



# Complex molecules toward low-mass protostars: the Serpens core

[Karin I. Oberg](#), [Nienke van der Marel](#), [Lars E. Kristensen](#), [Ewine F. van Dishoeck](#)

(Submitted on 28 Jul 2011)

Gas-phase complex organic molecules are commonly detected toward high-mass protostellar hot cores. Detections toward low-mass protostars and outflows are comparatively rare, and a larger sample is key to investigate how the chemistry responds to its environment. Guided by the prediction that complex organic molecules form in CH<sub>3</sub>OH-rich ices and thermally or non-thermally evaporate with CH<sub>3</sub>OH, we have identified three sight-lines in the Serpens core - SMM1, SMM4 and SMM4-W - which are likely to be rich in complex organics. Using the IRAM 30m telescope, narrow lines (FWHM of 1-2 km s<sup>-1</sup>) of CH<sub>3</sub>CHO and CH<sub>3</sub>OCH<sub>3</sub> are detected toward all sources, HCOOCH<sub>3</sub> toward SMM1 and SMM4-W, and C<sub>2</sub>H<sub>5</sub>OH not at all. Beam-averaged abundances of individual complex organics range between 0.6 and 10% with respect to CH<sub>3</sub>OH when the CH<sub>3</sub>OH rotational temperature is applied. The summed complex organic abundances also vary by an order of magnitude, with the richest chemistry toward the most luminous protostar SMM1. The range of abundances compare well with other beam-averaged observations of low-mass sources. Complex organic abundances are of the same order of magnitude toward low-mass protostars and high-mass hot cores, but HCOOCH<sub>3</sub> is relatively more important toward low-mass protostars. This is consistent with a sequential ice photochemistry, dominated by CHO-containing products at low temperatures and early times.

Comments: 20 pages, including 5 figures. Accepted for publication in ApJ

Subjects: **Galaxy Astrophysics (astro-ph.GA)**

Cite as: [arXiv:1107.5824](#) [astro-ph.GA]

(or [arXiv:1107.5824v1](#) [astro-ph.GA] for this version)

## Submission history

From: Karin Oberg [[view email](#)]

[v1] Thu, 28 Jul 2011 20:23:55 GMT (135kb)

[Which authors of this paper are endorsers?](#)

## Download:

- [PDF](#)
- [PostScript](#)
- [Other formats](#)

Current browse context:

astro-ph.GA

[< prev](#) | [next >](#)

[new](#) | [recent](#) | [1107](#)

Change to browse by:

[astro-ph](#)

## References & Citations

- [INSPIRE HEP](#)  
([refers to](#) | [cited by](#))
- [NASA ADS](#)

Bookmark([what is this?](#))



