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Understanding compressible turbulence in the solar wind with multipoint density measurements derived from spacecraft potential

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Measurements of spacecraft potential can often be used to derive the electron number density with higher time resolution than is typically available with plasma instruments. On board the Cluster spacecraft the potential is measured with the Electric Fields and Waves instrument (EFW) which consists of four booms in the spin plane of the spacecraft. Consequently the potential measurement is affected by spin and wake effects. This makes the study of frequencies larger than the spin frequency challenging. To overcome these caveats a statistical model of the potential is obtained as a function of the angle the spacecraft is facing. When this variation is known it can be removed from the potential data, resulting in a much more accurate determination of the electron density and a cleaner power spectrum. Spikes at harmonics of the spin frequency can be removed without the need to use a notch filter on the time series. The treated data can then be used as an input to the k-filtering technique, which has previously been applied to the incompressible components of the magnetic field. This allows determination of the three dimensional power distribution in wave space as well as the wavevectors and plasma frame frequencies. Results for the compressible component (using electron density and magnitude of the magnetic field as inputs) and the incompressible component (three components of the magnetic field) will be compared.