

# New Understanding of Prebiotic Organic Synthesis

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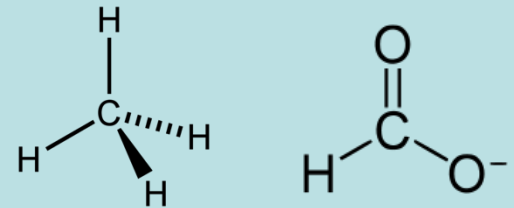
An active hydrothermal vent located in the Von Damm hydrothermal field.



**New calculations of reaction energetics at hydrothermal sites show that there are multiple mechanisms for the formation of small organic compounds.**

- The prevailing theory for the abiotic origin of organic compounds suggests that the warm, hydrogen-rich fluids circulating through the rock systems allows inorganic carbon to be reduced to organic compounds.

Methane (left) and formate (right) are examples of simple organic compounds produced in hydrothermal systems.



McDermott et al. (2015), *PNAS*

- Measuring conditions for two distinct reaction pathways (for methane and formate) at the Von Damm hydrothermal fields has shown that there are pathways that are different from the current theory in temporal and spatial scales: methane predominantly within small inclusions over thousands of years and formate very rapidly within subsurface environments.
- These different pathways show that microbial life strategies may be more comprehensive than expected, which has implications for habitable hydrothermal or deep subsurface environments on the early Earth and on icy bodies in the solar system such as Europa or Enceladus.