas-phase or grain surface chemistry.

We used the NOEMA interferometer to image NH₂CHO towards the L1157-B1 blue-shifted shock, a well known interstellar laboratory, to study how the components of dust mantles and cores released into the gas phase triggers the formation of formamide. Results. We report the first spatially resolved image (size ~9", ~2300AU) of formamide emission in a shocked region around a Sun-like protostar: the line profiles are blueshifted and have a FWHM~5km/s. A column density of N(NH₂CHO)=8x10¹²cm⁻¹, and an abundance (with respect to H-nuclei) of 4x10⁻⁹ are derived. We show a spatial segregation of formamide with respect to other organic species. Our observations, coupled with a chemical modelling analysis, indicate that the formamide observed in L1157-B1 is formed by gas-phase chemical

process, and not on grain surfaces as previously suggested.

The SOLIS interferometric observations of formamide provide direct evidence that this potentially crucial brick of life is efficiently formed in the gas-phase around Sun-like protostars.

Description:

Datacube in fits format of the NH₂CHO(4_{1,4-3}1,3) emission imaged towards L1157-B1 using the IRAM-NOEMA interferometer (see Fig. 1).

The L1157-B1 shock was observed at 3mm with the IRAM NOEMA seven-element array during several tracks in July, October, and November 2015 using both the C and D configurations. The shortest and longest baselines are 19m and 237m, respectively, allowing us to recover emission at scales up to ~17".

Objects:

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      RA      (2000)      DE      Designation(s)
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  20 39 09.5    +68 01 10  L1157-B1 = [DE95] LDN 1157 B1
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File Summary:

FileName	Lrecl	Records	Explanations
ReadMe	80	.	This file
list.dat	95	1	Informations of fits image
fig1.fits	2880	94	Fits image

See also:

[J/A+A/605/A57](#) : SOLIS. II. OMC2-FIR4 HC₃N and HC₅N images (Fontani+, 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-	30	I3	Kibyte	size	Size of FITS file
32-	40	A9	---	FileName	Name of FITS file
42-	95	A54	---	Title	Title of the FITS file

Acknowledgements:

Claudio Codella, [codella\(at\)arcetri.astro.it](mailto:codella(at)arcetri.astro.it)

References:

Fontani et al., Paper I, [2017A&A...605A..57F](#), Cat. [J/A+A/605/A57](#)

(End)

Patricia Vannier [CDS] 21-Aug-2017

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