Study: Meteorites point to our solar system as source of organic materials

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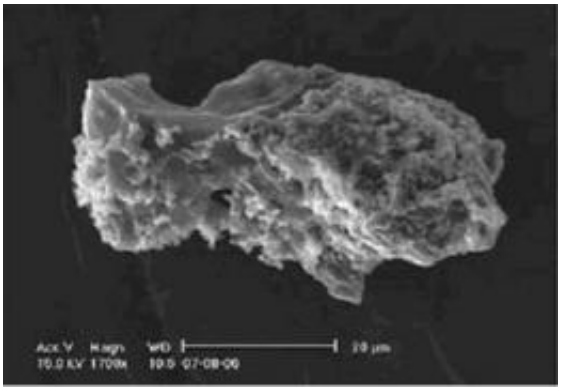

Ultracarbonaceous micrometeorite found near the Concordia base, seen through a scanning electron microscope. © CSNSM-CNRS

Tiny meteorites found in ultra-pure Antarctic snow may provide scientists with evidence that the building blocks of life may have come from within our own solar system, rather than from the far reaches of space, researchers reported in a paper published online Thursday in the journal Science.

Scientists have for years been trying to mark a clear line between which materials, including carbon-rich organic materials, formed within our solar system and which came from outer space.

"This line is very, very difficult to draw," said study lead author Jean Duprat, a physicist at the University of Paris-South in France. "But to

draw that line, you need to have very primitive objects that didn't change too much."

Duprat and co-workers studied micrometeorites, particles fractions of a millimeter in size that fell to Earth from space. Not just any micrometeorite would do: Although 30,000 tons of this cosmic dust falls on the Earth each year, most of it is irretrievably contaminated by other particles or water.

To find pure, unadulterated cosmic dust, the researchers went to the Antarctic and headed about 750 miles inland to a dry, deserted region around the French-Italian Concordia research station to collect samples of the cleanest snow they could find.

The winds in Antarctica blow from the center outward, Duprat said, and so contamination is unlikely to travel to this region. This fact, coupled with the lack of water and limited human presence, means the region provides some of the purest samples on earth.

When the scientists analyzed two of the carbon-rich micrometeorites they collected there, they found that the samples contained a high proportion of deuterium, a heavier, stable isotope of hydrogen. In addition, the micrometeorites had a relatively high level of crystalline silicates.

Normally, a higher deuterium ratio is a sign that an object came from far-off interstellar dust clouds. But it also could mean it came from the cold outer regions of the solar system early in its formation, the researchers argued. The presence of crystalline silicates suggests the latter, since these materials are associated with the protoplanetary disk, the ring of dust and debris that accumulated around the young sun before forming planets, comets and other heavenly bodies.

The scientists say the micrometeorites -- and the organic molecules they contain -- could have come from icy comets within our solar system.

Conel Alexander, a cosmochemist with the Carnegie Institute in Washington, D.C., said the data are interesting but not yet conclusive; it would take the study of more micrometeorites to shore them up.

He added that that the origins of organic materials on Earth are a subject of much debate -- partly, he said, fueled by "wishful thinking" because of the implications they hold for alien life. If organic molecules came from the far reaches of space, he said, it would imply that life could have been seeded on planets other than our own.

More information: Extreme Deuterium Excesses in Ultracarbonaceous Micrometeorites from Central Antarctic Snow
J. Duprat, E. Dobrică, C. Engrand, J. Aléon, Y. Marrocchi, S.Mostefaoui, A. Meibom, H. Leroux, J.-N. Rouzaud, M. Gounelle and F. Robert; Science, Mai 2010