Voyager observes magnetic field fluctuations in heliosheath

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As they near the outer reaches of the solar system, for the past several years the two Voyager spacecraft have been sending back observations that challenge scientists' views of the physics at the edge of the heliosphere, the bubble created by charged particles flowing outward from the Sun. A new study looks at magnetic field fluctuations and cosmic ray intensity observed by Voyager I.

In 2004, Voyager I crossed the termination shock, the region where the solar wind begins to slow as it interacts with the interstellar medium. Just outside the termination shock is the heliosheath, where the solar wind continues to slow, reaching a stagnation region where solar wind speed drops to zero. Burlaga and Ness studied the magnetic field observed by Voyager I during 2010, when the spacecraft was moving through this stagnation region. Their analysis shows that magnetic field fluctuations outside the termination shock were primarily compressive fluctuations in field strength along the direction of the motion of the planets around the Sun. The fluctuations were observed on time scales of several hours.

They also observe that the intensity of high-energy cosmic rays (above 70 megaelectron volts per nucleon) tend to increase with increasing magnetic field strength and increasing magnetic fluctuations. This is contrary to expectations, as theories predict that charged cosmic rays would be scattered by fluctuations in the magnetic field. The authors suggest that compressive fluctuations of the magnetic field may play a role in accelerating energetic particles in the heliosheath.

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