Radial Evolution of the High/Low Frequency Breakpoint in Magnetic Field Spectra

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The spectra of magnetic field variations in the solar wind show different behavior in two frequency regions; a high frequency region in which the spectral exponent is about -5/3 and a low frequency region in which it is typically -1. The two types of variations must arise from different processes and a clue to the relationship between the spectral regions lies in understanding the behavior of the breakpoint between the spectral regions. Studies of the average behavior of spectra have shown that the break point occurs at about 3.5 hours at 1 AU. It is also known that, on average, the breakpoint occurs at lower frequencies with larger heliocentric distances. Ideally however, instead of the average properties of the spectra, we would like to know how the breakpoint evolves in particular samples of the solar wind as they propagate to larger heliocentric distances. In the study reported here we take advantage of the fact that, in 1974, Pioneer 10 (4.4 AU) and Pioneer 11 (5.6 AU) were close to being co-aligned and being aligned with the Earth. Solar wind observed at Earth can be closely matched with solar wind later observed at P1O and PI 1. We here compare the breakpoint observed at Earth with that observed at Pioneers 10 and 11 for matched samples of the wind.

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