

So, has Voyager 1 left the Solar System? Scientists face off

Cosmic-ray fluctuations could mean the craft has exited the Sun's magnetic field.

Ron Cowen

21 March 2013

A space physicist this week suggests that NASA's venerable Voyager 1 spacecraft has become the first vehicle to venture beyond the heliosphere — the magnetic bubble created by the Sun — but other mission scientists disagree.

William Webber of New Mexico State University in Las Cruces bases the claim on signals recorded last August by the Voyager 1 cosmic-ray subsystem — a device that he helped to build — along with his late colleague and study co-author Francis McDonald.

The instrument recorded a dramatic drop in the intensity of the cosmic rays trapped in the Sun's magnetic field and a concomitant rise in that of rays generated by more distant reaches of the Galaxy. That pattern indicates that Voyager 1 has travelled beyond the Sun's magnetic influence and is no longer being shielded from galactic cosmic rays, the researchers report in a study published online this week in *Geophysical Research Letters*¹.

But if one is to believe a press release issued by NASA on 20 March (the same day the report was published), the two researchers jumped the gun.

Other Voyager scientists who analysed the same data last autumn reiterate what they said then: the cosmic-ray data indicate that **Voyager 1 is in a transition zone** within the outer part of the heliosphere, but until a dramatic change in magnetic-field intensity and direction is detected, the craft remains firmly within the Sun's magnetic sphere of influence.

Stamatios Krimigis, a Voyager scientist at the Johns Hopkins Applied Physics Laboratory in Laurel, Maryland, says that the NASA statement speaks for itself. "There is nothing more to say," he says. "This is old news."

Webber characterizes the different interpretations of the data as "a controversy over semantics". He notes that space scientists previously agreed that when the craft, which is now about 123 astronomical units (au) away from Earth — or 123 times farther than the Earth is from the Sun — encountered the telltale change in cosmic-ray populations, it would be on its way out of the heliosphere. The craft has reached a boundary, "and I would call that boundary the edge of the heliosphere", he says.

The behaviour of the Sun's magnetic field at the heliosphere's edge is highly uncertain, notes Webber. Voyager 1 detected fluctuations in the field, but not at the same time that it detected the change in cosmic-ray abundances, he adds. (The craft's twin, Voyager 2, is about 101 au away from Earth and is not believed to have reached the transition zone.)

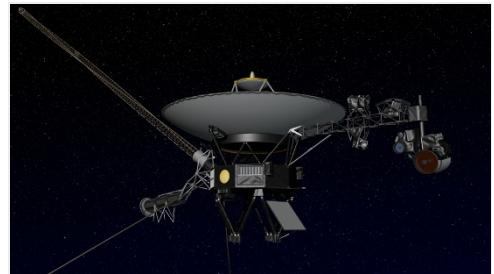
"There is little we can say about the magnetic field" until the publication of papers scheduled to appear in an upcoming issue of *Science*, Krimigis says. "That's where the magnetic-field data are, not in Webber's paper."

Either way, no artificial objects are likely to leave the Solar System anytime soon. Strictly speaking, the Solar System comprises all objects that orbit the Sun — which probably includes icy bodies thousands of au away.

Nature | doi:10.1038/nature.2013.12662

References

1. Webber, W. R. & McDonald, F. B. *Geophys. Res. Lett.* <http://dx.doi.org/10.1002/grl.50383> (2013).



JPL-Caltech/NASA

Voyager 1 recorded a sudden drop in cosmic rays last August, a possible sign that it had left the Sun's sphere of influence.