The Solar Wind as a Magnetofluid Turbulence Laboratory

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The solar wind is the Sun's exosphere. As the solar atmosphere expands into interplanetary space, it is accelerated and heated. Data from spacecraft located throughout the heliosphere have revealed that this exosphere has velocities of several hundred kilometers/sec, densities at Earth orbit of about 5 particles/cm^3, and an entrained magnetic field that at Earth orbit that is about 5 10^{-5} Gauss. A fascinating feature of the solar wind is that the magnetic field fluctuates in a way that is highly reminiscent of "Alfvén waves, i.e., the fluctuating magnetic fields are more-or-less aligned with fluctuations in the velocity of the plasma and, with proper normalization, have approximately equal magnitudes. The imperfect (observed) alignment leads to a variety of complex interactions. In many respects, the flow patterns appear to be an example of fully developed magnetofluid turbulence. Recently, the dissipation range of this turbulence has been studied using search coil magnetometer data from the STAFF instrument on the four Cluster spacecraft. I will attempt to give an overview of selected properties of this large-scale and small-scale turbulence.