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Tracing the heliospheric flux tube pattern with Jovian electron jets

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We discuss the propagation of magnetic flux tubes of solar origin through the heliosphere up to the orbit of Jupiter and the possibility that Jovian electron jets result from the interaction of these flux tubes with the magnetosphere of Jupiter. In order to do so, we analyze Ulysses observations in the interplanetary medium along the spacecraft's highly inclined orbits between the orbit of Earth and Jupiter. We apply a method originally developed for the analysis of ACE measurements at 1 AU, in which it was shown that the distribution of the relative change in plasma quantities can actually be attributed to plasma turbulence on the one hand, and the existence of individual flux tubes in the solar wind on the other hand. The application to Ulysses data shows that this typical behavior can be observed even up to the orbit of Jupiter. We discuss possible consequences of the existence of these flux tubes at such large distances for the transport of charged particles through the inner heliosphere and analyze observations of so-called Jovian electron jets with Ulysses and Pioneer 10 data with regard to changes in the magnetic field and interpret these as the result of the magnetic interaction of flux tubes with the Jovian magnetosphere.